COAL AGE

A McGraw-Hill Publication—Established 1911

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

New York, September, 1931

Volume 36 . . . . Number 9

Self-Help for Coal

ADVERSITY is not without its compensations. Not the least of these is the impetus which depression gives to intensive thinking about industrial fundamentals. This has been particularly true in the bituminous coal industry since the last hopes for calamity prosperity vanished in 1927.

OUT OF THE MASS of suggestions which have been put forward since that time it should be possible to define the major objectives which must be set up if an effective program of stabilization is to be realized. An attempt to do this is made in "A Program for the Stabilization of the Bituminous Coal Industry," appearing on pages 469 to 472 of this issue.

THIS PROGRAM has been limited with deliberate intent to broad outlines. While it mirrors the views of many leaders in the industry, it is not a detailed blueprint for action and operation. There are so many conflicting opinions and interests to be harmonized that expectation of reform by mere pronouncement would be ridiculous.

STABILIZATION of bituminous coal must be generated within the industry itself. *Coal Age* is unwilling to subscribe to the proposal, advocated with increasing frequency, that the cure for the industry's ills lies in becoming the wards of Washington.

ON THE CONTRARY, what is needed is not more government restrictions but removal of the legal uncertainties which make many men reluctant to take concerted action and deprive them of the right to make agreements which can be enforced against those who hold their pledged word lightly. For that reason, the program recommends specific modification of the Sherman law if that modification can be secured without still more burdensome restrictions.

ACHIEVEMENT of the other objectives is wholly within the control of the bituminous industry itself and depends upon its willingness to face realities and to act in concert in meeting them. That this will not be easy of accomplishment is recognized, but the goal is worth the travail.

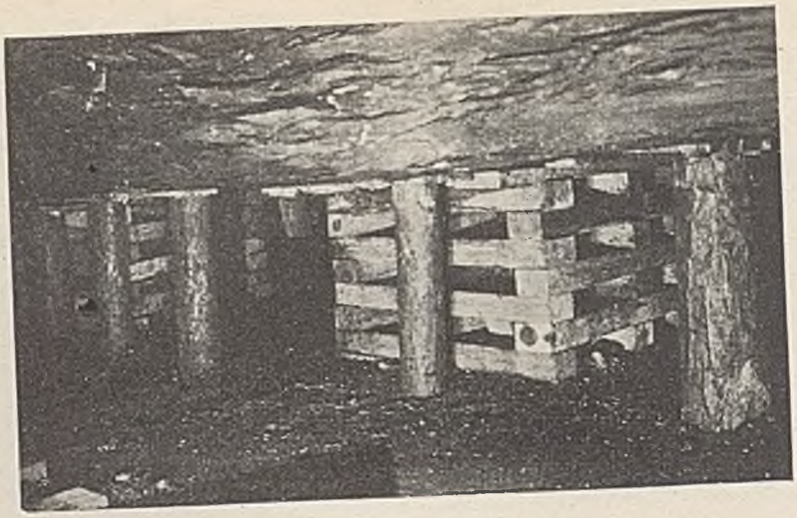


Fig. 1 — Timber and Cribs on Heading; Conveyors Not Yet Installed

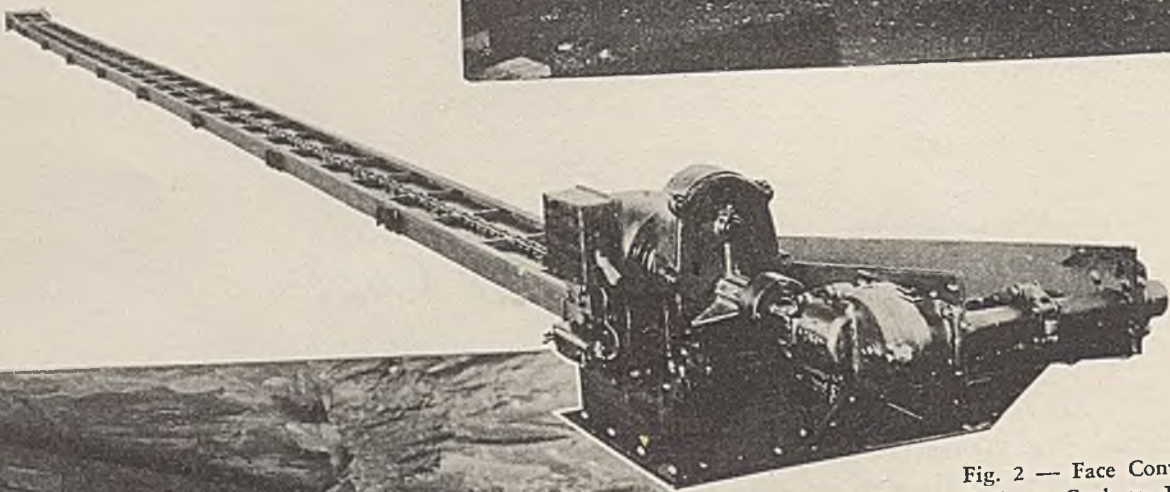


Fig. 2 — Face Conveyor Delivers Coal to Room Conveyor

Fig. 3 — Head of Room Conveyor With Cribbing to Help Sustain Air-course Ribs

Fig. 4—Room Conveyor With Loading Head

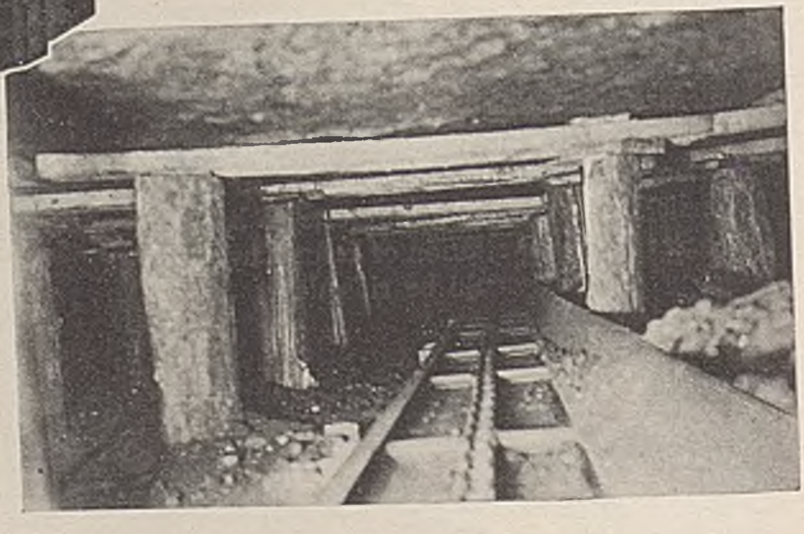


Fig. 5—Heavy Capboards With Timbering at Face

HOW SIPSEY MINE + Laid Plans for Mechanization

By MILTON H. FIES
Vice-President in Charge of Operations

and W. M. LACEY
*Eastern Division General Superintendent
De Bardeleben Coal Corporation,
Birmingham, Ala.*

POSSIBILITIES of using mechanical methods in the mining of a thin coal seam, and the savings thereby resulting, are well exemplified by the operations at Sipsey, Ala. Sipsey mine belongs to the DeBardeleben Coal Corporation and is located in Walker County and in the Warrior coal field. It is situated on a branch of the St. Louis-San Francisco Ry., about seven miles north of a main-line station, Dora.

The mine comprises several drifts on the Black Creek seam, which is the bottom bed of the coal measures. Development first started on this property in 1912, and the mine has been in constant operation since. The seam is 30 in. thick, and the coal is hard, blocky, of bright luster, and of the average analysis given in the accompanying table.

Average Analysis of Black Creek Coal Seam at Sipsey, Ala.

	Per Cent
Moisture	1.60
Volatile matter	34.95
Fixed carbon	60.70
Ash	2.75
Sulphur	0.90
Calorific value (dry basis)	14,750 B.t.u.

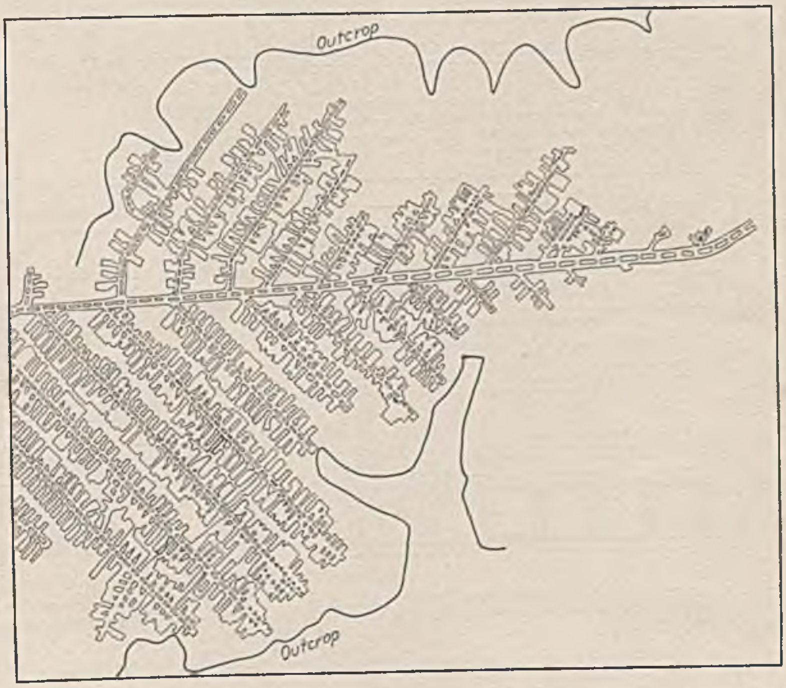
As indicated by the analysis, the coal is of high quality, suitable for domestic, gas, coking, and steam purposes. The quality of the coal and its varied application make it possible to mine a seam of this limited thickness for commercial use.

Sipsey mine has been developed and operated for nearly seventeen years on the room-and-pillar system. The capacity has been about 1,000 tons daily. During this period it was necessary to drive many miles of entries and through-drifts which were opened on the outcrop of the coal. The general plan of operation is indicated in Fig. 6, which represents, of course, only a small portion of the entire mine.

Rooms were driven from 30 to 40 ft. wide, dependent upon the strength of the top, although at times as many as four rooms were connected together and carried forward abreast. The length of these rooms was 150 ft., and the average recovery on this system was from 70 to 75 per cent.

As the hauls lengthened it became more difficult month by month to maintain an output of 1,000 tons per day, and to produce the coal at a satisfactory cost it was found necessary to design a mine car of a capacity larger than that at first used. The original cars, which were of wood, carried about 1,400 lb. and were equipped with wheels having plain bearings. Working with the Sanford-Day Iron Works, Inc., an automatic drop-bottom car was designed which was 21 in. high, equipped with 14-in. wheels, and had a carrying capacity of 2,400 lb. These cars were built heavy enough so that wooden sides could be added, whereby the cars could be made to carry from 2½ to 3 tons of coal. The installation of these cars with automatic doors eliminated a number of tipple men, rock-dumping crews, carpenters, etc., and the output of the mine was in-

Fig. 6—Section of Old Room-and-Pillar Workings Prior to Mechanization With Face and Room Conveyors



creased to 1,400 tons per day (see Figs. 7 and 9).

The installation of these cars proved to be quite a success and, with the increase in output per day from 1,000 to 1,400 tons, a corresponding decrease was made in the cost per ton. However, due to market conditions, it was soon apparent that something else should be done in order to keep the mine in profitable operation. The management studied the situation carefully in order to determine and develop the best possible plan of mechanical mining for this thin coal. It was obvious from the outset that, because of the high mining rate which prevailed in thin seams, there was a great opportunity for mechanical mining; and it was further evident that if the mine could be mechanized on long faces, the possibilities of success were greater than to continue with the old room-and-pillar system. This method had the following objections: (1) Low tonnage per miner; (2) small percentage of lump coal produced; (3) high cost of development; (4) high cost for room yardage; (5) high cost for loading; (6) high cost for transportation, because of the necessity for using small tram cars; (7) high cost for machine cutting, because of scattered places and travel of machines; (8) high cost for tracks, because of the numerous switches and tracks in rooms; (9) high cost of deadwork, because of the large territory which must be used in connection with room-and-pillar work.

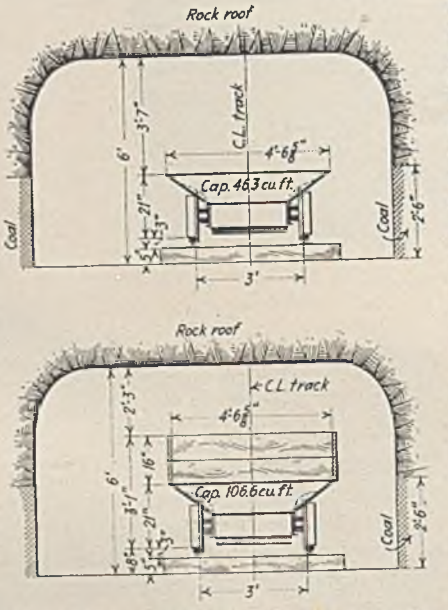


Fig. 7—Cross-section of Heading Showing Loss of Available Space Above Old and New Types of Cars

Of course, the old room-and-pillar system had many staunch supporters, and some good features, which are listed below: (1) The men in charge of the mines had been trained for work in driving rooms and advancing pillars and had, up until this time, been making satisfactory cost sheets; (2) the laborer at the face being familiar with the room-and-pillar system, would be reluctant in many cases to change to another type of mining; (3) a nearly uniform tonnage could be produced from room-and-pillar work, as rock falls, derailments, etc., rarely affect more than one or two working places.

However, the management believed that by the introduction of conveyors and wide faces, and a complete change in the plan of work, a new system of mining could be developed which would be far superior to the present system and would have the following advantages over the room-and-pillar system: (1) Increased tonnage per miner; (2) increased percentage of lump coal; (3) reduction in cost of development; (4) elimination of cost of room yardage;

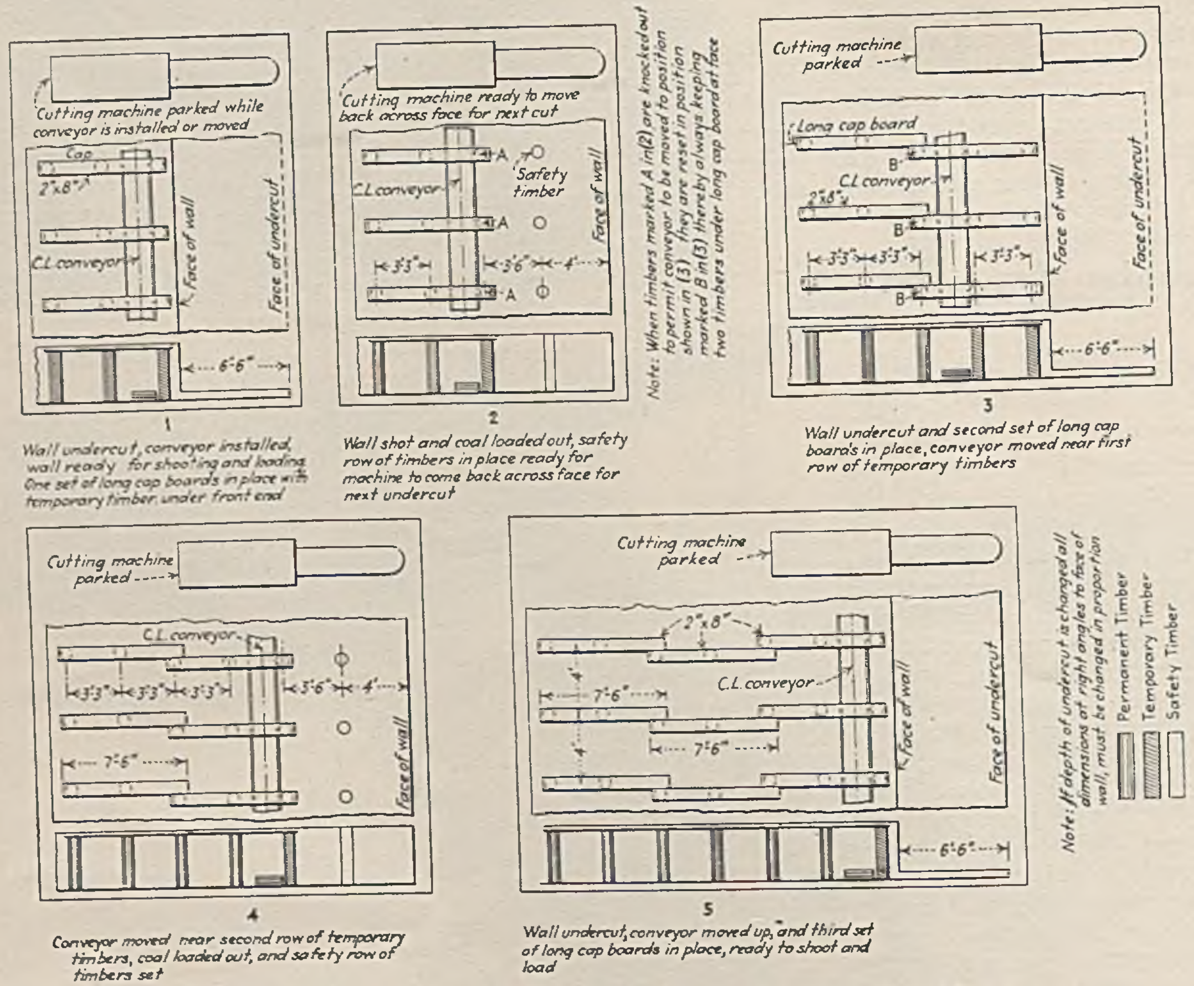


Fig. 8—Method of Timbering and Moving Conveyor Forward as Face Advances

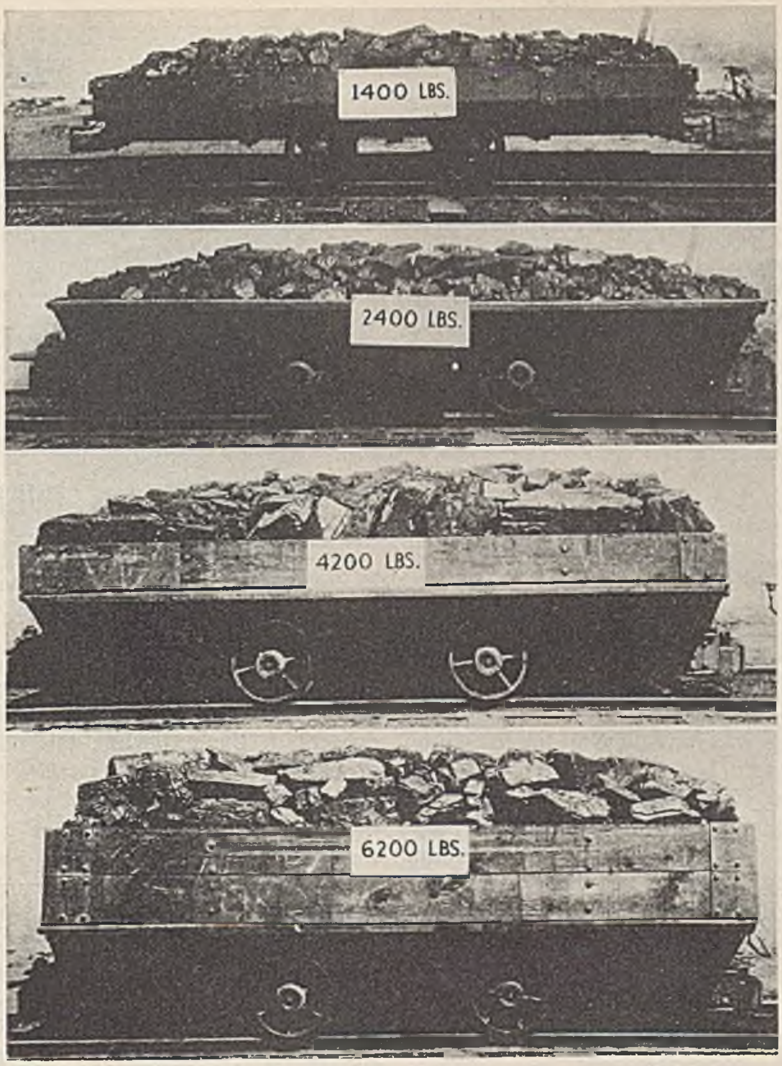


Fig. 9—Showing How Cars Were Designed to Carry Larger Loads Without Much Increase in Length and No Increase in Width

(5) reduction in cost of haulage, on account of the ability to use a car which would carry practically three times as much coal as the car in service, the car being loaded on the entry and being made as large as the entry would permit; (6) reduction in the cost of machine cutting, because of its concentration on wide faces; (7) reduction in the cost for tracks, because of elimination of room switches, and because, with wider spacing of headings, one-half of the heading track would be eliminated; (8) reduction in the cost of deadwork, on account of concentrated workings; (9) reduction in the cost of supervision, on account of the concentration of working places.

It occurred to the management that in thin seams throughout the entire country they, with other engineers, had for years been making a palpable error. In the old system of mining, entries had been driven 6 ft. high and 10 ft. wide. Rooms were turned into 30-in. coal and driven for a distance of 150 ft., and the mine cars had been designed low enough to go into these rooms. In other words, a mine car 21 in. high and carrying from 1,400 to 2,400 lb. of coal had been designed to travel in rooms of this limited height and to be pushed an average of 75 ft., and then were brought out onto an entry 6 ft. high and hauled for two or three miles. The top of the loaded car on the entry track was less than 36 in. from the bottom of the entry and was over 3 ft. clear of the top.

Think of the folly of wasting 2 ft. of clearance over these cars for a distance of two or three miles. Why not bring the coal to the cars in the entry and use cars of a carrying capacity of from two to three tons?

To get the best results it was necessary to make the faces as wide as possible, in order to concentrate the cutting and the loading. Therefore, the action of the roof was the crux of the whole matter. It was necessary to determine what length of faces could be supported, and how far these faces could be carried forward.

The cover over the seam is from 60 to 200 ft. thick. Directly above the coal lies from 10 to 20 ft. of shale. This has a sandstone cap about 20 ft. thick. Above this is sandstone and sandy shale. The bottom is hard fireclay, and the top of the fireclay immediately adjacent to the coal is unusually strong, with a layer about 1½ in. thick, likewise of fireclay and containing carbonaceous matter.

The management decided that rather than buy a lot of machinery and then try to make the working places fit the equipment thus purchased, it would be wise to experiment with the top to ascertain what width of places could be worked and to what depth they could be driven. Then equipment could be bought to fit the mining conditions. These experiments could be made with tracks and mine cars, thus avoiding a useless expenditure of money.

A section of the mine was allocated to the experiments, and it was found that faces from 150 to 200 ft. wide, varying with the top conditions, could be supported for a distance of 200 ft. The experiments were made with heavy timbering, with lighter timbering, and then with heavy timbering and cribs, and finally with lighter timbering and cribs. It was found that heavy timbering and cribs (which was later modified to timbering with cross collars and cribs) was the safe and efficient means of supporting the roof (Figs. 1, 3, 5, and 8).

After the experiments had determined the width of the face to be driven, the distance the face could be allowed to advance, and the best way of timbering such a place, it then became necessary to determine what type of conveyor should be used to carry coal from the face to the entry. Serious consideration was given to several types of conveyors, and the final decision was to use in units of two, for conveying coal along the face, Jeffrey No. 49-E face conveyors (Fig. 2), which have a length of from 75 to 92 ft. These face conveyors were to empty onto a main conveyor in the middle of the working place. It was decided to install the Jeffrey No. 57-A as the main conveyor (Fig. 4). These latter were bought in lengths of 250 ft. Face conveyors, No. 49-E, were made in 6-ft. sections, and the main conveyor in 12-ft. sections with one 6-ft. section which is used every other day.

PNEUMATIC STOWAGE

+ Makes Rapid Strides In Mines of Germany

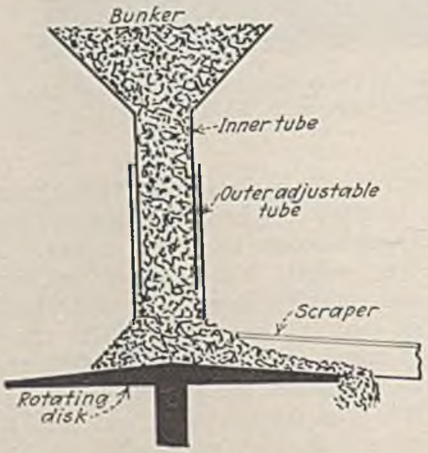
By H. A. DIERKS

Mining Engineer
Stuart, James & Cooke, Inc.
New York City

IN THE PAST, coal operators usually have turned to hydraulic stowage when seeking a large-scale system for the backfilling of their mines. They have found that it is an effective agent in combating subsidence or squeezes and that it also provides practically the only means by which coal can be mined without loss under populated areas or from thick seams. Without doubt, hydraulic packing, when conducted efficiently and on a sufficiently large scale, surpasses hand packing in economy as well as in the supporting quality of the backfill obtained, but it has, nevertheless, many defects which may render it undesirable and its use even impossible under certain conditions.

The chief inconvenience of hydraulic packing is the large volume of water which must be used to transport the solids to be stowed. In some instances, the water draining from flushed chambers will flood gangway roads or even inundate whole sections of a mine. In any event an elaborate system of sumps must be maintained for the accumulation of the large quantities of water which hydraulic backfilling involves. Furthermore, the installation, maintenance, and operation of a pumping plant for returning the water to the surface are items of considerable expense. All this reacts unfavorably against hydraulic packing. This situation becomes even more serious in mines which are deep or which have several drainage areas, each of which has its separate pumping plant.

Much thought has been given therefore to the problem of using air as the carrying medium instead of water, for air does not have to be pumped back to the surface after it has fulfilled its purpose. Once the proper machinery to accomplish pneumatic packing had been perfected, a field was opened for mining methods which were safer as well as more economical than those in which hydraulic backfilling had been used; for, as was explained in the article on hydraulic backfilling which appeared in the July issue, the pipes used for this purpose being under high pressure occasionally burst and endanger human lives in shaft and gangways either directly or by inundations. The latter at times are so extensive as to close off vital airways.



Feeding Device on Lower End of Bunker

For many years bulk material has been moved through pipe lines by air under pressure. Such methods have found extensive use in the unloading of grain from railroad cars and boats, for the handling of ashes, lime, sand, etc., as well as for removing sawdust and chips from woodworking machinery. Pneumatic backfilling in coal mines was but an extension of the same principles to stowing of materials in underground workings. The earlier installations were operated with the compressed-air system of the mine. This, however, proved to be a costly procedure, for the compression of the air involved a heavy power bill and that, with the inevitable defects in the experimental machinery, caused pneumatic packing temporarily to fail.

However, the prospects of a successful mechanical backfilling process were too inviting to be abandoned without further effort. The problems involved were gradually solved by the coal-mining engineers of Europe, and at the present time, in a number of German coal mines, such as: Ewald Fortsetzung, Grimberg, Matthias Stinnes, Lohberg, Prosper 3, all in the Ruhr district and Vertrauensschacht near Zwickau-Saxony and Deutschland near Oelsnitz, pneumatic packing plants are operating continuously, and seemingly with economy and technical success.

Pneumatic packing plants, in operation abroad, can be divided into two distinct groups, one using high-pressure and the other low-pressure air as carrying medium. In the former, by the sudden release of compressed air a definite quantity of packing material is forced through a pipe line in bulk, much as a bullet is forced through the barrel of an air rifle. The low-pressure plants work on the principle of the pneumatic conveying system. Here a swift air current carries loose material through a pipe line much as wind will carry dust and sand in suspension during a gale.

High-pressure systems work intermittently, each charge being loaded and "shot." Low-pressure systems, in contrast, work continuously, regulated quantities of packing material being constantly fed into the air current and blown through the pipe line.

Technically both systems have been

successful. Both transport backfilling material over a long distance through a pipe line with the aid of air. Low-pressure systems appear to be more economical, however, than high-pressure and are consequently gaining in favor.

Certain features of pneumatic-packing installations remain the same, whether the high- or low-pressure system is used. These are in the main, the preparation plant for the crushing and sizing of the packing material and the storage bunkers.

All present-day installations operate from a central point underground. Between two mine levels, a steep slope or a blind shaft is converted into a bunker. In the upper of these two levels, at a point over this storage bunker, screening and crushing machinery are installed, the pneumatic plant proper being located in the lower level near the bottom gate of the bunker.

Rock from the mine workings is hauled in mine cars to the screen in the upper level. Washery refuse, ashes, sand and any other suitable material is brought from the surface either down the shaft in mine cars or directly through a borehole to the same point. Here all packing material is passed over a grating of the proper mesh and the larger pieces that refuse to go through are crushed to the required size. Thus treated the material falls into the top of the bunker to be drawn out at the lower end located on the level below. Here it enters the pneumatic plant and is blown or "shot" into empty chambers. From this point on, high-pressure and low-pressure systems utilize machinery of widely different types and are operated by methods, each adapted to the equipment provided.

High-pressure system—The machinery used with this system is built on the lines of the cement gun, and is consequently put on the market by manufacturers of such equipment. It consists of a large steel container into which the material for stowing is loaded in charges up to 1 cu.yd. The container, which, of course, is closed hermetically after it has been loaded, connects on one side with a receiver containing air under a pressure of about 100 lb. per sq.in. The bottom valve of the container is connected with a pipe line through an elbow. This pipe line carries the charge into the chamber which is being backfilled.

When the full air pressure is turned on the charge in the container and the bottom valve is suddenly opened, the packing material is forced through the pipe line in bulk and at high speed. It leaves the other end of the pipe with great force, packing so tightly that the backfill thus made compresses but little when a load comes upon it. As soon as a charge is "shot," the container is loaded again and the whole action repeated. The number of charges that may be shot in a given time, depends largely upon the loading facilities available. An average installation of this kind will backfill from 40 to 50 cu.yd. of material per hour.

It is obvious that, in a system where the packing material travels under such force and at such high speed, the bends and fittings of the pipe line must be subjected to enormous strain. They cause constant trouble and thus constitute the weak points of the entire system. With fairly straight lines, however, high-pressure pneumatic packing has given satisfaction.

The pipe lines used, have, in general, a diameter ranging from 6 to 8 in., and have been extended to a maximum length of about 1,500 ft. without introducing excessive operating difficulties. The maximum diameter of the material backfilled in this manner ranges from 2 to 3 in. It must be admitted, however, that the pressure and speed at which the packing material is forced through the pipe line, causes much abrasion, thus greatly shortening the life of the pipes.

Low-pressure system—This system seems to be constantly gaining preference over that using high pressure. Most of the present installations are of this type. As already stated, the operation of this system is based on the principle used in pneumatic conveying. It is therefore natural that firms manufacturing pneumatic conveying equipment are the sponsors of this new development. The installations now being operated in European coal mines are said to be obtaining satisfactory results. In fact they seem to have reached such a degree of mechanical perfection that further experimentation may not become necessary, at least for some time.

In its essentials a low-pressure plant consists of an air-propelling apparatus, a feed, and a distributing pipe line. In the first installations of this kind fans or blowers were used to drive the air through the pipe line at sufficient velocity to carry the packing material along with it. Lately, however, they have been replaced by air pumps of the plunger type which use appreciably less power per 1,000 cu.ft. of air supplied. It is stated that, in general, a fan or blower has an efficiency not exceeding 70 per cent, whereas an air pump will have a 90-per cent efficiency. An example will illustrate the significance of this difference.

In order to operate during a whole 8-hr. shift, while backfilling 300 cu.yd. of material, 2,430,000 cu.ft. of air at a pressure of 8 lb. per sq.in. or 1,152 lb. per sq.ft., will be required to blow 300 cu.yd. of material through the pipe line.

With a fan or blower having an efficiency of 70 per cent the power consumption for this performance would be as follows:

$$\frac{2{,}430{,}000 \times 1{,}152}{0.70 \times 2{,}653{,}200} = 1{,}507 \text{ kw.-hr.}$$

But with an air pump having an efficiency of 90 per cent the power required would drop to:

$$\frac{2{,}430{,}000 \times 1{,}152}{0.90 \times 2{,}653{,}200} = 1{,}172 \text{ kw.-hr.}$$

A difference of 335 kw.-hr. per 8-hr. shift will afford a substantial saving in power cost. Based on a price of \$0.015 per kw.-hr. and assuming a yearly operation of 300 days the total savings would be:

$$335 \times 0.015 \times 300 = \$1{,}507.50.$$

A feeding apparatus links the distributing pipe line with the bunker, and provides the means by which packing material is evenly fed into the air as it courses through the pipe line. Essentially the feed consists of two rollers in a hermetically closed casing to which a bunker gate delivers a uniform flow of packing material.

As due care must be taken that the right quantity of packing material at all times will be delivered into the air current so that no air will be wasted and no more solid material will be deposited than the air current can remove, a detailed description of the feed may be pertinent. The bunker ends in a cylindrical tube surrounded by another tube of somewhat larger diameter. By raising or lowering this tube, the quantity of material falling onto a rotating disk beneath it can be controlled. A scraper pushes the material off the disk, this scraper being set in such a position that any desired quantity of material may be delivered per revolution.

This rotating disk and the feeder rollers are driven by the same motor, and the same speed reducer. The ratio of speed between the two units is changeable, but once set, remains constant. Any change in the quantity of packing material to be fed onto the feeder rollers can only be effected through the adjustable pipe at the gate of the bunker. This feeding arrangement works to perfection and automatically. It also permits two or even more pipe lines to be simultaneously fed merely by placing additional scrapers over the rotating disk.

Packing material fed over the feeder rollers into the pipe line is readily blown away and each particle while moving through the pipe line is completely surrounded by air. Though this feature decreases the abrasion of the pipes, much more air is needed with this system than with air at high pressure.

The maximum size of packing material that can be blown through a pipe line is in definite ratio to the diameter of the pipe. In general the maximum size of material with the low-pressure system should never exceed one-third of that diameter. Hence, through a 10-in. pipe, pieces of rock and slate of 3-in. diameter can be blown without trouble for a distance of 1,500 ft. By using 10- or 12-in. pipes, washery refuse can be used as backfill material without crushing. Naturally, when the pipe line slopes downward the distance over which material can be conveyed may be extended; blowing uphill, on the other hand, will decrease this distance.

Most of the low-pressure backfilling plants now under operation in European coal mines have a capacity per hour of 30 to 40 cu.yd. The backfill produced by this method is in every respect as satisfactory as that obtained by hydraulic stowing.

It must always be borne in mind, however, that even the low-pressure backfilling process involves a heavy power consumption. The ratio between solid material and air is as high as 1 to 300. One installation, handling about 350 cu.yd. of backfill per 8-hr. shift requires a total connected load of 300 hp. including the motors for crushers and feeders. The power cost, therefore, is the determining factor in the economy of this system.

As the pneumatic packing process can be operated independently from coal extraction, it is practicable to do the backfilling during those hours of the day when the power requirements for the rest of the mining plant are at a minimum. The bunker, however, must have sufficient storage capacity to hold all the packing material which will accumulate during that interval.

Dependent on the kind of material used is the quantity and nature of the dust which backfilling raises. In any event the dust settles on the walls of the chambers which are to be backfilled and can hardly escape beyond the brattice set up at the entrance to these chambers or in the roads in communication with them. As the workmen in charge of the backfilling enter the chambers only during intervals in the process and only then to change the location of the pipe line they are little, if at all, inconvenienced by the dust which, raised during the blowing period, may still, in part, be suspended in the air.

For the same reason pneumatic packing cannot be of any real assistance in the protection of the mine against coal-dust explosions. The dust that may be created in stowing crushed rock pneumatically is localized in the chamber to be backfilled and in its immediate surroundings. Consequently, it cannot be deposited in quantities that will immunize the coal dust created in other sections of the mines.

Pneumatic backfill is placed in worked-out chambers by methods which only slightly differ from those employed with hydraulic stowage.

Though the mechanical features of the pneumatic packing process seem to have been solved successfully, much study and many experiments need to be made before it can be so correlated with the mining operation as to assure ultimate economy. It also remains for the future to solve the problems, where and how to build the underground storage bunker most efficiently and how to bring the rock and slate from the mine workings to the top of the storage bunker where they are to be prepared as packing material. In other words, the unsolved problems pertaining to pneumatic packing relate rather to organization and planning than to the mechanical features of the operation.

Where Credit Is Due

In the article entitled "Nemacolin Mechanically Mixes and Cleans Its Entire Output," which appeared in the August issue, p. 408, reference failed, inadvertently, to be made to the Link-Belt Co., which supplied all the equipment used in the mixing plant. This mixing plant is one of the outstanding features of the Nemacolin mine.

A STABILIZATION PROGRAM
FOR THE
BITUMINOUS COAL INDUSTRY

THE BITUMINOUS COAL INDUSTRY is now going through the painful cycle of readjustment which has faced, or is facing, practically every other natural-resource industry, including agriculture. As a result of the era which changed the United States from an agricultural to an industrial nation between 1870 and 1910, for nearly half a century the primary problem of the bituminous coal industry was one of production. Under the spur of recurring labor troubles, transportation blockades, and brief periods of abnormal price levels, productive capacity was developed to a point outstripping peak demand, while the stimuli which gave the speculative surge to "good times" in the bituminous coal trade either have disappeared or no longer excite. In the meantime, increased efficiency in the utilization of coal by the larger consumers and inroads of competitive fuels have been working to check the normal expansion in demand.

As a result of these conditions, the bituminous coal industry is confronted with the following fundamental difficulties: Too many mines, too many operating companies, a declining market for coal as a raw fuel, weak marketing policies and methods, lack of research to develop new uses for its product, inadequate sales realizations, and an unstable labor situation. While the law of the jungle is driving out some of the inefficient, it also is draining the resources of many producers who richly deserve to survive. Under the law of the jungle, the lion is little more secure than the jackal.

No industry can continue indefinitely to render adequate service to the public and to deal fairly with those whose capital and labor are invested in it without a fair profit. Even were it possible to anticipate a return of the conditions which formerly brought about brief periods of flush earnings, such a return would be unhealthy. A gambling basis of profit for an industry so important to the industrial welfare of the nation as bituminous coal is neither conducive to stabilization nor safe for the nation or for the industry itself. The time is ripe for the consideration of a program for rehabilitation and stabilization that will rest firmly upon a sound economic foundation.

In presenting the outlines of such a program in these pages, *Coal Age* is by no means unmindful of the fact that many organizations within the industry, such as the National Coal Association and several of the local operating groups, and many individual producing companies have done and are doing much to place the industry upon a sounder basis. On the contrary, it is the very existence of these efforts and the achievements already made which encourage the belief that there is real hope of success for a still broader program. Such a program involves:

1. Production control.
2. Sound merchandising.
3. Stabilized industrial relations.
4. More mechanization.
5. Coordinated research to develop new uses for coal.
6. More consolidations.
7. More safety.

There is nothing basically new in any of these proposals. All of them have been urged upon the industry at one time or another with the zeal of the crusader and the fervor of the discoverer of a new panacea. And therein lay their weakness. No one thing will establish the bituminous coal industry upon an enduringly profitable basis. When research, or production control, or better merchandising, or consolidation was put forth as the one solution and cure for all the ills of the industry, the attempt to sell a single help as the complete remedy resulted in the rejection of the proffered cure.

What is needed is a coordinated program broad enough to cover all the necessary steps to reach stabilization. It is with that view in mind that this program is suggested. No one of the proposals named is the complete answer. They are all of equal importance and all are interrelated. They define major objectives to which every one in the industry can freely subscribe, however much there may be questions as to the best way to give them specific application. All that is attempted at this time is to present the broad outlines: the working out of these principles in detail can come only through discussion and counsel with and within the industry itself.

I—Production Control

DURING the past ten years, consumption of bituminous coal, exclusive of colliery fuel, within the United States has fluctuated between 382,726,000 and 526,853,000 net tons. So long as consumers will not or cannot make long-term commitments for fuel, the bituminous coal industry must carry idle capacity to take care of peak loads. The need for production control within the industry, therefore, is recognized as imperative.

Modification of the Sherman law to permit joint agreements among operators on production policies and on prices offers the most direct route to the attainment of this control. Modification which imposed burdensome restrictions as the price of this relief, however, could be as destructive as the ills which the change in the statute was intended to cure. There are too many dangers inherent in the proposal, frequently made, to set up an independent government commission empowered to pass in advance upon the legality of suggested concerted actions to make that solution acceptable. The bituminous coal industry should insist:

1. That the statute be specifically amended to legalize agreements on production-control policies without the creation of an independent government bureau, and

2. That, where the Department of Justice has reason to believe that agreements so made violate the law as amended, civil suits be instituted, as under the present statute.

Pending the achievement of this relief, however, there is much that can and should be done by individual operators and by producing companies within a given district in the field of production control. For example, more crushing of coal to take care of slack contracts during periods of low demand for prepared sizes would be a helpful contribution by the individual operator both to production control and to market stability. Interchange of orders between producers where individual unbalanced demand as between different sizes might be equalized in whole or in part is another possibility worth exploring.

These and steps of like character, of course, are minor contributions. Fundamental stabilization of production control on a large scale is dependent upon the removal of the legal uncertainties which now discourage concerted action.

II—Sound Merchandising

THERE are individual examples of merchandising in bituminous coal which compare very favorably with results in enterprises less production-minded. For the industry as a whole, however, there is still a need for a greater development of sound merchandising policies and practices. These policies and practices should be predicated on the trinity of successful merchandising fundamentals—knowledge of the product and its uses, knowledge of its logical markets, and knowledge of the detailed costs of production and distribution.

The price structure of bituminous coal stands in critical need of revision. To a large extent, the 20 per cent of the total output which goes into domestic channels carries the entire profit burden of the industry and, in many cases, absorbs the losses incurred in industrial sales. A system under which many large industrial consumers buy coal at less than the cost of production and the individual householder pays vastly more has little economic and no ethical justification. Such a situation, unless equitably corrected, is bound some day to plague the industry. Detailed cost analyses which will show definitely the production and distribution costs by sizes are necessary as a basis for a proper differential readjustment.

Inasmuch as the bituminous coal industry is in no sense a monopoly, it would seem desirable in the interests of stabilization and of conservation of natural resources that the proposed modification of the existing restrictive laws be broad enough to permit price agreements, subject to the proviso that no producer under such permission should be allowed to establish or maintain a minimum price less than the cost of production of his coal. Such modification, however, should prohibit agreements for the parceling out of territory as between different producing districts. This prohibition against any form of concerted action to zone or limit areas of distribution would preserve to the consumer his free choice of fuel and give him ample protection against unreasonable prices without the necessity for any form of government price regulation.

Although such modification of the law would offer the industry the quickest approach to an early financial rehabilitation, the maintenance of the position so achieved would depend both upon the general adoption of other sound merchandising methods and the general adoption of the other planks in this program. Among the other sound merchandising plans to be considered are: Joint promotion of air cooling and conditioning in public buildings and in private residences; extension of community heating in urban communities; still more active promotion of completely mechanized home heating; continued study of new uses for coal.

III—Stabilized Industrial Relations

DIRECT labor charges are such a major part of the cost of production that it is obvious that there can be no hope for price stability and for long-term planning without stabilization of wages and standardization of working conditions. In an industry compelled to carry the idle-capacity load of bituminous coal, such stabilization without the interposition of some outside agency representing the workers presents almost insuperable obstacles. During periods of sharp competition, individual companies and districts seeking to maintain what they conceive to be proper industrial relations find themselves isolated from their logical markets because competing districts have cut wages, increased the hours of labor or by otherwise changing working conditions have reduced out-of-pocket costs of production.

Inherited prejudices in some fields and bitter personal experiences in others have made the idea of a revival of unionism obnoxious to many employers. Nevertheless, unless some new formula can be found, the conclusion seems inevitable that the desired stabilization of wages and of working conditions must come through a recognition and an acceptance of an outside labor organization by a sufficiently large percentage of the operators to give the wages and the working conditions so established a controlling influence in the districts where direct recognition is withheld.

Whether this labor organization shall be the United Mine Workers of America or some other new group equally independent of employer control rests largely with the existing union. It is faced with the task of convincing doubting operators that it has abandoned the policies and practices which have made it highly objectionable to many producers and that it now has the vision and the judgment which will promise effective and constructive leadership.

There must be a genuine partnership between capital and labor if the goal of stabilized industrial relations is to be reached.

IV—More Mechanization

THE bituminous coal industry cannot ignore the external competitive conditions which confront it. Its problem is to sell coal in volume, pay wages consonant with the highest standards of American living, and make a profit. As one step in achieving these ends, the industry must make the fullest possible use of mechanization. For the most part, mechanization (in the modern limited sense of that term in the coal industry) has been employed as a competitive weapon in cost reduction in competition between individual operators. What is needed is to employ that weapon for the industry as a whole in competition with other fuels. No other way is open for the maintenance of high wages and low prices with profit.

Regardless of what its past attitude may have been, labor must accept the machine and do everything in its power to realize the full possibilities of mechanization. To the extent that the attitude of labor prevents the fullest employment of the machine in the multiplication of manual effort, labor is encouraging low wages. To the extent that labor narrows the differential in the production costs per ton between machine coal and hand coal, labor makes it possible for the non-progressive operator to offset the partially realized advantages of the machine by a low wage scale. To the extent that labor works to widen that differential, labor promotes the maintenance of high wage scales. What the operator is and should be interested in is not the rate per day or per hour but the cost per ton. Complete acceptance of the machine by labor means a low cost per ton and a high daily earning for the worker.

Under existing conditions, mechanical loading contributes to further technologic unemployment. That fact must be frankly faced. But the immediate effects of the introduction of the machine can be cushioned by allowing turnover to reduce the number of men on the payroll without actual discharge of any worker. In its larger aspects, however, this problem is only a segment of the broader problem of unemployment in American industry as a whole. There is serious question whether the answer will not be found in a definite shortening of the working day and of the working week—at least, until new industries arise to absorb the surplus man-power displaced by the machine in the older enterprises. With its present irregular operation, coal might well do some experimental pioneering in this field without affecting either its total production or its total man-hours.

Obviously, in the constant struggle to keep down costs of production per ton, the operator cannot stop with mechanical loading. Continuous modernization in all its changing phases must be accepted by the operator as whole-heartedly as he expects the mine worker to accept the machine. One advantageous byproduct of such a policy would be the discouraging of an influx of marginal producers every time demand rose above a dead level. If wage levels are high and the investment of capital in equipment large, it will be less easy for the man with insufficient financial backing to enter the picture.

V—Coordinated Research to Develop New Uses

IF EVERY commercial coal company producing less than 200,000 tons per annum had been wiped out of existence in 1928, the companies producing in excess of 200,000 tons and operating 1,269 mines by working on a 280-day basis could have supplied the 1929 coal demands and would have had 70,000,000 tons excess output. While economic pressure reduced the total number of captive and commercial operations, exclusive of wagon mines, from the peak of 9,331 in 1923 to 6,057 mines in 1929, such a drastic liquidation as suggested in the preceding sentence is neither likely nor probable in the near future, although there undoubtedly will be further reductions in the number of active operations. If any appreciable part of existing excess capacity is to be employed for some time to come that employment must be the result of the development of new markets for coal as a raw fuel and for coal as a basic material in manufacturing processes. Development of new uses for coal in its raw state belongs to the field of merchandising; finding new uses for coal as a raw material for manufacturing lies in the field of scientific research.

Universities, independent research organizations, and private industrial laboratories have done much excellent work in this latter field. It should be readily apparent, however, that, if the bituminous coal industry is to realize the full advantages of technical research for the direct development of products which will have a commercial sale value, these research activities must be coordinated and centralized. The industry should either establish its own research laboratory or take over some existing agency and confine the activities of that laboratory to the development of new uses for coal.

If it is to capitalize effectively on this research, however, the bituminous coal industry must be prepared to take still another step. When a process or a product which shows real commercial promise has been developed, the industry should be in a position to undertake the commercial exploitation of that process or product. In this way the industry would be assured not only that its coal would be the basic raw material but also that the profits of manufacturing would return in a large measure to the pockets of the coal operators.

For the carrying out of this particular part of the general stabilization program, it is suggested that the bituminous industry organize a Coal Research and Development Corporation to be financed by a continuing tonnage assessment on the production of the companies forming the corporation. It is suggested further that a definite percentage of these funds should be allocated to laboratory work and that the balance be held in reserve for commercial exploitation. If, for example, operators with an annual output of 300,000,000 tons were to join in such a venture and agree to contribute to its support on the basis of an assessment of one cent per ton, in the course of the first year of its existence the Coal Research and Development Corporation would have available $3,000,000. If 20 per cent of that sum were allocated to laboratory work, there would be a reserve of $2,400,000 held for commercial development. Overnight discoveries are not usual in research work. By the time the laboratory had perfected a product or a process which appeared to justify commercial exploitation, the corporation probably would have $5,000,000 to $7,500,000 in reserve to establish and promote a manufacturing company in which each of the coal producing companies would have a participating interest equal to the percentage relation the assessment they had paid bore to the total fund. Manufacturing profits, after adequate allowances for reserves, would flow back to the coal companies in the form of dividends.

While the creation of a separate corporation is recommended, initiative in its organization might well be undertaken by the National Coal Association.

VI—More Consolidations

UNDOUBTEDLY mergers of companies within a given district have their place in stabilization. But the immediate outlook in this direction is not bright. Moreover, their beneficial effects have been overrated and some of their disadvantages ignored. Unless it can be assumed that the management of the district combination has a broader national perspective on the coal industry than the managements of the individual companies merged, there is grave danger that the industry will merely substitute a battle of giants for a battle of pygmies in interdistrict competition.

A merger to attract outside capital must be a merger of strength. Financial interests are no longer ready to believe that a consolidation of weaknesses means strength. District mergers, therefore, must be largely internally organized and internally financed. District selling agencies probably would be an easier first step than physical merger of producing companies.

There is another type of consolidation, however, that should be encouraged—that is the consolidation under common ownership and management of a number of good properties in different districts. Such consolidations, by giving the consolidated company a stake in several producing fields, help to give owners a national instead of a sectional or district viewpoint of the coal situation and so work for a lessening of senseness and ruinous interdistrict competition. Anything that will give the individual coal operator a broader picture of the industry as a whole is bound to have a beneficial effect. In addition, such consolidations would pave the way for still larger mergers if such combinations were later deemed advisable and economically desirable.

VII—More Safety

THE accident record of the bituminous coal industry is not one of which the industry can be proud. Excellent records made by certain individual companies over periods of months and years, however, show that high accident rates cannot be explained away by "the natural hazards of the industry." The accident record undoubtedly is a factor in creating an unfavorable public attitude toward the industry and its problems. Such a public attitude may easily impede the successful achievement of other necessary steps in stabilization.

The bituminous coal industry should take the lead in insisting upon better state safety laws and their stricter and more impartial enforcement. A mine that cannot afford to be safe cannot justify its continued operation. If safety requirements were strengthened and their enforcement made more rigid, not only would the accident rate be reduced but many of the marginal operations, the competition of which contributes neither to the profit nor the stabilization of the industry, would be eliminated.

POWER GENERATION +Part of Modernization Program Of Indiana Mine

Tipple Was Modernized and Generating Equipment Added to Power Plant

SHIFTING from purchased power to mine-generated power was one of several major changes made at the Crown Hill No. 6 mine of the Ferguson Coal Co., Clinton, Ind., when operation was resumed at the union scale in September, 1930, after a four-year shutdown. During the shutdown the tipple was rebuilt and equipment installed to utilize as plant fuel material which formerly had been wasted and which was responsible for a proportion of the refuse-disposal expense.

With the present set-up, the mine at any time can be switched to purchased power if occasion demands. Five of the company mines still are being served with purchased power from a single metering point and through the several miles of a 33,000-volt line owned by the coal company. Only two of the Ferguson mines are operating at present, but the others are using a small quantity of purchased power for pumping and ventilation.

Crown Hill No. 6 mine is a shaft operation in the No. 5 vein, which at this point lies 190 ft. below the surface. Power equipment prior to the shutdown consisted of a 300-kw. 275-volt converter driven by purchased power and a steam hoist and steam fan supplied with steam from hand-fired horizontal return-tubular boilers. In order to generate power, a 300-kw. 275-volt generating unit and additional boilers, all moved from another mine, were installed in the No. 6 power plant. The engine, which is direct-connected to the generator, is a Chuse non-releasing Corliss and is operated non-condensing. The steam-generating equipment consists of four 150-hp. and one 125-hp. hand-fired boilers, all equipped with shaker grates. Water is obtained from shallow wells near Bruiletts Creek which furnish an inexhaustible supply.

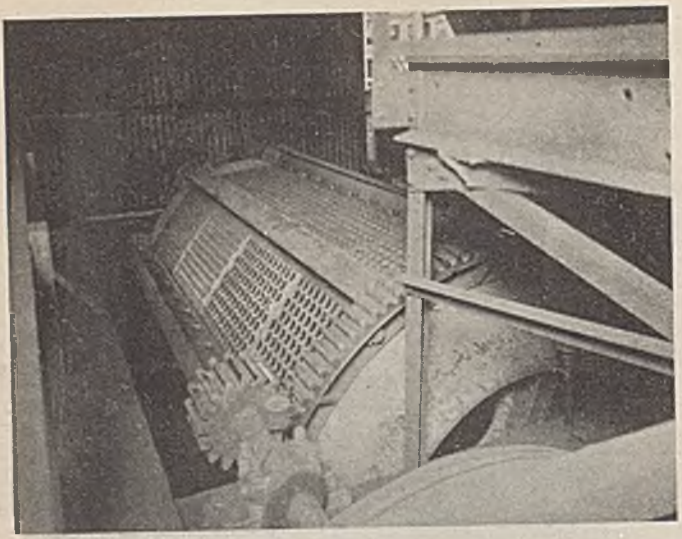
The steel tipple was rebuilt and a Bradford breaker installed for reclaiming as boiler fuel the coal content of the sulphur-and-coal lumps discarded at the tables. The rebuilding, which was done by the Morrow Manufacturing Co., included the adding of picking tables, loading booms, a mixing conveyor, and a Leahy No-Blind vibrating screen. It is now a modern four-track plant having a capacity of 200 tons per hour and equipped with three loading booms. The Leahy screen, made by the Deister Concentrator Co., equips the plant to prepare, for automatic stokers, sizes such as $1\frac{1}{4}x\frac{3}{4}$ and $\frac{3}{4}x\frac{5}{8}$ in.

Pickers on the lump table break the large lumps of coal containing sulphur and reclaim any resulting chunks of clean coal. The remainder and all other pickings from the table go into a Bradford breaker. Most of the breaking of the lumps with pick or sledge is done during periods when no coal is passing over the tipple. The lumps to be broken are stored temporarily on the floor beside the table.

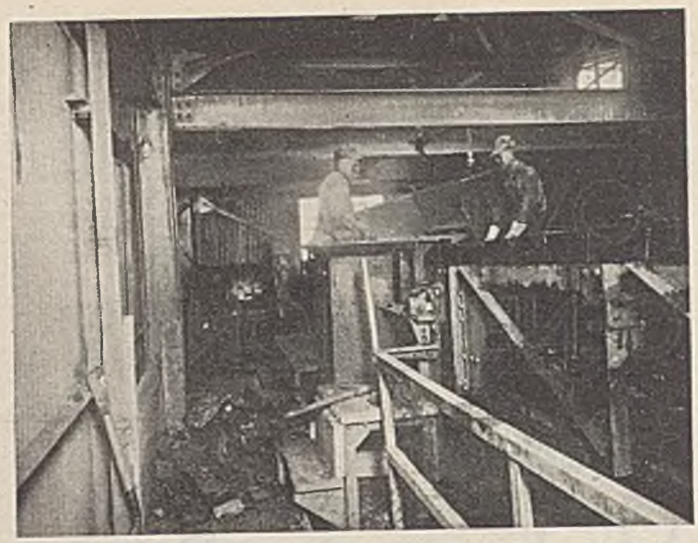
The Bradford breaker is installed in a separate steel building on the opposite side of the headframe from the tipple. The breaker plates have $1\frac{1}{4}$- and 2-in. holes, and all material passing through these holes drops into a conveyor and is deposited in the boiler-room fuel bins. Pyrite and other hard material which does not break below 2 in. travels through the breaker and is deposited in a refuse bin.

Ordinarily the 2-in.-and-under product from the breaker supplies enough fuel for the needs of the plant and at times more is made than can be handled. Formerly tipple screenings of market value were burned under the boilers. Now the only marketable coal used as fuel for the plant is the mine-run consumed during a mine shutdown when tipple pickings are not available. As the mine fan still is driven by steam, the boiler plant must be operated continuously.

H. M. Ferguson, president of the company, estimates that purchased power would cost close to $2\frac{1}{2}$c. per



Bradford Breaker at Crown Hill No. 6 Mine Is Not Covered



Pickings From This Lump Table Supply Power-Plant Fuel

Ready for Automatic Stoker Market

Firing Fuel for Mine Power

kw.-hr., alongside of which the cost of the mine-generated power is insignificant. Operating the generator involves no extra labor charge either in the boiler or in the engine room. The generator and converter are located in the same room with the steam hoist and are under the observation of the hoisting engineer. Assuming that the plant fuel has no market value, the only expenses chargeable to the electricity generated are the costs of materials used in maintaining the engine-generator and the added boiler equipment. Heavy repairs, however, might entail a labor charge for the employment of outside mechanics.

Exact information as to the net power rate for a specific demand and energy consumption is given by the following pertinent figures taken from a power invoice for a recent month; Demand, 130 kw.; energy, 32,400 kw.-hr.; net rate, 2.44c. per kw.-hr. Additional consumption by operating the No. 6 mine from the power line would reduce the net rate to some extent.

In addition to the saving effected by power generation from unmarketable fuel and the bettered market position attained by improved tipple preparation, two radical changes were made in mining methods. Undercutting machines were installed to displace pick mining and the loading was placed on a 100-per-cent pit-car loader basis. The present method of cutting in the fireclay below the coal has reduced the ash in the screenings 10 per cent. Goodman shortwall machines are used.

The mine is equipped with twenty Fairfield pit-car loaders. At the present rate of production, 850 tons per day, not all of these are in use. The extras serve as standby units. Two men working on a day-rate basis load onto each machine, and a boss is provided for each unit of three pit-car loaders. Rooms are driven 22 ft. wide and the pillars are left in place. Gathering is by mules and the main haulage by electric locomotives. The most distant working places are slightly less than a mile from the hoisting shaft.

During the domestic - heating season as much as 180 tons per day is sold at the mine to dealers and consumers who haul with motor trucks. This market is an important revenue producer.

STORAGE BATTERIES

+ In Illinois Mines—II*

STORAGE batteries in locomotive service are doing much to simplify the problems of power supply and utilization in mechanized mines. Concentration of machines in limited working area and more continuous full-load operation of the machines, made possible by the avoidance of long moves, are building the demand charge higher. Relief from this electrical condition, as by the use of storage-battery locomotives, may be economical, even though the means used require a somewhat greater total consumption of power for the entire system, provided part of the consumption is transmitted to off-peak hours. But this is only one of the considerations, as the experience of the Consolidated Coal Co. of St. Louis, at its No. 15 mine, goes to show.

Twenty-one storage-battery locomotives gather coal behind thirteen mobile loading machines for a daily consumption of 4,600 tons at this mine, which is located at Mt. Olive, Ill. One locomotive is in direct attendance on each loading machine, and serves merely to exchange empties for loads, plying short distances only. The remaining eight locomotives are assigned to "swing" service, taking trips the remaining distance to and from the partings. In territories of greatest concentration one swing motor is teamed with two primary gathering locomotives. Three battery locomotives are held as spares, besides the 21 already accounted for. The majority of these locomotives were installed in 1928, when the mine was switched to mechanical loading.

*The first installment of this article appeared in the July issue, p. 355.

Severe grades are seldom encountered. The layout is in panels, 20 rooms on each side of the panel entry, each 380 ft. deep and 33 ft. wide on 80-ft. centers. Consequently, the maximum haul of a swing motor is in excess of 2,000 ft. As the crosscuts nearest to advancing faces—never more than 60 ft. away—are laid with track to facilitate car changes, the distance traversed by the primary gathering locomotives is compensatingly short. It must be so to provide the quick car change expected and attained at this mine, where the average loading-machine shift yields over 350 tons.

To produce this tonnage, 114 car changes must be made in a shift, as the cars hold only 3.1 tons each as machine loaded. After the locomotive pulls the loaded car, two men at the rear end of the loading machine follow it out and hand-tram an empty into place from the nearest crosscut. By this arrangement the change is normally accomplished in 45 sec. and the loading machine kept in actual loading operation 52 per cent of the time.

BATTERY CHARGING RECORD

Mine No. 15 Date

Motor No.	Amp. Hr. Disch.	Gravity Start	Gravity Finish	Rate Start	Rate Finish	Temperature Start	Temperature Finish	Remarks
1	380	1100	1255	75	30	93	105	
2	250	1130	1260	70	30	88	100	
3	250	1150	1260	70	35	88	100	
4	250	1145	1260	70	30	94	102	
5	240	1130	1240	75	35	90	103	
6	250	1150	1250	65	30	90	98	
7	220	1170	1260	60	20	85	95	
8	240	1130	1250	70	35	89	100	
9	370	1120	1250	85	40	98	105	
10	200	1190	1275	60	30	87	97	
11	380	1100	1275	80	25	87	100	
12	250	1190	1275	50	20	81	90	
13	300	1110	1260	75	30	88	100	
14	330	1100	1260	75	35	90	100	
15	360	1100	1270	70	30	85	100	
16	160	1200	1275	40	25	83	92	
17	240	1180	1275	70	20	86	95	
18	220	1180	1270	70	20	90	100	
19	250	1110	1260	70	25	80	102	
20	450	1100	1260	80	35	90	106	
21	240	1190	1275	60	20	85	92	
Av.	280	—	—	—	—	—	—	

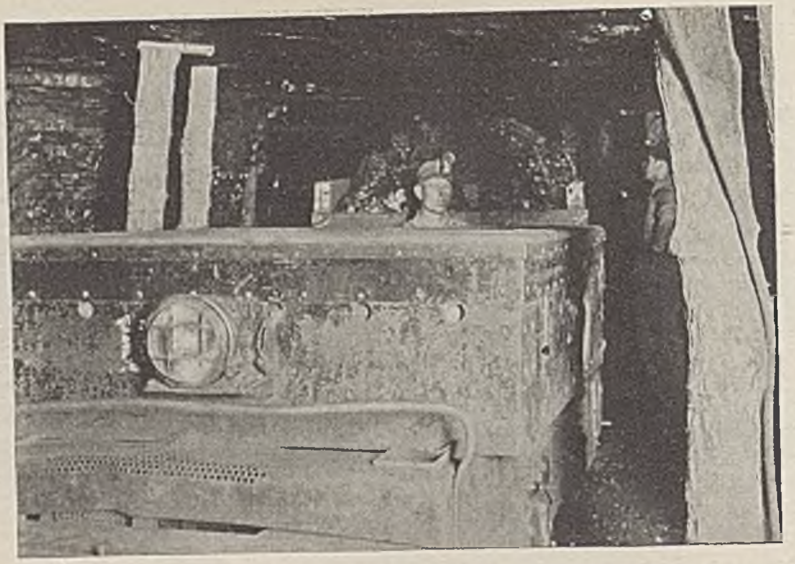
Fig. 1—Battery Charging Record Used by the Consolidated Coal Co. of St. Louis

Seven of the locomotives have a weight, exclusive of the weight of the battery, of 5 tons and 17 on the same basis weigh 4 tons. The batteries used are of the lead-acid type, the standard being 48 cells of 33 plates each to deliver 480 amp.hr. In this installation but one battery is provided for each gathering unit.

The average full-duty life of batteries in this service is about 32 months. While the generally recommended policy is to scrap a battery when it falls below 80 per cent capacity rating, the limit has been reduced to 60 per cent at this mine, because there are a number of sections which can be handled satisfactorily by a battery capable of discharging no more than 250 amp.hr. This adds about two months to the otherwise normal life of the batteries. Some idea as to the condition of the batteries now in service at this mine and as to their tasks can be derived from the ampere-hour discharges in Fig. 1. The monthly depreciation per battery is $42 to $45.

"With complete mechanization," says Lee Conway, chief electrician of this company, "more machines naturally are installed and problems of power supply become more acute. Any relief from this electrical tax, as by utilization of stored power and curtailment of transmission facilities from congested areas, in which working faces are advanced rapidly, eases the entire mechanization problem proportionally. That is why the storage

This Barn Accommodates 24 Battery Locomotives. It Is in the No. 14 Mine, Consolidated Coal Co. of St. Louis



The Quick Response of the Battery Locomotive Is Best Appreciated in Mechanical Loading

battery must be given a place, at least in secondary haulage.

"The all-around characteristics of a storage-battery locomotive, we have found, are ideally suited to mechanical loading operation. Its independence of wired power supply and its quick response are most appreciated in the back and forth jogging of the mine car being filled, to meet the maneuvering of the loading machine for position. The cable-reel locomotive cannot match this performance, and requires constant manipulation of the reel clutch. Furthermore, the rated speed of the storage-battery locomotive, from 3 to 4½ m.p.h., is well suited to car changing behind a loading machine."

At the No. 3 Mine of the Superior Coal Co., at Gillespie, Ill., fourteen storage-battery locomotives are applied to the gathering of coal behind pit-car loaders. The layout (see Fig. 2) is a modified panel system in which rooms are driven to a depth of 325 ft. Generally, a working section is made up of six panels each measuring 745x1,162 ft. The maximum haul is about 1,500 ft. When in full production, one of these sections will produce about 900 tons a day, utilizing 27 pit-car loaders, 1 track-mounted cutting machine, and 3 storage-battery locomotives. The mine cars are equipped with anti-friction bearings and hold 2½ tons as loaded by the portable conveyors. Battery locomotives were first installed in 1919.

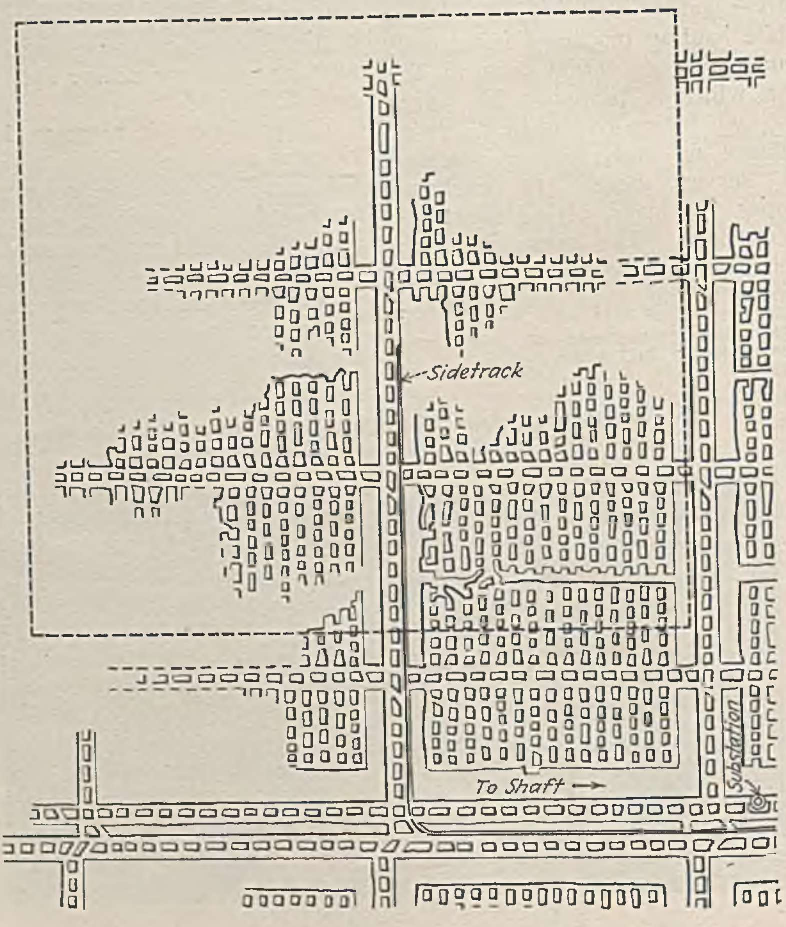
Seven 7½-ton locomotives in 1930 gathered 398,205 tons in 199.44 working days, or an average of 285.2 tons per locomotive shift. During the same period seven 6-ton locomotives gathered 333,978 tons, or an average of 239.4 tons per locomotive shift. One 6-ton battery locomotive was used as a spare in extra day-time service and at night.

All the batteries are of the lead-acid type. Eight are of 98 cells and 17 plates; three are of 49 cells and 27 plates; four are of 98 cells and 15 plates. Two makes of batteries are in use. The average life of fifteen discarded batteries of the one make was 592 working shifts, or about 40 months, the highest being 51 months. The average per-shift replacement cost was $4.13, the highest being $5.07 and the lowest $2.09 per battery. The average life of seven discarded batteries of the second make was 437 working shifts of about 24 months, the highest being 38 months. The average per-shift replacement cost was $5.22, the highest being $6.88 and the lowest $3.10 per battery.

In the No. 2 mine, where coal also is handled via pit-car loaders, an adverse gradient of about ½ per cent prevails. Here, fourteen cable-reel locomotives are in service. Seven of these units in one group, of which five are old and will be replaced shortly, in 1930 gathered 341,060 tons in 210.83 working days, an average of 231 tons per locomotive shift. The remaining seven locomotives in the same time gathered 393,955 tons, or an average of 266.3 tons per locomotive shift.

Commenting on these performances F. S. Pfahler, operating vice-president of the company, said: "Each of these two types of gathering locomotives has its place. Where grades are level or nearly so, the storage-battery locomotive will give a good account of itself, and can be depended upon to give reliable service."

Fig. 2—Battery Locomotive Gathering Is the Practice in This Concentrated Panel Layout in the No. 3 Mine of the Superior Coal Co.



ELECTRIFICATION PROBLEMS
+ In Modern Preparation Plants—II

By E. J. GEALY

Electrical Engineer
Pittsburgh Coal Co.
Pittsburgh, Pa.

IN the preceding article, which appeared in the issue of July, pp. 346-348, consideration was given to the factors governing plant design, to load factors, substation locations, selection of voltage, and the construction of conduits. In this article will be considered the choice of motors, motor starters, pushbutton control, safety switches, power factor, welding, and lighting.

Rarely, if ever, is it absolutely necessary in preparation plants to use totally inclosed motors; particularly in wet-preparation plants is this true. Not only can money be saved by not using inclosed motors but even when they are used, by avoiding certain types, the cost of the motors for a plant can be cut in half. Standard motors require less space, are more efficient, and have a higher power factor than motors not of standard design, and they have greater utility within the company operating a preparation plant and outside of it.

Squirrel-cage motors can be used on almost any drive except one which must operate at more than one speed, or in the few instances where the WR^2 of the driven load requires a slipring motor. Some few loads may be found to require direct current, because of the better speed regulation thereby obtained. Here again, however, a close study will nearly always reveal that the work of such a motor could be satisfactorily performed by a standard squirrel-cage unit. Particularly is this true of the Dorr thickener and of boiler- and furnace-fan drives. Regulation of the fans for the boiler and heat dryer often can be provided more economically by shutters in the air system.

Another advantage which the squirrel-cage motor has over the slipring motor is that when carrying a given load the speed regulation is better. In coal-preparation plants it has been noticed that slight changes in motor speeds will unbalance parts of the system. When nearly all the motors are of the same type they vary together in almost the same relation, and thus keep the operating system balanced within narrow limits.

In any preparation plant, magnetic starters and pushbutton controls are almost absolutely essential. Manually operated starters in such a plant nearly always prove to be a sorry selection, because sooner or later some workman will be given a change in location, or will have to be given some other work than that of starting or stopping individual units, thus disturbing some convenient arrangement which the plant manager had endeavored to embody in his operation.

Furthermore, such magnetic control facilitates the location of the starters in a clean, clear, dry place and enables the electrical engineer to place extra stop buttons at any desired point in the plant. Where magnetic starters are used, workmen need not approach any of the arcing parts of the control; consequently such starters are safer and can be located in the most effective location without hazard.

When the motors chosen are of the same and of a simple type the problem of control is simplified. In all instances inclosed controls are recommended, though they need not necessarily be highly moisture- or dust-proof. For 440-volt, 3-phase, 60-cycle squirrel-cage motors from 1 to 20 hp., including the latter, direct-across-the line inclosed magnetic starters with overload protection and pushbutton stations are well suited. Motors of the same characteristics from 25 to 100 hp. are fitted with inclosed dry-compensator-type starters with overload protection and pushbutton stations.

Small slipring motors generally are fitted with two-step contactor starters with overload protection and pushbutton station, and larger slipring units are provided with inclosed contactor panels having the standard number of steps and overload protection.

Almost every drive should be equipped with a squirrel-cage motor. Even when the engineer is disposed to think that a slipring motor is needed for a certain duty, should he finally decide to put a squirrel-cage motor in its place he usually will congratulate himself on the result.

And this is true for this reason: Many drives, on the basis of operating load, have to be over-motored, because of the high starting horsepower they usually require, and even more because of the necessity of providing power to meet the needs of occasions when the motor must start under the heavy load brought about by an irregular stoppage of the plant. When such unexpected stops occur, solids settle in water and pack around the equipment which the motors have to drive, thus increasing the necessary starting torque.

A sincere effort to equip almost every drive with a squirrel-cage motor results in many economies and benefits. Among them are lower initial cost for motors and controls; less risk of fire, explosions, or shocks; more simple controls; greater interchangeability of motors; less cost for repairs, maintenance costs, and stocks.

When slipring motors are used it is important to remember that they do not absolutely require drum control. It has been found that even centrifugal dryers can be started satisfactorily by contactor-panel controllers.

As a further standardization, it has been found possible to equip almost every drive with a 900-r.p.m. motor. When this is done there are many advantages, particularly that of interchangeability. In some instances where motors of different horsepower are to be interchanged and a careful selection of tapered motor extension shafts has been made, the change can be easily made without even any modification in the bore of the pulley. If it is absolutely necessary to have other speeds, 1,200 r.p.m. should be the next higher speed and 600 r.p.m. should be the next lower.

A factor which aids the engineer to select standard squirrel-cage motors is the introduction of V-belt drives. These belts reduce the starting and running shocks on the motor to such an extent that heavy-type inclosed motors are quite unnecessary.

In order to ascertain the power used and the characteristic of the load taken by each unit in the plant, arrangements should be made for the insertion of meters into motor circuits. A most efficient way of doing this is by providing circuit-testing boxes in the motor circuits, using jacks for plugging in meters. With this arrangement motor loads can be tested and recorded without shutting down drives.

Since the first modern preparation plants were constructed a new type pushbutton station has been put on the market that greatly decreases the costs of manual operation and attendance. This button is termed a signal-type unit. It is equipped with two lamps for signal and pilot service. When wired for operation, a green light indicates whether the starter overload relay is closed or open, and another lamp shows whether the starter contactor is closed.

Normally the signal operates as follows: The green lamp is lighted, indicating that the starter is ready for the motor to be operated. When the operator pushes the start button, the green light remains lighted and the red one lights. If the overload relay opens, both lights go out, but as soon as the relay is reset, the operator sees the green light again and knows, without a workman returning to the pushbutton station to inform him, that the starter is again ready for service. If the red light goes out, the operative knows that somebody has pushed a stop button in the circuit and stopped the starter.

By employing this type of pushbutton control most of the advantages of interlocking control are realized without the disadvantages of electric interlocking. The operative, knowing the sequence of starting various motors, can start each unit in its proper sequence by merely pushing the start buttons in the required order and watching the red lamps light. Thus the starting and stopping sequence can be varied at will. Any predetermined sequence can be revised without complication.

By means of a pushbutton station equipped with this type of button control an operative can start and stop any motor located anywhere within or beyond his vision and recognize any irregular condition immediately. At one heat drying plant equipped with three furnaces and three kilns complete with individual drives, fans, feeders, and necessary conveyors, etc., it has been possible to operate this entire section of the plant with but one worker, the fireman. A signal-type pushbutton control station tells him at all times what is happening at every motor.

Each motor should have its own control and its own inclosed safety switch. The latter should be an approved Type A unit complete with an efficient device for extinguishing any arc drawn at the blades when opened. This is essential in modern installations, particularly in parts of the plant where there is likely to be any quantity of dry coal dust.

Table I—Switches Suitable for Motors of Given Horsepower
(440-volt circuits)

Horsepower of Motor	Ampere Capacity of Switch	Horsepower of Motor	Ampere Capacity of Switch
1–5	30	40–75	200
7½–15	60	100–150	400
20–30	100	....	...

These switches should be of such liberal rating, as shown in Table I, for 440-volt circuits, that they will not experience any undue trouble under normal operating conditions. They should be located at a point conveniently within reach. The fuses should be so large that they will not heat and give trouble under the most severe operating conditions, but not so large as to fail to provide secondary protection under extremely high overload conditions. Normally, reliance should be placed on the heater-type relay of the starter for overload-tripping purposes.

In connection with the signal-type pushbutton just recommended, the starters can be equipped with a solenoid-operated reset device which will reclose the overload relay. This is accomplished by wiring the normally open contacts of the stop button to the reset device. By this arrangement a relay which has been tripped may readily be reset without the operative moving from his position at the pushbutton station. The resetting will be indicated by the lamp.

Contrary to recommended practice for dry-cleaning plants, the switches and controls in a wet-process plant may be arranged wherever sufficient suitable space can be provided. Space near the motors can often be utilized, and this arrangement has the advantage that the switch for disconnecting the motor will be readily available if, in any emergency, the current needs to be interrupted.

What means of power-factor correction shall be adopted depends largely on the way in which the plant is related to other operations of the company. Where it is tied electrically to existing synchronous motor-generator equipment, these machines will afford power-factor correction. In other instances correction will have to be provided at the preparation plant. As the biggest motors at some of the largest of these plants do not exceed 100-hp. capacity, and because there are so many small units, the tendency is not to seek power-factor correction by the use of synchronous motors, which would add greatly to the expense, but to choose some other and less expensive method of attaining the same end.

Sometimes synchronous motors can be placed on the main circulating water pumps, although this practice is not general, because of its cost and because of the low percentage of correction obtained per unit, unless special care is taken to select such synchronous motors as are of excessive size and have a large corrective capacity.

A popular way of correcting power factor is by a synchronous condenser. This unit may be combined with the direct-current generator which provides current of that character, principally for the operation of the magnet by which pieces of iron and steel are removed from the raw coal as it comes to the plant.

Static condensers arranged so that various sections may be switched on and off at times as required can be provided for this same purpose. This method has the advantage that the equipment used, unlike the synchronous condenser, has no moving parts. However, with the static condenser the voltage usually has to be stepped up, in this case from 440 volts to 2,300 volts, if the cost is to be kept at the most favorable figure.

Without any synchronous equipment on the lines in the plant the power factor will run from 72 to 78

(Turn to page 482)

CHOOSING FANS

+ For Maximum Efficiency*

By HENRY BRIGGS
Hood Professor of Mining
Edinburgh University
Edinburgh, Scotland

IN the issue of May last, on pp. 251-253, I cited the changes taking place in consideration of mine-ventilation problems, and in this article I desire to discuss the theory of selection of fan sizes for use in specific mines and the means of finding a basis for such determinations, based on recent investigations of the problems of ventilation in Great Britain and Continental Europe.

Mechanical Efficiency — From the designer's point of view the most useful efficiency is the mechanical efficiency, which is defined as the ratio between the "horsepower in the air" and the horsepower applied to the fan shaft. The mechanical efficiency has a simplicity of conception and a directness which the manometric efficiency lacks. Its only drawback lies in the practical difficulty of measuring or estimating the power supplied to the fan shaft.

Static and Total Water Gages— The "horsepower in the air" being equal to the ventilating pressure in pounds per square foot multiplied by the quantity in cubic feet per minute and divided by 33,000, the manner of measuring the ventilating pressure generated by a fan becomes of much importance, and many otherwise useful fan tests have been spoiled by ascertaining it incorrectly.

As I stated in 1923,[1] the majority of engineers realize that the end of the tube connected to a water gage should be turned to face to windward, as in Fig. 1, thus obtaining the so-called total pressure. The only change in this regard is one of convenience rather than of principle, and arises in the following connection:

In mine airways, and especially in fan drifts where the velocity is high, the flow is subject to more or less vigorous fluctuation. Irregular and pulsating flow causes the measurement of pressure (or suction) by aid of such a tube as that of Fig. 1 to be troublesome, inasmuch as the total

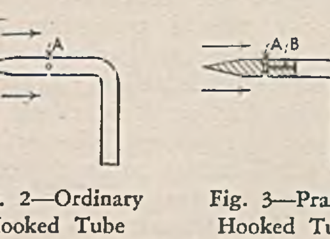


Fig. 1—Facing Gage Tube

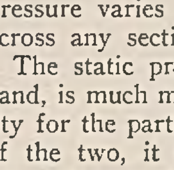


Fig. 2—Ordinary Hooked Tube

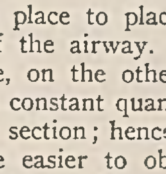


Fig. 3—Prandtl Hooked Tube

pressure varies from place to place across any section of the airway.

The static pressure, on the other hand, is much more a constant quantity for the particular section; hence, of the two, it is the easier to obtain. As was observed by a German committee on fan testing,[2] it proves therefore in practice to be advisable to measure the static pressure at the section; to adjust it by adding or deducting the velocity head, thereby attaining the total pressure. The velocity head is $\frac{wV^2}{2g}$ pound per square foot, where w is the weight of a cubic foot of air, V the mean velocity at the section in question, and g the acceleration due to gravity. If a force fan is used, the correction is added to the static pressure, whereas it has to be subtracted for a suction fan.

The most satisfactory manner of taking the static pressure is to use one of the two forms of hooked tube shown in Figs. 2 and 3, the Prandtl type in particular being recommended for its accuracy. The first (Fig. 2) is the easier to make; it has a few small holes drilled through the tube at *A*, whereas the Prandtl form is provided with a narrow slot, *A*, which extends all round the tube and which is connected to the bent portion by means of the perforation, *B*. As the diagrams show, each of these tubes, when in use, is set with its point directed to windward, and each possesses the advantage that, when properly set, the manometer registers a minimum pressure or maximum depression. Unlike the D'Arcy tip or other forms of fitting intended to provide the static pressure, these hooked tubes, then, automatically indicate when they are aligned correctly.

*The first article in this series appeared in the May issue, p. 251.
[1] "Developments in the Theory of Centrifugal Fans," *Coal Age*, Vol. 23, 1923.
[2] *Regeln für Leistungsversuche an Ventilatoren und Kompressoren*, Berlin, 1926.

Anemometer or Pitot Tube—It is less easy to dogmatize as to the best way of measuring the velocity of the air when testing a fan. As surface leakage seldom is negligible, the air measurements usually have to be taken in the fan drift, where the current is far from uniform and is subjected to pulsation and swirling. The researches of A. C. Callen and C. M. Smith as to the relative accuracy of the anemometer and Pitot tube, carried out underground at sections where the speed was moderate but the flow distribution uneven, definitely indicated the superiority of the Pitot tube.[3]

These workers found that the latter, used with discretion, furnished reasonably precise results, but that the anemometer, though useful for checking, invariably gave values much higher than the true values. The liability of the anemometer to read high in pulsating or fluctuating currents has, of course, long been known, and admittedly it is an instrument which gives relatively rough results. Some recent tests made under my direction in fan drifts at mines are, however, much more favorable to that instrument than those of Callen and Smith. When testing mine fans, the circumstances usually are such as to preclude any rigidly precise determination; the results will be only approximate, no matter what means of measurement is adopted; and the greater convenience of the anemometer, coupled with the fact that, under fan-drift conditions, the rival appliances give results (so we find) in fair agreement, goes to support general practice in using the anemometer.

In either case, much depends on the instruments; they must be good of their kind, effectively calibrated, and used with judgment. The choice of the measuring station is almost as important as the choice of instruments. A drift of irregular section is likely to introduce error in determining both air velocity and sectional area. It may be advisable to square it up at a measuring station by means of tongued-and-grooved boards carried along the walls and roof, the spaces behind the boards being tightly packed with clay or earth. The boarded section should not be too short; indeed, the longer it is, the better. The best section for a measuring station is the square or rectangle; its area may be quickly and accurately ascertained, and it is readily divided up into equal parts by wires stretched across from side to side and from roof to floor.

There is always the chance of expulsive reentry near a centrifugal fan; that is, of a current of air flowing back from the fan-inlet along the floor or along one side of the drift. A preliminary test with the anemometer will indicate whether the air is thus reentering. If it is, another station should be selected or means taken—by restricting the area or otherwise—to eliminate the reentry of air altogether before any measurements are made.

Reentry is prevalent also in évasé chimneys and is a principal cause of the high values obtained for volume when the air is measured at the top of such a chimney. The error so introduced may be large, and it invariably exaggerates the derived efficiency. Only as a last resource should the air be metered at the mouth of an expanding chimney.

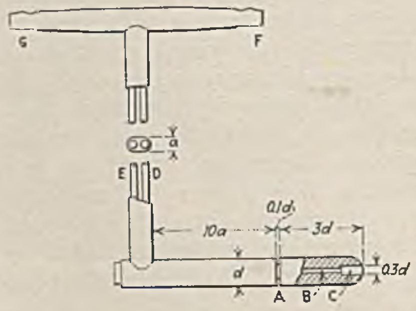


Fig. 4 — Prandtl Pitot Tube With Manometer Gives Velocity Head

The conditions in this regard are generally unfavorable enough in a fan drift; over a chimney they are worse.

A certain degree of advance has been made lately in the design of Pitot tubes and of delicate manometers for use in connection with them. The best Pitot tube of which I have knowledge is Prandtl's, shown in Fig. 4; it is robust and accurate, and has no holes or passages small enough to be choked by condensed moisture — an important matter when measurements are to be made in fan drifts. If the proportions given in the diagram are followed, the tube has a unity factor: that is to say, we may employ the formula

$$V = 18.3\sqrt{h_v \div w}$$

in which V is the air velocity in feet per second, h_v the velocity head in inches of water column, and w the weight of a cubic foot of air. With this arrangement it will be unnecessary to introduce a modifying coefficient of an empirical kind.

The Prandtl form is one of several variants of the concentric type of Pitot tube. The central "total pressure" tube, ending on one side in the enlarged mouth, C, and connected on the other to the pipe, E, and the branch, G, is directed straight up stream. Around it is an annular space kept at static pressure by means of the narrow slot, A, and joined *via* D to the branch, F.

A manometer connected across G and F will record the difference between the total and static pressures; *i.e.*, the velocity head. In dusty air a little cotton wool may be pushed loosely in C. Care has to be taken that the parts of the outer tube on each side of the slot are exactly in line, and with so many soldered joints it is necessary to make sure by a pressure test that there is no leak from the static to the total-pressure connections. I have found Prandtl tubes having $d = 1$ in. satisfactory for mining purposes and have supplied duplicates to the Mysore gold mines.

A number of well-constructed and sensitive manometers are now obtainable for use with Pitot tubes. They provide the precision in reading small differences of pressure which the ordinary upright U-tube lacks. Many of them, however, are not suitable for fan-testing purposes, because of their responsiveness to rapid fluctuations in the air current. It is obviously useless for a manometer to be designed to read to, say, 0.02 mm. if the liquid surfaces oscillate up and down over an amplitude of perhaps 5 mm. or more.

All things considered, the most satisfactory gage to employ with a Pitot tube is, I find, one having two long glass tubes of 1-in. bore, fixed parallel to each other on a surface adjusted to a slope of 5 deg. 44 min. —a slope which amplifies the readings in the ratio of 10:1. By using a large quantity of liquid (kerosene, toluol, or gasoline of ascertained density) in the inclined gage, its inertia will prevent much of the "dancing" which is so troublesome a feature with certain other manometers.

After the limbs of the gage have been read on a scale fixed to the sloping platform, the rubber connections to the Pitot tube should be interchanged and the readings repeated. The mean of the results is free from the error due to instrumental imperfections; for example, that caused by the tubes being

[3]Bulletin 158, Univ. of Illinois Experiment Station, pp. 46, 70.

slightly bent. Water should never be used for this purpose; its surface tension is too great and it moves in an irregular manner over glass. If gasoline or any other volatile liquid be selected, care should be taken that the manometer and the Pitot tube are at the same level, or the results may be inaccurate.

Fundamental Relations—The most important of the relationships apropos of fans of any kind is also the simplest. It is that the volumetric discharge is directly as the speed if the mine resistance is kept constant. If q be the quantity in cubic feet per second, n the speed in revolutions per second, and u the velocity of the runner rim in feet per second, we therefore have:

$$q \propto n \propto u \qquad (1)$$

As $p \propto q^2$, we also get:

$$p \propto n^2 \propto u^2 \qquad (2)$$

And, as the power required to move the air is measured by the product pq, it also follows that:

$$\text{Horsepower in the air} \propto n^3 \propto u^3 \qquad (3)$$

Another fact of value to both the designer and the user of these machines is that, when the mine resistance is constant, the mechanical efficiency is independent of the speed, or, to be more precise, the efficiency remains approximately constant with any alterations of speed likely to occur during ordinary operation.

The efficiency changes, of course, if the resistance or equivalent orifice changes, and in every known design there is one particular equivalent orifice with which the fan gives its optimum efficiency. Suppose that best orifice is found to be a_1 sq.ft. for a fan of diameter D_1 ft., and that another fan is required to operate on an orifice of a_2. The two machines being geometrically similar (that is, identical in everything except scale), the second fan will also function at the optimum efficiency if its diameter D_2, satisfies the relation:

$$a_2 \div D_2^2 = a_1 \div D_1^2 \qquad (4)$$

For the designer, then, the ratio $a \div D^2$ acquires a special significance. It is the *orifice coefficient*, one of three coefficients first applied by the late Prof. Rateau to fan questions. The second of his coefficients, which finds its basis in a combination of relation (1) with the same principle of dynamic similarity, is termed the *volumetric coefficient*, and is written $N = q \div u D^2$. The third, called the manometric coefficient, is of minor utility and need not concern us here.[4]

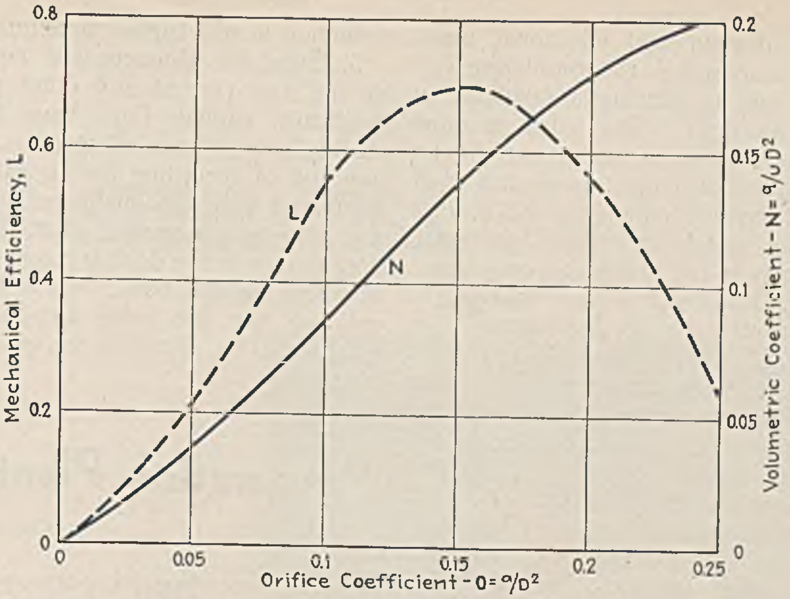


Fig. 5—Typical Characteristic Curves for Fan Operation

Characteristic Curves and Their Use—Make a series of efficiency tests with any fan, causing it to function against a variety of resistances. Derive the orifice and volumetric coefficients for each set of measurements. Plot these coefficients and the mechanical efficiency in the manner illustrated by Fig. 5, thus obtaining the so-called characteristic curves for the particular kind of fan. Such curves stand at the foundation of fan design and performance. They are by no means new, but they deserve a place in this summary, as they are not well known, and are only now coming into their own in English speaking countries.

Once in possession of these curves, it is an easy matter to draw up specification for a fan of the same kind (that is, one geometrically similar to that tested) to satisfy any reasonable requirement.

What, for example, would be the most suitable fan, of the type for which the curves of Fig. 5 apply, for circulating 180,000 cu.ft. of air per minute through a mine having an equivalent orifice of 30 sq.ft.?

We learn from the L curve that the optimum efficiency of 0.7 (70 per cent) is realized when

$$o = a \div D^2 = 0.15$$

Hence the diameter of the proposed fan,

$$D = \sqrt{(a \div 0.15)} = \sqrt{(30 \div 0.15)} = 14 \text{ ft.}$$

By substituting, $Q = 180$ and $a = 30$ into the ordinary equivalent orifice formula: $a = 0.38\ Q \div \sqrt{h}$ we find that the water gage, h, will require to be 5.2 in. On that depression, a quantity of 180,000 cu.ft. a minute is equivalent to 144 hp. in the air, and at 70 per cent mechanical efficiency this again will call for the application of 206 hp. to the fan shaft.

Now look at the N curve of Fig. 5. At the locus of maximum efficiency N is 0.138 (right-hand scale). Inserting that figure for N in the formula:

$$N = q \div u D^2$$

and also writing $q = 3{,}000$ (cu.ft. per sec.) and $D = 14$, we get $u = 111$ ft. per sec. To obtain that speed for the runner rim, a 14-ft. fan must be driven at 152 r.p.m.

Our specification is now complete: The conditions will be satisfied by a fan of the type in question having a diameter of 14 ft., running at 152 r.p.m., generating a depression of 5.2 in. of water column, and requiring 206 hp. to be supplied at the fan shaft. The fan would operate at the optimum efficiency of 70 per cent. Given the characteristic curves appropriate to the particular machine, similar calculations can be made for any kind of mine fan.

Controlling the Delivery of a Centrifugal Fan—The centrifugal fan is not a machine lending itself to adjustment. In fact, only one adjustment is possible for it: namely, that of altering the speed. The only way of increasing the air volume with such a fan is to increase the speed; but if it should become necessary to diminish the volume, two alternatives offer themselves: either the speed can be reduced, or the speed can be

[4] See "Ventilation of Mines" (Methuen, London), p. 42.

kept constant and additional resistance imposed in the ventilating circuit; say, by placing a regulator in the fan drift. Now when a mine fan is driven, as many are, by an a.c. induction motor, an alteration of speed involves changing the pulleys on the motor shaft and fan shaft, and this is not always an easy operation. Usually it is more convenient to throttle the air by means of a regulator, especially as the latter may be fitted without stopping the fan.

It has often been asked whether throttling or speed reduction is the better method of diminishing the delivery of a centrifugal fan. If convenience is to be taken into consideration, throttling, as we have seen, offers distinct advantages, but if efficiency is the principal issue, speed control is, in most cases, the more economical method of the two.

However, before a reliable quantitative comparison can be made, it is necessary to have the characteristic curves of the fan and a knowledge of the natural ventilating pressure operating at the period. With that information available—and only then—the problem admits of a definite solution. Possession of the characteristic curves allows one to decide as to the effect, on the locus of operation, of imposing extra resistance. For example, if the fan is normally working under conditions realizing the highest possible efficiency, to add resistance will obviously reduce its efficiency. On the other hand, if the machine is functioning on an equivalent orifice greater than that for which it was designed, the addition of a certain amount of resistance may improve the efficiency, and, in these circumstances, the throttling method shows up to rather better advantage.

I investigated the subject in detail during 1929,[5] a fan having characteristics similar to these of Fig. 5 being selected for the purpose, and the following is a summary of the conclusions reached:

1. In any circumstances likely to arise in ordinary practice, the method of decreasing the fan speed in order to reduce the air quantity is much more economical of power than the alternative of maintaining the speed constant and putting resistance in the air current. The more the quantity of air is reduced, the greater the relative superiority of the former method.

2. Where natural ventilation assists the fan, the advantage of speed reduction is still further accentuated.

3. Once the characteristic curves of the fan (or of any other geometrically similar fan) have been obtained, the effects of speed reduction and of throttling the air can be calculated with reasonable accuracy.

4. The only occasion when throttling the air in the drift is economical is where natural ventilation is present and, the fan being stopped, it is desired to diminish the quantity of air below that normally yielded by natural ventilation acting alone. If the mine resistance were kept constant, the only alternative in that exceptional case would be the wasteful one of running the fan at low speed with the reversing arrangements[6] in operation so as to make the fan oppose, to the required degree, the effect of natural ventilation.

[5]*Colliery Engineering*, May, 1929; p. 169.

[6]Reversing arrangements are compulsory at British coal mines.

▼ ▼

Preparation Plant Electrification

(*Continued from page 478*)

per cent, depending, of course, on the loading of the motors. This power factor is quite reasonable, being about that of a 15-hp. 900-r.p.m., 440-volt, three-phase, squirrel-cage motor operated at 75 per cent load. Considering the number of small units in the plant, the power factor is relatively high.

In some plants an auxiliary source of power has been needed to guard against the possibility that the main circuit will be interrupted for some time. To this end a steam turbine with a generator, a storage battery, or a gasoline-driven generator can be provided. In some plants a continuous supply of energy is of the utmost importance, because when the power fails, the pumps and the circulating water in tanks stop immediately. The water drops its solids, which promptly imbed the conveyors, plows, and scrapers. When heat dryers are employed in the preparation plant, a stoppage of kilns, fans, and conveyors presents a difficulty and a hazard.

But other stoppages occur, against which the auxiliary plant furnishes no protection. Motors and conveyors may stop unexpectedly, due to an overload or the breakage of parts; when they do, serious difficulties often arise. To get notice of this possibility before the units come to rest and a flood of coal crowds the stalling equipment, blinking lights are sometimes attached to the shafts of units that are likely to stall, and they have proved of some advantage. But the indications of the blinking light, if not watched, may not be noted until the speed of the equipment has been so greatly slackened that nothing can be done to correct it.

A device on a motor control which will give an audible signal does not always solve the problem satisfactorily, for the controller may be closed and the motor may be running, but the conveyor nevertheless may be stopped, because a speed reducer, drive chain, or the conveyor chain itself may have broken. A mercury switch has been designed, for application to a slow-moving conveyor shaft, which sends out a signal only when the shaft has slowed down almost to a rest.

All large plants require systems of signaling, calling, and sounding alarms. Such devices can be best coordinated by means of a carefully planned system in which calls for key men, fire alarms, and operating signals can be arranged so as not to conflict with one another.

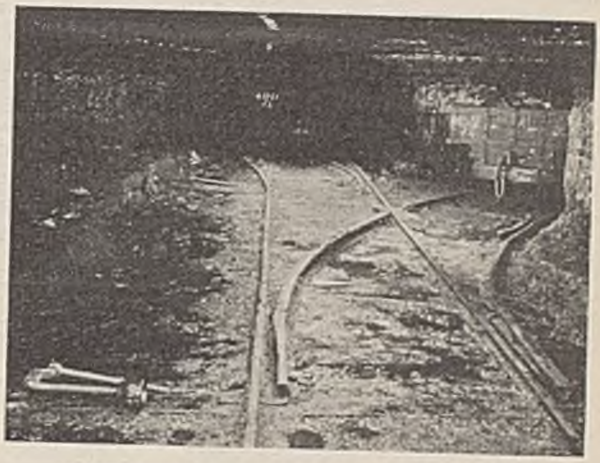
Such an arrangement will provide for the grouping of telephone stations with other signals and alarms. By coding the bells, much extra wiring will be eliminated, and the plant superintendent will always be in close touch with all his men and with every section of the plant.

For repair service the plant should be equipped with a 200-amp. direct-current welding outfit. For normal conditions a single unit of this capacity will be sufficient to make all the repairs in which welding is involved. This outfit should be set up in a permanent location and the plant wired throughout with a welding circuit inclosed in conduit and provided with fittings into which the welder can plug his outfit and thus reach his work with a short length of welding cable.

Plant lighting is too long a subject to discuss in this article, involving as it does the success of the process and the safety of the plant. It may be said, however, that it has been found that approximately 10-kva. transformer capacity per 100 tons per hour of plant capacity will provide adequate lighting during short winter days, or even for night operation.

ECONOMY OF STEEL TIES

+ Is Proved at Scarbro Mine



Turnout With Ride-over Switch Point

By A. R. LONG

Superintendent, Scarbro Mine
The New River Co.
Scarbro, W. Va.

ARE steel ties more efficient and economical than wood ties for use in mine track? Our experience has conclusively proved such to be the case. About three years ago it was decided gradually to replace all the wood ties with steel ties in the Scarbro mine, of the New River Co., which is in the New River field of West Virginia. Substitution was effected in such manner as not to increase the cost of supply or upset the organization of the track gang.

Ultimate operation of the plan provided for the miner laying all track at the working face and using only steel ties. His compensation was to be based on the time required to lay a pair of rails, properly joined by fishplates and accounted for at the time yardage was taken up, provided the track was laid according to specifications. A company supervising official would be responsible for the placing of material at the working face, as needed, and for painting a line on the roof for alignment guidance.

The plan provided that each miner be supplied with five steel-rail extension ties for an adjustable face track, eliminating short jumpers. These extension ties (*Coal Age*, Vol. 34, p. 698) hold the rails in either an upright or inverted position and give the miner a track section that may be easily extended as the coal is loaded out; at the same time they provide a track that is strong enough to support track-type cutting machines. In addition to the extension ties, each miner was required to have, among his tools, a track wrench and a car stop. The car stop (*Coal Age*, Vol. 35, p. 116) is a safety appliance which prevents the car from moving, on either an ascending or descending grade, after being placed at the face for loading. It fits over either an upright or inverted rail and has a spring attached to it by a short length of chain.

Steel Ties for Every Purpose

All advancing breakthroughs were considered as separate working places and a crossover switch was to be laid after the first cut was taken out. In entries the switch would remain in the last open breakthrough until the next breakthrough was completed, providing a haulageway for the aircourse coal, the haulageway moving forward as the breakthroughs advance. The materials required for room and breakthrough switches were to consist of three steel switch ties, guard rail, frog, standard steel ties and rails curved to the proper radii and cut in lengths convenient to handle. (For details of these switches see *Coal Age*, Vol. 35, p. 380.)

Having determined the plan after a careful survey of organization and working conditions in the mine, putting it into operation was the next move. Beginning in August, 1928, a quantity of steel room ties was placed in the mine each month. The result was a gradual decrease in the number of wood ties in use. In January, 1929, a few sets of steel rail extension ties and car stops were placed in service. As we considered ourselves going through an educational period, we advanced slowly until August, 1929, when we started to push this system more extensively and to place in service a greater number of steel-rail extension ties. In October, 1929, we placed in service a few crossover switches in breakthroughs. In January, 1930, the use of steel ties under switches was begun, and by February, 1930, being convinced that the use of steel ties was fundamentally correct and that they increased the efficiency of our operations, we began putting the system into effect, section by section. The results of this plan appear in the accompanying table.

This modernization program has proved itself entirely satisfactory under all working conditions. No wood ties have been used since July 1, 1930. Ninety per cent of all room switches are on steel ties, and about 25 per cent of all breakthroughs have crossover switches. Every miner now uses steel-rail extension ties and lays his own straight track. No steel room ties have been added to the supply since March 1, 1931.

Steel ties have given better track at the working face and caused fewer wrecks on crossover switches in breakthroughs, because the track is non-spreading. Haulage costs thereby are reduced. Less lost motion in the laying of track has reduced labor expense, and greater recovery and reuse of steel ties have reflected substantial economies in material cost.

Over 3,000 ft. of main haulage track has been laid on steel ties and over 5,000 ft. has been laid with a few steel ties per rail to strengthen the track until the wood ties are entirely replaced by steel ones. Steel ties sufficient to lay an additional 3,000 ft. of main haulage track have been ordered. While we have not progressed as far with main haulage track as we have with room and entry track, nevertheless we have become convinced, in view of the economies and operating efficiency derived from the installations already mentioned, that the use of steel ties in main haulage track will reflect even greater improvements in our transportation system as a whole.

Account of Steel Ties, Wood Ties, and Spikes Used at Scarbro Mine In the Years 1927, 1928, 1929 and 1930

Year	Number of Steel Ties	Wood Ties in Feet	Cost of Spikes	Total Material Cost	Tons of Coal Mined	Material Cost Per Ton	Track Labor Cost	Track Cost Per Ton
1927	...	93,000	.....	$3,326.90	$206,000	0.01615	$12,031.00	0.0585
1928	...	8,375	$50.25	301.50	24,756	....	$1,410.73	....
January	...	......	50.16	300.96	25,455	....	1,488.23	....
February	...	8,360	90.00	660.00	28,547	....	1,644.78	....
March	300	15,000	69.48	416.88	24,091	....	1,645.85	....
April	...	11,580	68.28	409.68	27,408	....	1,518.38	....
May	...	11,380	53.70	322.20	25,967	....	1,658.09	....
June	...	8,950	60.75	364 50	25,203	....	1,574.46	....
July	...	10,125	51.93	431.58	27,561	....	1,470.11	....
August	300	8,655	51.93	431.58	24,092	....	1,382.42	....
September	300	8,655	81.36	608.16	28,684	....	1,629.26	....
October	300	13,560	49.20	535.20	23,747	....	1,404.38	....
November	600	8,200	25.38	272.28	22,360	....	1,293.38	....
December	300	4,230	......	....	......	....	....	....
Total	2,100	117,070	$702.42	$5,054.52	308,799	0.01637	$18,120.07	0.05868
1929								
January	600	6,160	36.96	461.82	28,008	....	1,578.10	....
February	300	5,810	34.86	329.16	26,254	....	1,399.08	....
March	600	2,700	16.20	337.20	25,619	....	1,389.37	....
April	600	2,175	13.05	318.30	26,056	....	1,383.03	....
May	300	1,300	7.80	166.80	23,318	....	1,263.66	....
June	230	1,200	7.20	135.20	21,242	....	1,034.90	....
July	630	875	5.25	283.50	24,903	....	1,209.49	....
August	600	3,250	19.50	356.00	27,250	....	1,464.48	....
September	...	2,825	16.95	101.70	24,903	....	1,163.50	....
October	600	4,185	25.11	390.66	26,332	....	1,186.90	....
November	600	1,000	6.00	276.00	23,397	....	1,088.02	....
December	900	1,850	11.10	426.60	22,047	....	823.96	....
Total	5,960	33,330	$199.98	$3,582.94	299,329	0.01193	14,983.49	0.05005
1930								
January	600	250	1.50	249.00	26,052	....	982.70	....
February	600	300	1.80	250.80	18,077	....	649.27	....
March	300	250	1.50	129.00	15,875	....	407.88	....
April	700	259	1.50	289.00	14,787	....	377.34	....
May	900	......	......	360.00	19,532	....	580.60	....
June	300	375	2.25	133.50	20,230	....	693.00	....
July	200	......	......	480.00	24,359	....	586.41	....
August	600	......	......	240.00	21,060	....	531.32	....
September	600	......	......	240.00	21,312	....	543.98	....
October	720	......	......	288.00	22,965	....	579.75	....
November	600	......	......	240.00	16,926	....	493.19	....
December	300	......	......	120.00	15,369	....	441.28	....
January (1931)	300	......	......	120.00	12,350	....	319.48	....
February	200	......	......	80.00	9,013	....	204.02	....
March	....	......	......	....	17,591	....	416.29	....
Total	7,920	1,425	8.55	$3,219.30	275,498	0.01164	$7,824.51	0.0284

Recapitulation of Savings:

1929 over 1928 on material	0.00444 for	299,329 tons	$1,329.02
1929 over 1928 on track labor	0.00863 for	299,329 tons	2,583.20
1930 over 1928 material	0.00463 for	275,498 tons	1,275.55
1930 over 1928 on track labor	0.03028 for	275,489 tons	8,342.08
1929 over 1928 on haulage	0.00639 for	299,329 tons	1,912.71
1930 over 1928 on haulage	0.0574 for	275,498 tons	1,581.35
			$17,823.91

VIBRATING SCREENS + Handle Sizing Job At Syracuse Tipple

VIBRATING screens occupy a definite place in the preparation of coal for the market, though few companies have installed them for the whole of the sizing program. The latest member of this group is Syracuse Mining, Inc. The new tipple of this company, located at Syracuse, in the Pomeroy field of Ohio, has been equipped solely with vibrators for the production of four standard sizes of coal. Capacity of the plant is 200 tons per hour, and two screens size the coal, discharging the larger sizes onto picking equipment arranged for maximum efficiency in the manual separation of impurities.

Syracuse coal comes from the Pittsburgh No. 8 seam, which is reached by a shaft on the banks of the Ohio River. Thickness of the seam is 36 in. Banded impurities of any kind are absent, though the seam is overlaid by 8 in. of bone. The latter, however, is readily separated from the coal. The coal itself is hard and blocky. Domestic consumers and railroads take a large part of the production, while most of the remainder goes to the lakes.

The new Syracuse plant replaces a former tipple equipped with shaker screens, destroyed by fire late in 1930. Immediately after the destruction of the old plant, the management started a search for some type of preparation equipment which would require the minimum expenditure of time and money to install. Inspection of vibrating screens in operation at other mines convinced officials that such equipment could be applied at Syracuse. Consequently, it was decided to install vibrators in the new plant, which was completed in the middle of February.

Rubber belt conveyors were selected for picking lump, egg, and small egg (nut). Recognizing the trend toward mixtures, the company also decided to install a mixing conveyor to insure maximum flexibility in shipments. Two belt loading booms and one drag-scraper boom are employed to lower the three coarse sizes into the railroad cars.

Arrangement of the equipment is shown in Fig. 1. The coal is hoisted in $1\frac{1}{2}$-ton mine cars and dumped into a weigh basket. A flygate in the chute ahead of the weigh basket allows mine rock and other refuse to be bypassed to the refuse bin (not shown in the sketch) under the feeder. From the feeder, the coal passes to the two "Summit" vibrating screens.

The first, or "lump vibrator," is of the single-deck type, 8 ft. long and 6 ft. wide. It is equipped with a lip screen with 4-in. openings. Everything above and including 4-in. coal goes to the lump picking belt. Minus 4-in. coal passes to the second, or "egg vibrator," a double-deck machine set at right angles to the "lump vibrator." The "egg vibrator" is 8 ft. long and 5 ft. wide. All coal above 3 in. goes across the lip screen on the top deck to the large egg picking belt. The screen plate on the second deck of the "egg vibrator" has $1\frac{1}{2}$-in. perforations, the $1\frac{1}{2}$x3-in. small egg going across to discharge onto the small egg picking belt, while the $1\frac{1}{2}$-in. slack is chuted to the mixing conveyor to be loaded separately or mixed with the other sizes.

Both screens, furnished by the J. S. Morrison Co., Inc., are suspended by rods from the tipple frame. Driving motors are mounted on the screen frame, as shown in Fig. 3. Power is transmitted to the eccentrics through Texrope drives. The "lump vibrator" is driven by a $7\frac{1}{2}$-hp. induction motor, while a 5-hp. machine suffices for the "egg vibrator." Tests to determine the screening efficiency in this type of service have not been made, but the company officials state that no complaints on sizing have been received.

As the 4-in. lump comprises 48 per cent of the coal shipped, it has the lion's share of the picking facilities. The lump picking belt is approximately 56 ft. between pulley centers, and picking can be done on about 36 ft. of the top strand. Six refuse chutes are provided, three of which also serve the egg and small egg picking belts. The lump belt is 4 ft. wide and would accommodate

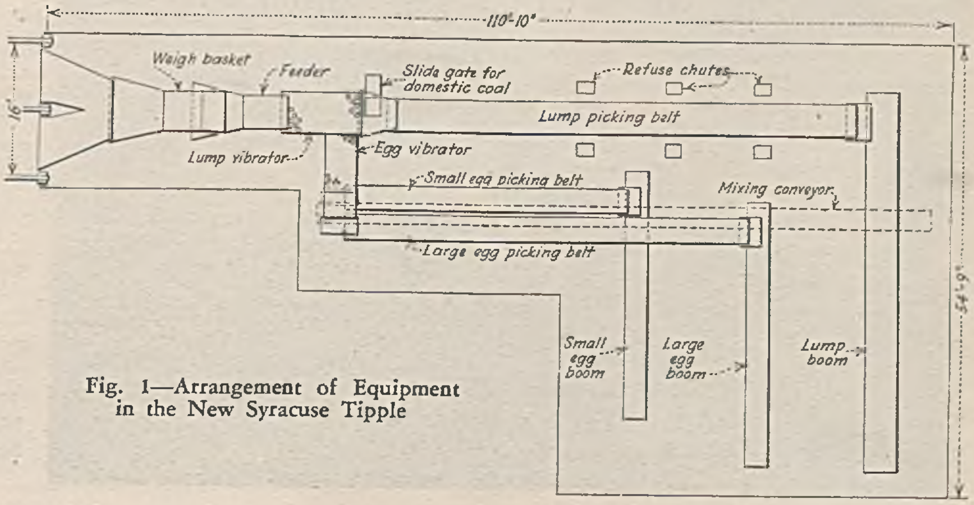


Fig. 1—Arrangement of Equipment in the New Syracuse Tipple

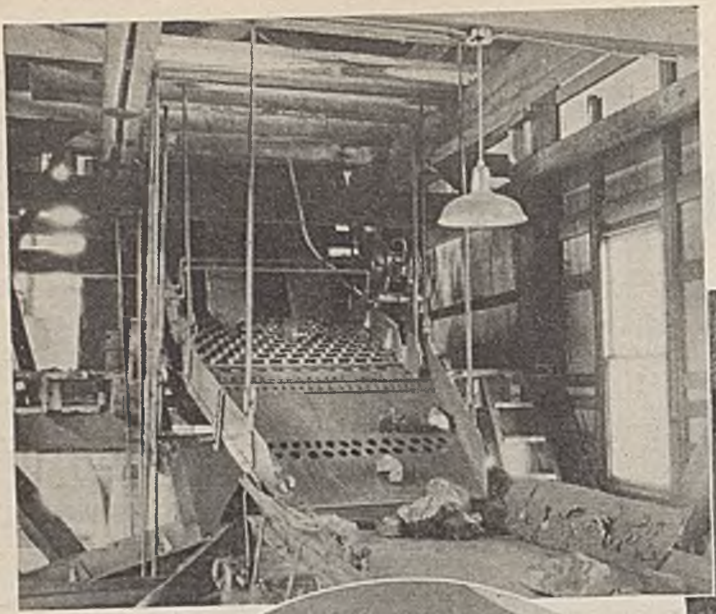


Fig. 2—"Lump Vibrator"

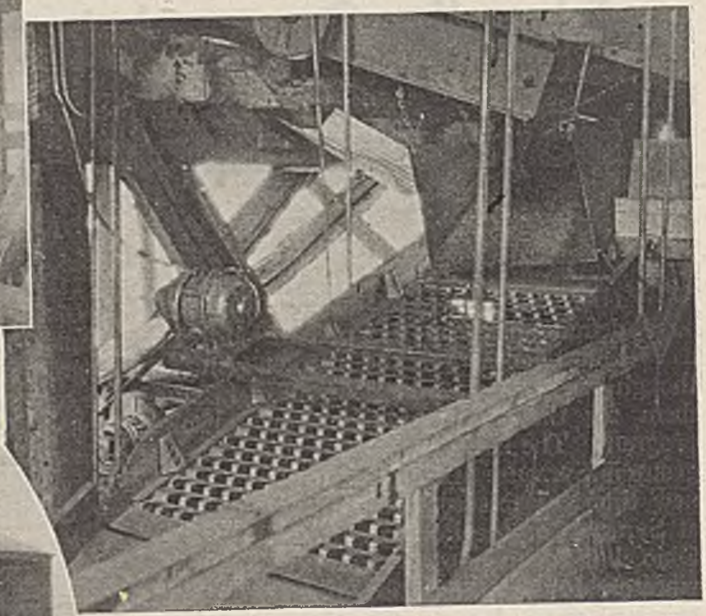


Fig. 3—"Egg Vibrator," Set Below and at Right Angles to the "Lump Vibrator"

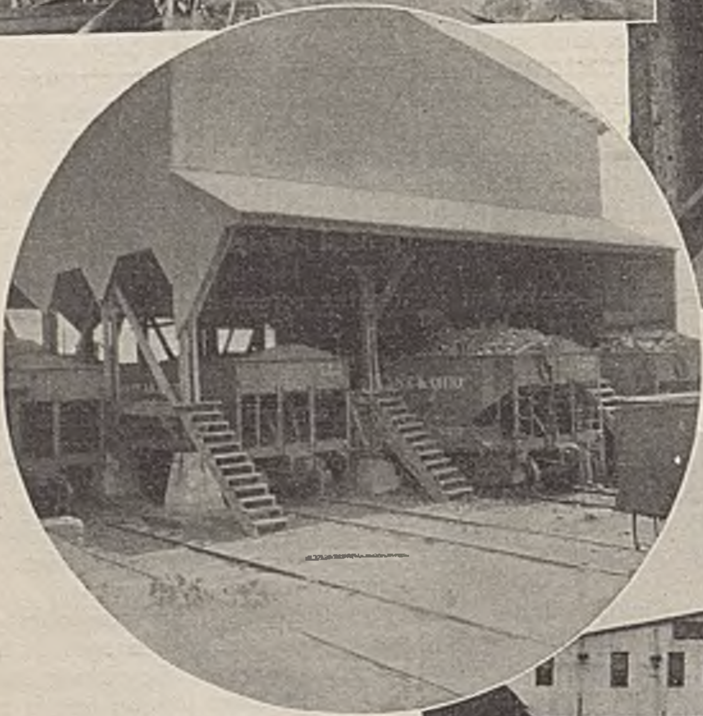


Fig. 4—Loading Tracks at Syracuse

Fig. 5—Syracuse Tipple

Fig. 6—View of Picking Floor With Screens in the Background

twelve pickers, if necessary, without crowding. Both the egg and small egg belts are 3 ft. wide. Picking length on the former is about 10 ft., while on the latter it is approximately 6 ft. Refuse from all three belts goes through the chutes to a 14-in. refuse belt beneath the lump picking belt, and from there is carried back to the refuse bin next to the shaft. As shown in Figs. 1 and 6, arrangement of the equipment on the picking floor makes supervision easy and insures the maximum amount of natural illumination during the daylight hours.

Standard sizes produced are as follows: 4-in. lump; 3x4-in. egg; 1½x3-in. small egg (nut); and 1½-in. slack. Mixtures of these four can be made in any combination by use of the mixing conveyor, or cleaned mine-run can be loaded if desired. To date, little of the latter has been produced, except for railroad fuel, while the tonnage of mixtures is small. Four-inch lump is supplied to the local trade directly from the "lump vibrator" by opening a sliding gate in the chute between the screen and the picking belt.

Connected horsepower in the new tipple is 57.5, made up of ten 5-hp. General Electric induction motors and one 7½-hp. machine of the same type. This total compares with 65 hp. in the old tipple, which included one 30-hp. motor used in driving the shaking screen and operating the loading booms. Each motor in the new plant has an individual push-button switch for starting and stopping each piece of equipment separately. Sequence starting and stopping, in view of the simplicity of layout, was not deemed necessary, though all equipment may be stopped at once through a master switch. Picking belts, the two belt loading booms, feeder, and refuse and mixing conveyors were supplied by the Northern Conveyor Co.

LETTERS

. . . to the Editor

Union Pacific Coal Reduces Accidents Per Ton Shift

In the concluding paragraph of "How to Achieve Safety," pp. 291-293, *Coal Age*, in the issue of June, 1931, refers to the remarks of I. N. Bayless, assistant general manager, Union Pacific Coal Co., as follows: "Mr. Bayless remarked that the accidents with mechanical loading are 'favorable on tonnage. but do not look so good on the man-shift basis.' "

It is difficult to gather just what Mr. Bayless said or meant to say, from the paragraph as written. The facts, however, are that two years' careful study in ten mines operated by our company, show the following results:

Increase in tons mined per compensable accident, where mechanical replaces hand loading

1929		1930	
Tons	Per Cent	Tons	Per Cent
11,387	89.2	10,147	95.7

Increase in man-shifts per compensable accident, where mechanical replaces hand loading

1929		1930	
Man-Shifts	Per Cent	Man-Shifts	Per Cent
531	44.6	428	42.9

The apparent better showing made by the mechanical loading process. when compared on a tonnage basis to that on a man-shift basis, merely expresses the fact that a greater output is obtained per man-shift where loading machines are used than hand loading will provide. The Union Pacific officials still hold to the position that accident figures based on tons loaded per accident are misleading, due to the growing application of power machines. These, be it remembered, include stripping shovels which load many times more tons per man-shift than can be obtained by any other process.

Eugene McAuliffe,
President Union Pacific Coal Co.
Omaha, Neb.

* * *

Rate Increase Would Nullify Cost Reductions

The proposed increase in freight rates on all commodities, including coal, raises some interesting questions as to the effect of such an increase upon the cost of steam and power. This is an important question, because the total cost of coal at the point of consumption, except in those industrial districts like Pittsburgh, which are themselves in the coal fields, includes freight charges which are more than half of the total.

Obviously, those points which are most distant from a source of coal supply will be the most severely affected by a flat percentage increase in freight charges. And also the effect is modified somewhat by the type of coal being shipped, for coal is sold for its energy value. For example, an increase of 40c. a net ton means an increase of 1.4c. per million B.t.u. to the buyer of a good low-volatile coal from Pennsylvania, and 1.8c. to the buyer of a typical Illinois slack. In other words, the increase in terms of energy is nearly 30 per cent more in one case than the other, although the increase in cents per ton is the same in both cases.

Reduced to the basis of the cost of transporting energy, a 15 per cent increase in coal freight rates means an increase in cents per million B.t.u., approximately as follows:

To Central New England from Pennsylvania	2.0
Middle Atlantic points from Pennsylvania	1.5
Western New York State from Pennsylvania	1.2
Chicago and Vicinity from Southern Illinois	1.3
St. Louis and Vicinity from Southern Illinois	0.75

When it is realized that the present delivered cost of energy in the form of coal ranges from less than 11c. per million B.t.u. at St. Louis to 20c. in central New England, it will be seen at once that these increases represent a substantial addition to the cost of steam and power. Excepting St. Louis, which is favored by close proximity to the coal fields, it means an increase of just about 10 per cent to the coal consumer.

These figures, too, are interesting if considered against the background of declining coal prices during the past few years. Comparing the prices of run-of-mine and slack bituminous coal during the first six months of 1925 with those being obtained during the first half of 1931, the decline in all of the important fields has been almost exactly 2c. per million B.t.u. The proposed freight rate increase of 15 per cent would therefore cancel two-thirds of this reduction in the cost of coal during the past six years at points like Buffalo and Chicago, three-quarters of it at most Middle Atlantic points, and practically all of it in central New England.

The bituminous coal industry is, of course, suffering acutely from this decline in prices, and the curious thing about this proposed increase in coal freight rates is that it would leave the producer of steam about where he was in 1925, as far as the cost of energy is concerned; the producer of coal worse off; while the railroads, which also are hard pressed at the moment, would absorb most of the difference.

The figures already given regarding the cost of coal at points of consumption obscure the fact that the percentage decline in price at the mines between 1925 and 1931 varies from 25 to more than 50, depending upon the size and kind of coal. It is doubtful if a 15 per cent increase in freight rates would cancel from two-thirds to the entire amount of such a decline in the price of any other important commodity at the principal points of consumption. It would seem as if coal, among all the commodities, is in a unique position as far as the effect of a freight rate increase upon both the producers and consumers is concerned, and that the determination of changes in coal freight rates should rest upon a consideration of these special economic factors.

Gerald B. Gould,
President, Fuel Engineering Co.
New York City.

Coal Age

Sydney A. Hale, *Editor*

New York, September, 1931

Mousetraps, Mahomet, and stokers

THE beaten path in the woods to the maker of better mousetraps is stimulating, perhaps, in theory, but, in these days of high-pressure competition for the consumer's dollar, the manufacturer who relies upon word-of-mouth praise to bring the prospective purchaser to his door will have much idle time in which to meditate upon the stupidity of his fellow men. Mahomet had a better idea, and modern salesmanship has improved upon his system by not even pausing to see if, by chance or miracle, the mountain will move in the direction of the order blank.

Coal and its allies have learned much in the last few years, but there are still many opportunities unrealized. Clever merchandising sold many householders the notion that thermostatic control was a development which the oil-burner brought into the picture, although thermostats were in use long before oil became a competitor of coal in domestic heating. Oil-burner interests, too, have seen the advantages of exhibiting their wares at state and county fairs visited by thousands of rural citizens.

At the Iowa State Fair in Des Moines last year, to cite one example, oil burners were part of the exhibit of home and farm devices and equipment, but an observer from Mars would have been justified in the belief that coal to cheer the chilly winter days of the plains and prairies was as little used as the buffalo chips of pioneering days. And yet it is at places where consumers congregate that the story of coal and its modern allies in mechanized home heating needs to be told.

What size car?

IN the selection of new or "replacement" mine cars for mechanical loading, the question of size demands paramount consideration. Yet, in too many instances, size has not been properly integrated with respect to the various and conflicting conditions which the car must meet in service. The root of the trouble undoubtedly lies in thinking in terms of capacity without proper regard for limitations in the efficiency of operation.

When those limitations are accurately reckoned, it will be found that the right car will not answer the exigencies of every branch of the haulage system, to say nothing of the extraction methods most dependent on transportation. Main haulage naturally is facilitated by the use of cars of increased proportions. But, having improved this end of transportation, will the larger car do as much for operations at the face?

That is the question. True it is that increased car capacity tends to increase the output of the loading machine by cutting down the time required for shifting cars. But to what extent can the machine avail itself of this opportunity? That is a matter which must be determined, keeping in mind that certain jobs must be performed apart from actual loading, during which the machine is nonproductive though a car is available for loading; for instance, maneuvering for position, testing roof, setting props or making minor machine adjustments. That these factors are important is evidenced by the fact that cars holding as little as one ton are known to be producing more coal per machine than some installations with much larger cars.

The point is that arbitrary selection of larger mine-car capacity is likely to lead to disappointment. It is fallacious to say that because a three-ton car yields this much, a five-ton car will give so much more in nearly direct proportion. The actual requirement may be only a new car of better design holding, say, 3.107 tons. Let broad study, with the assistance of the stopwatch, determine this.

Cellar air

NO one cares to live in the air of a cellar, a basement, or a mine, because it has two bad qualities, moisture and the lack of vitalizing sun's rays. The first fault is characteristic of cooled air at most of our restaurants, hotels, and theaters. It is distinctly displeasing to the public. The air should first be cooled to an unbearably low temperature, then heated to almost the temperature of the air of the street. Cooling will deposit moisture and heating will bring the air to a temperature which can be borne by the human body without shock. There is no loss of efficiency in excessive cooling and subsequent reheating, because the air coming to be cooled can be used to heat the air about to be discharged into the cool-air ducts.

When the temperature is below blood heat, a dry hot blast of air is grateful to the body because it removes moisture. Those little hot-air blowers that are used in some washrooms to dry the hands after washing, if directed up the sleeves of the wearer, dry the skin and the clothes and make the wearer comfortable, even though they supply heat to the body, proving that the trouble lies in the moisture and not in the heat.

Progress in "cooling with coal" is sure to be retarded if the advantages of supplying dry air at almost the ruling temperature are not learned and duly observed by those who make air-conditioning installations. Mere coolness may result in severe colds and discomfort. With every pore open and the clothes saturated with moisture, cold damp air results in shock. Places thus cooled are likely to be avoided rather than sought by the public. Note the declaration hung at nearly all of them, "No drafts." With temperate, dry air, a draft would not be objectionable.

Facing a new era

ALL the workingman's recent improvement in living standards has arisen from mechanization and has been the gift of the engineer. It has had more to do with our present prosperity than has our form of government, our business structure, or unionization, though these have been helpful. As soon as the march of mechanization ceases, that increase in the well-being of the masses will be largely halted. We shall enjoy then the blessings of stabilization as to the number of men employed, but it may be questioned whether these benefits will compare with those of our present mechanical progress, awkward as are the situations in which that progress sometimes places labor meanwhile.

Only a passing phase is the increase in mechanization, yet in general it has been postulated thoughtlessly as a permanent condition, not to be hedged about with even proximate dates. Nevertheless, as every one knows, many industries are already fully mechanized and all have made much progress in that direction. Some industries, notably that of coal, are not far advanced. For the most part, they are those where mechanization can increase the product of labor only two- or three-fold instead of a hundred- or a thousand-fold.

Perhaps in two decades even the most difficult of these will have been entirely mechanized. A revulsion will come against hard hand labor of any kind, and jobs requiring it will be discontinued. Thereafter, existing machines may be modified so as to reduce the expenditure of labor a trifle or do the work a little better, but the age of progressive mechanization and labor easing will largely have had its day.

Nevertheless, humanity, will still progress. An age of refinements will follow, and coincidentally a chemical age, which even now has commenced, overlapping this present age of progress in mechanization. It will be an age of stabilization, as far as the number of men employed is concerned, though men will change locations and industries as much as or more than before. Still, one should not be too jubilant about that regularity of employment, for the standard of living will then cease to be improved by progressive reductions in cost. The cheapening of product will not be as great as that which has accompanied the advent and development of mechanical production.

In fact, due to the decline in natural resources and the necessary falling back on the rejects of today's operations, the expenditure of labor per unit of product, except in Asia and Africa, may increase or, at least, remain unchanged. As an instance; even today, what our fathers rejected is being worked over in all Eastern coal fields, especially in the anthracite, Georges Creek, and Connellsville regions. Beds which they refused to work are now being mined with painful assiduity; coal which they left as pillars, as roof, or as floor is being recovered at high cost, and what was thrown on yesterday's dump is being cleaned and shipped today. Figuratively speaking, the future will see the children devouring the stale meats of their forbears.

In the coal industry, mechanization will advance with rapid strides for at least ten years. With what remarkable speed has mechanical loading been advancing, more rapidly than did mechanical cutting, and that despite the fact that the latter promised to increase the productivity of labor in that one limited operation twenty- to forty-fold! The mechanical loader thus far promises only three or five times as much coal per man engaged as hand loading when all the men are included who do the work formerly performed by the hand loader, including timbering, roadlaying, shooting, and mechanical repair.

Its progress, therefore, clearly demonstrates that the coal industry is more alert than at the beginning of the century and gives reason for hoping that loading mechanization will be practically achieved in ten years, and mechanical cleaning in perhaps twice that time. Then will enter a period of machinery improvement, replacement, and refinement which will supplant the present period in which machinery has been pushing forward into new locations and tackling new jobs.

Requiescat in pace

WITH most of the operators who were invited to consider the advisability of a conference with officials of the United Mine Workers definitely opposed to such a plan, Secretary of Labor Doak on Aug. 31 informed John L. Lewis that it did not appear that a call to discuss the labor leader's "plan for stabilization of the industry would have any result." Unless the President himself should intervene—and most Washington observers believe such intervention extremely unlikely—the attempt of the union to use the federal government as an agency to force unwilling employers to deal with Indianapolis comes to an unmourned end. The way is still open for operators who so desire to enter or resume union relationships through direct negotiations, but the immediate shadow of political intervention, which in the past has brought only grief in its wake, grows fainter. A political maneuver has failed, and the failure brightens the prospects for an economic working out of the problems of the bituminous coal industry.

NOTES

. . . from Across the Sea

EMPHASIS has been laid by the British Safety in Mines Research Board (Paper No. 69) on the danger that accompanies coal crevices which intersect or even approach a shothole. The atmospheres in such crevices may be explosive. With such broken coal the explosives may be practically unstemmed and the cartridges may be surrounded by an explosive mixture which may communicate with the atmosphere in the undercut, which in turn may itself be explosive. The cut will have some coal dust in it, and, as only a little suffices to carry an explosion, enough is sure to be present to extend trouble. So there are real dangers in a hole that traverses a long crevice.

Because one may look for such crevices in beds that have been undermined by earlier workings in other seams, the danger in Great Britain or in the anthracite region of this country is undoubtedly great and only less great in our bituminous mines. Reference to most of these dangers is not to be found embodied in the report of the Research Board, but a statement which follows suggests a precaution is taken in Great Britain that is almost if not wholly unknown in the United States.

Foremen, says the report, should insist on the importance of examining a shothole for breaks in the walls of the hole. As the shotfirer makes his examination under difficulty, having to depend on the indications of the scraper with which he examines the hole, miners who in drilling the hole have learned the features of the surrounding coal or rock should warn the shotfirer against such crevices. Their presence is often more readily ascertained when drilling than when testing later with a scraper, because they may have filled with rock dust or coal dust in the process of drilling. Breaks are dangerous, say the authors of the monograph, H. E. Grimshaw and W. Payman, even when they do not cross the shothole but are in close proximity to it, because they constitute a confined space which usually contains firedamp. It has been shown in the course of the experiments of the Board that the smallest charges used in practice of any "permitted explosive" may cause ignition of a methane-air mixture contained in such a confined space and a small rock separation only causes a limited increase in safety.

The Board also recommends that material that can be brought down by a pick or bar should not be blown down by explosives, which sounds good advice except as regards the pick. This should not be used for taking down roof rock. The authors of the report give as a reason that the line of weakness may result in the shothole being opened up before the process of detonation is complete, so that the atmosphere outside which may contain firedamp, already present, or liberated by the shot, may come in contact with the explosive which is still detonating. The bulletin just quoted is known as "The Ignition of Firedamp by Coal-Mining Explosives: I—Gallery Experiments" (price 50c.).

A report has just been made by E. H. Frazer, His Majesty's divisional inspector of mines in Great Britain, on an explosion at the Houghton Main Colliery, Yorkshire, England, Dec. 12, 1930, where seventeen men were burned by flames, seven of whom subsequently died from their injuries. The explosion was due to the presence of a crevice into which the shothole entered or almost entered. The report suggests that the rock ripper, who drilled and shot his own holes, and was duly qualified as a deputy for that work, knew that the drill had struck the crevice, and put in clay to prevent the shot from firing back in that direction. The deputy said the hole he drilled was 2 ft. 6 in. long, but Mr. Frazer thinks it was at least 3 ft. 10 in. long and perhaps 5 ft.

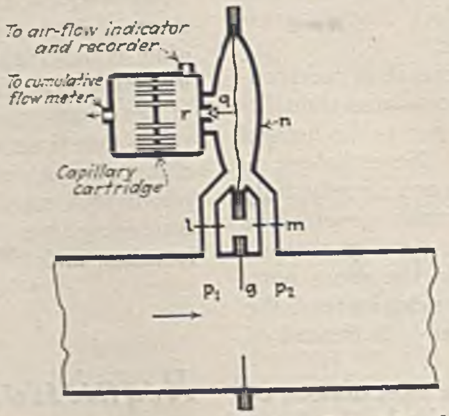


Fig. 1—Cross-Section Showing Principle of Air Measurement

Some time after the accident, someone found the clay in what remained of the end of the hole after the shot was fired. At the inquest it was testified that the deputy had asked if there was plenty of clay left and pushed some of it into the hole before inserting the charge. Under the law, the ripper had no right to load the hole and fire the shot if he was aware that the hole crossed or reached a crevice. Clause 6 (d) of the Explosives in Coal Mines Order requires that a shotfirer shall examine every shothole for breaks running along and across the hole, but does not specify how he shall make the examination.

Hitherto, a scraper has been considered an indispensable tool for such examinations, but it has been said frequently that an ordinary scraper is of little use for detecting breaks that run along the hole and that one end of a scraper should be spoon-shaped and the other end should have a chisel edge running lengthwise the tool. Both ends should be used in the exploration of the hole, says Mr. Frazer.

Major H. J. Humphrys, senior inspector, who is in the staff of Mr. Frazer, with the assistance of the manager of Cadeby Main Colliery, placed a handful of rock dust in a shothole and applied compressed air. He found the dust was blown out of breaks which were so small that they had not been observed when carefully examining the hole with the aid of a scraper. The coroner's jury declared that by applying suction or compression to a hole it might be possible to tell by a gage whether the hole was tight.

All this pother was started by a 3-oz. or 4-oz. shot of a "permitted" explosive. The deputy said he used so small a shot because the hole was only 2 ft. 6 in. long and needed only a light charge. It was only a ripping shot, of course. The small size of the charge chosen was ascribed by Mr. Frazer to the fact that the rock was already well loosened. Apparently it would have been better if the deputy had brought it down with a bar. One of the worst German explosions was caused, it is believed, by a small shot in a short shothole.

Nowhere are the losses around a coal mine larger, perhaps, than in connection with the use of compressed air. In Germany, where this form of energy is used far more generally than in this country, the German Council of Coal Mines held a prize contest to determine the best means of measuring the flow of compressed air. That there were 31 entries is evidence of the interest that was shown in the development of such equipment for coal mines; yet in the United States, the practice of measuring the input of compressed air does not seem thus far to have any part in the management of mines.

It appears that the problem is not simple, for, with an ordinary flow meter, a volume of 35 cu.ft. per min. will give the same reading at a static pressure of 40 lb. per sq.in. as a volume of 70 cu.ft. at a static pressure of 80 lb. per sq.in. The data obtained from flow-meter readings, consequently, had to be corrected, with all the chances of error which such calculation introduced. The award of the Council was given to the Askania apparatus, one that was destined later to be introduced into the United States for the measurement of natural gas.

The principle of this measuring instrument is shown in Fig. 1. It is that of the Venturi Meter. Into the pipe in which the air is flowing is introduced a special joint with an orifice plate or ring, which causes the pressure on either side of it to be different. The intake pressure may be termed p_1 and the other pressure p_2. Two small pipes, l and m respectively, introduce the air from both sides of the orifice plate, g.

These pipes, each of which is equipped with an orifice plate, lead to a chamber, n, in which is a diaphragm, o, and the movement of the diaphragm o causes a needle valve, q, to recede from or approach the orifice r with every change in relative pressure. The orifice plates in l and m are to prevent either of these passing so much air that a sudden increase of pressure would overload one side of the diaphragm, injure it or the needle valve. The bypassed flow passing through the orifice plate l and through the needle valve q is measured and the quantity passing in the main pipe can be ascertained merely by multiplying the indication by the orifice-plate factor.

By reason of the escape of air through the orifice r the static pressure

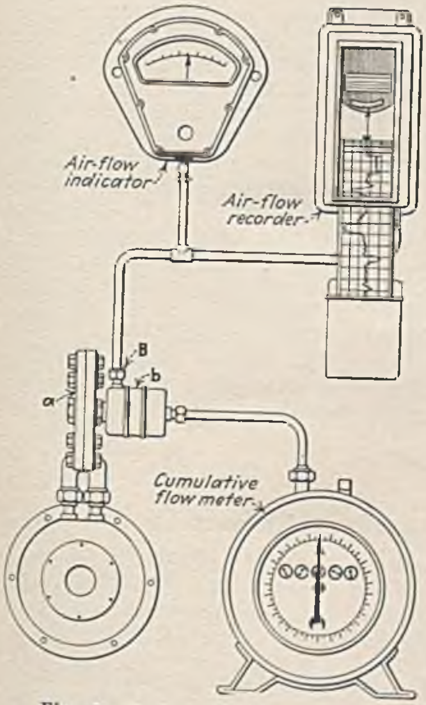


Fig. 2—Stationary Air-Measuring Installation

on either side of the diaphragm is the same and the temperatures are the same. Consequently the constants that apply are equal. The flow meter, therefore, is independent of pressure. A cumulative indication of air volume can be measured (Fig. 2); the momentary flow can be determined by the load indicator; and the quantity of air passing at any given moment can continuously be recorded on the graph. Any or all of these instruments can be used, if desired. Meters of this type are being installed in the United States by the American Askania Corporation for the measurement of natural gas.

What wastes there are in drilling equipment out of condition has apparently never been determined in the United States. The efficiency of compressing machinery is rarely known. Whether any given compressing machine is delivering its due quantity of air is always a matter of doubt. Some kind of equipment should be available to satisfy all these questions. Yes, and it might be highly illuminating to many mine managers if they could tell in dollars and cents the loss arising from the cracking of a valve to assist in ventilation. Valves are often "cracked" when men leave the mines at night and are still blowing air when the men return in the morning.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Silicosis, Records of the International Conference Held at Johannesburg, Aug. 13-27, 1930. Studies and Reports, Series F (Industrial Hygiene), No. 13. World Peace Foundation, Boston, Mass. 692 pp., 6¼x9½ in.; paper. Price $4.

At this comprehensive conference on the causes and nature of silicosis, the United States delegates were few in number, only two being present, and their contributions are somewhat scanty. But these delegates apparently had more to say than all the others about silicosis from coal mining. It is interesting to note that the rock dust of anthracite mines has a free-silica content of 31 per cent and that of bituminous coal mines one of 54 per cent. These figures, of course, are not reliable averages but are given by the author of the paper without further explanation. Granite contains 35.2 per cent of free silica, a little more than half the silica being free.

Evidently the rock dust in coal measures may be, and often is, of an extremely dangerous character. Dr. Albert E. Russell, U. S. Health Service, who makes the report says:

"Anthracite miners develop acute bronchitis and later emphysema and miners' asthma. These chronic conditions, together with the effect of some rock dust, make it very difficult, even for those who specialize in that subject, to diagnose pulmonary tuberculosis. Obviously, the disease is easily overlooked among coal miners, but routine sputum analysis will often give information as to whether a tuberculous infection is present. Dust counts made in anthracite mines studied by the Public Health Service showed that the dustiness encountered by workers in the various occupations averaged as follows:

Dust Particles in Anthracite Mines

Occupations	Million Particles Per Cu.Ft.
Miners and mine laborers..	124.2
Rock workers	81.9
Drivers and runners.......	36.5
Others	2.3

"Petrographic analysis showed that a sample of coal dust from an anthracite mine contained 1.5 per cent of crystalline silica as quartz. The incidence of tuberculosis among coal miners has been a much debated subject; we found among those included in our study some who had tuberculosis. In considering the causes of death at Wilkes Barre, Pa., from 1906 to 1926, deaths from all external causes being excluded, also data of epidemic years, it was found that the cause of 11.4 per cent of the deaths of coal miners was given as tuberculosis, while 6.5 per cent of the deaths of other adult males in the same area was stated to be due to this disease."

In bituminous mines, says Dr. Russell, "coal-loading machines are being introduced; their use lessens the quantity of dust." The dust count in the air breathed by bituminous operatives is as follows:

Dust Particles in Bituminous Mines

Occupations	Million Particles Per Cu.Ft.
Coal cutter	112.3
Coal loaders	112.3
Rock driller	78.1

The dust count for anthracite and bituminous rock drillers is high, for hand pneumatic-tool operatives working on granite are exposed to an atmosphere the dust count of which is only 59.8 million particles per cubic foot.

Dr. Russell says the pneumonoconiosis and miners' asthma of bituminous coal miners differ from those of anthracite miners and that the diseases are not so severe. Tuberculosis also has a lesser incidence on bituminous miners. The silica hazard in mines is augmented by the use of sand on tracks; the sand becomes pulverized and the motion of the trains fans it into the air. In many of these mines (especially the smaller ones) ventilation is accomplished through the same tunnel as transportation, thus increasing the silica hazard by the diffusion of this dust. Conditions could be alleviated by using some other material than sand to increase the friction of the car wheels on the track. Motormen on coal trips develop silicosis.

In the conference, primary place was given to the Witwatersrand (South Africa) representatives because of their unfortunate extensive experience. These authorities explored the etiology, clinical pathology, radiology, and symtomatology of the disease and were followed by representatives from Australia, Belgium, Canada, Germany, Great Britain, the Netherlands, and the United States.

R. DAWSON HALL.

THE BOSSES TALK IT OVER

OPERATING SUGGESTIONS—

How Much Should Be Paid for Them?

"Strange, isn't it, that our men don't come across with more operating ideas and suggestions," reflected Jim to his foreman, as they stopped on their way to the lamphouse, while he opened the suggestion box. "I know that ideas come to them, but they just don't seem to bother about letting us have them."

"That's not at all strange, Jim," replied Mac. "The trouble is we give them too little compensation for their help. What's a paltry dollar or two for an idea that may save us hundreds, or even thousands, of dollars in a year's time. That's the way they figure, and you can't blame them."

"It seems to me they should give us their ideas through sense of loyalty and cooperation if nothing else."

"Bunk!" exclaimed the foreman, somewhat irritated. "It's all right for us to talk that way because we stand to go up the ladder whenever we offer workable ideas. But the services of the poor devil in the ranks aren't so willingly recognized."

"You mean we should pay them more for their ideas?"

"Absolutely, Jim. They should be paid a sliding rate according to the merit of their ideas—up to, maybe, $100 or even $200."

WHAT DO YOU THINK?

1. On what basis do you conduct your suggestion box?

2. How do you decide the compensation?

3. Does a sliding scale of payment cause jealousies and how do you avoid misunderstanding?

All superintendents, foremen, electrical and mechanical men are urged to discuss the questions on page 492. Acceptable letters will be paid for ►►►►

Should foremen keep notebooks on the job? In August Jim chided Mac on the laxity of his men in this matter. What the readers think is told in the letters following.

It Is Indispensable

To me a notebook is indispensable. As a matter of fact I keep two at all times; one I carry in my pocket while on the job and the other I leave in my desk. In the one carried I record those details in need of immediate attention, such as the finding of dirty haulways, loose bonds, insecure roof, supplies needed, and brattices or doors requiring attention.

In the second notebook I record formulas, tables, costs of constructing such structures as seals or overcasts, of grading, brushing and maintaining haulageways. In it also I keep tonnage figures, production costs, accidents, their cause, and ways to prevent them. Last but not least are the ideas gotten from practical experience or from books and technical papers.

Keeping of notes does not interfere with my duties, as I do most of this at night. Certainly it helps me to be more efficient, since it gives me the information I need when I need it. A mine foreman might just as well try to get along without a timebook as without a notebook. ROBERT RIVES.

Drakesboro, Ky.

The Official and His Notebook

During the years I have acted in an official capacity at the mines the keeping of a notebook has been of inestimable value to me. It is well nigh impossible to work with any degree of efficiency without this aid, so many are the details that come up in the daily routine of the average official. The breadth of his duties is beyond the powers of memory.

In the course of the day's inspection there are many things which one sees to be out of line. Perhaps many of these are corrected at the time of the inspection. Others, however, must wait until the assistant foreman can lend his aid. Therefore, the matters that need attention should be entered in the book, taken up with the foreman of the section, and on the next visit checked. If for no other reason than this, the notebook serves a distinct end. And, further, the use of it by the foreman will tend to step up the efficiency of his assistants, who will know that their boss keeps a record of his instructions.

From the time that all new jobs are started, until finished, the costs should be kept by notes for future reference in planning other jobs. A record should be made of any specific instructions given in matters of safety. Then, in case of accident, evidence can be furnished that at least one man obeyed the law.

It must be realized, of course, that the mere jotting down of notes is not the entire answer. At the close of the day the official should go over his book and give serious thought to current items. This gives him an opportunity to analyze each problem, quietly and undisturbed by other demands upon his time. In no other way than by keeping a notebook can an official systematize his work and connect each day's work; only in this way can he follow real methods in his business transactions.

Kingston, Pa. A. WILLIAMS.

The Notebook a Living Thing

If it is not neglected a notebook is a valuable piece of property for any foreman to have. It should be an indexed loose-leaf affair to fit the pocket. What the notes should consist of is a matter for the judgment of the one who is keeping them.

There are many standing orders and instructions, and laws and rules, in addition to a large quantity of live data gleaned from the pages of the technical press that one will be glad to have in the every-day pocket notebook. It will surprise many who have never formed the habit of jotting down notes how valuable the little book becomes.

A page or two a week generally makes the growth of it. Frequent recompilation of the notes, at home, keeps the book alive and useful. Transfer the loose-leaf pages to another file or book as they become obsolete or not needed every day.

CHARLES H. WILLEY.

Penacook, N. H.

No Time for Books on the Job

Jim's idea of a notebook to be kept by the foreman, in which he must enter important data, is good and will pay in some cases. But the foreman doesn't have as much time for taking notes and referring to them as the super does. Jim has only to look after three or four men, while Mac sometimes has three or four hundred to deal with. If Mac keeps his official records, such as air measurements, daily reports on safety conditions, and the condition of the mines in good shape as required by law, and his map posted as to advance workings and pillar sections, he has plenty work to do.

I keep a file of all information on costs and materials, accounts of methods sent out by manufacturers or appearing in magazines; and when I have a difficult problem I refer to that.

A good library on mining is a big help to any foreman, but to be successful a man must keep most of his notes in his head and be ready to use them in a moment. He has no time at the mines for a pile of books.

Glo, Ky. WALTER HORNSBY.

Notes Save Steps

Just as a budgeting system is vitally necessary in business economics, so the foreman's notebook is equally important. Even subordinate officers will find the practice of recording the need of replenishing supplies and reinforcing or changing the existing order of things much more businesslike than the usual haphazard function or custom of relying upon memory alone.

Take the case of a room boss. Let's say he is responsible for the capacity of ten conveyor-loading machines, with forty loaders and a half dozen or so maintenance men, comprising haulage, timbering, and trackwork. The enterprising room boss makes all his conveyors first thing in the morning. As he visits each working conveyor he will note the quantity of coal available for loading. His notebook entries will read something like this: Conveyor No. 1, 12 cars; No. 2, 7 cars, etc. A glance at his notebook any time during the day, checked against the number of gathering trips already registered at the parting, can save many weary steps and offset the possibility of delay to the loaders, whose conveyor can be transferred as expeditiously as possible.

The conveyors, in this particular connection, almost invariably require moving one or more times a day, in accordance with the varying height of the coal and the width of the working place. A delayed or neglected move may mean a lost car, for the haulage usually is scheduled to gather so many trips in the day's run.

With the haulage functioning smoothly, the room boss makes a thorough examination of each room, usually alone. He looks the timber supply over and notes whether, should a further supply be needed, the height remains uniform, as the success in securing roof supports of the exact length effects a saving in this part of his labor costs that can be concentrated with advantage elsewhere. On a separate page in his notebook a record is made of the immediate needs of each room as to roof supports, and the need, if any, of more substantial reinforcement, such as crossbars, cribs, etc.

It may be that the room or entry is deep enough to necessitate another breakthrough. He tacks a 6-penny nail into a tie opposite the inby rib of the last breakthrough and hooks the loop of his tape over it and checks the distance. If he's of the old school which still adheres to the belief that the world is flat, he will make a mental observation that this place has three more cuts and let it go at that till the next day, when he begins to wonder if this was the place, goes over the same process, to the joy of his bootmaker and the detriment of his feet. The wise room boss, however, reaches for his notebook, and if the distance shows the necessity of another crosscut turning, he marks the outby rib for a breakthrough and makes an entry in his notebook.

Coal companies usually supply a notebook to every boss whenever needed. That isn't enough. A system should be maintained and each boss taught to carry out its terms during the working hours. It will eliminate errors through forgetfulness and hasten the day when we can bring coal mining into the category of Dr. Eliot's "durable satisfactions."

Perhaps the super or mine manager, too, mighty sharpen his pencil—an indelible one at that—and anticipate his immediate needs for his own mental peace. ALEXANDER BENNETT.

Panama, Ill.

Information Sources

Few indeed of the readers who have contributed letters to this department in this issue dissent from the opinion that the accurate keeping of job notes by foremen is a good thing. Most of the contributors recognize in this practice the one sure and definite means available to every foreman of organizing his job and controlling the work under him. There consequently remains only the problem of discerning values between what should or should not be comprised in the notes. Perhaps it might be well to list in a work of that kind rules of conduct and policies governing best mine foremanship. If that procedure is as worth while as it appears to be, then notes gathered from these pages should be given a place of preference in the individual's guide to better foremanship. Incidentally, readers are urged to contribute to these pages. Send in your letters today.

Notebooks Made a Big Man

Writing of a big mining man who has worked his way from the bottom up, and who is too modest to say anything about his methods of management, I'd like to remark that he has had enough engineering experience to appreciate the value of systematic note-keeping. Like the good engineer, he leaves nothing worth talking about to memory, knowing that a note made leaves more lasting impression on the mind.

When he was the foreman of a big mine, he made notes all day long. These he handed to his clerk, who promptly worked them up. The result was that his foremen and others got a letter almost every day covering some phase of their duties.

Every foreman and straw boss had been assigned a mail box in the outer office, where they appeared for conferences each night and morning. The big boss and his assistants were sure to pull out a notebook and pencil from their pocket when conversing with anyone or upon meeting an adverse condition at the plant.

Notes came under three headings: TODAY; TOMORROW; and FUTURE. These notes covered every phase of mining costs, conditions, bad practices, immediate and future needs of the mine and the men. With orders, sketches were frequently given, picturing to the man just what was to be done.

I'm glad to know that Jim and Mac have a system of note-keeping and that they appreciate the need of a better system. This sounds like business, and surely mining is a business proposition.

G. E. DAUGHERTY.

Paintsville, Ky.

Recent Patents

Mining Machine; 1,803,547. J. E. Dillon, Masontown, Pa. May 5, 1931.

Incandescent Gas-Light Miners' Lamps; 1,803,756. Walter Gosmann, Dortmund, Germany. May 5, 1931.

Processing of Coal; 1,805,109. Walter Runge, East Orange, N. J., and E. A. Packard, Yonkers, N. Y., assignors to International Coal Carbonization Co., New York City. May 12, 1931.

Blasting Cartridge; 1,805,541. Dent Ferrell and Arthur W. Helmholtz, Harrisburg, Ill., assignors to Safety Mining Co., Harrisburg, Ill. May 19, 1931.

Transfer Means for Mine Cars; 1,805,910. E. M. Hawkins, Glezen, Ind. May 19, 1931.

Coal-Loading Machine; 1,805,951. C. C. Miller, Jr., Gillespie, Ill. May 19, 1931.

Device for Changing Over Points in Mine Tracks from Traveling Vehicle; 1,806,129. Gustav Strunk, Essen-Ruhr, Germany. May 19, 1931.

Coal-Washer Box; 1,806,493. Bertram Norton, Claverley, England, assignor to Nortons, Ltd., Tipton, England. May 19, 1931.

Mine-Ventilating Apparatus; 1,806,760. Louis Kessler, Chicago. May 26, 1931.

Dust-Collecting System for Coal Cleaners; 1,806,780. Ray W. Arms, Chicago, assignor to Roberts & Schaefer Co., Chicago. May 26, 1931.

Miner's Lamp; 1,806,868. Paul Wolf, Zwickau, Germany. May 26, 1931.

Blasting Cartridge; 1,807,144. F. H. Armstrong, Chicago, assignor to Safety Mining Co., Chicago. May 26, 1931.

Process for Treating Coal; 1,807,817. C. P. Anderson, Scarbro, W. Va. June 2, 1931.

Flotation; 1,807,823. L. E. Booth, Salt Lake City, Utah, assignor to General Engineering Co., Salt Lake City, Utah. June 2, 1931.

Charging Mechanism for Blasting Cartridges; Frank H. Kneeland, Chicago, assignor to Safety Mining Co., Chicago. June 2, 1931.

Mine Car; 1,808,119. John Ruffing, Sr., Nokomis, Ill. June 2, 1931.

Mining Cartridge; 1,808,162. S. G. Frantz, Princeton, N. J. June 2, 1931.

Mine Locomotive; 1,808,277. C. O. Wood, Chicago, assignor to Goodman Mfg. Co., Chicago. June 2, 1931.

Mining Machine; 1,808,649. R. M. Fleming, Colver, Pa., assignor to Ebensburg Coal Co., Colver, Pa. June 2, 1931.

Briquetting Fuel Material; 1,809,245. Arthur D. Little, Brookline, Mass., assignor to Arthur D. Little, Inc., Cambridge, Mass. June 9, 1931.

Trade Literature

Shovels. Bucyrus-Erie Co., South Milwaukee, Wis.—37-B, 1¼-1½-yd., for gasoline, diesel, or electric power. Bulletin FBE-371; 24 pp., illustrated. Describes the different forms of conversion of this machine from one use to another—shovel, dragline, clamshell, or lifting crane.

Pyrometers. Brown Instrument Co., Philadelphia, Pa., has issued catalog No. 1101, 48 pp., illustrating and describing its potentiometer pyrometers.

Electrical Equipment. Steel tank mercury-arc rectifiers for converting alternating to direct current over wide ranges of voltage and current are illustrated and described in Circular 1907, 16 pp., published by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Coal-Mine Equipment. Duncan Foundry & Machine Works, Inc., Alton, Ill.—12-pp. bulletin illustrates and describes its pit-car loaders, mine cars, car wheels, chain-grate stokers, and portable elevator.

Brushes. Boxill-Bruel Carbon Co., Columbia Park, Ohio—Catalog No. 12, 42 pp., illustrated, gives complete information on its standard and special brushes for motors, generators, and rotary converters.

Pumps. Centrifugal pumps are covered in illustrated Bulletin No. 160-B10, issued by the Hayton Pump & Blower Division of International-Stacey Corporation, Connersville, Ind. The open impeller type multi-stage pump is featured.

Instruments. Warren-Knight Co., Philadelphia, Pa.—64-pp. bulletin illustrated and describes its Sterling transits and levels.

Pumps. Clogless Pumps is the title of a 15-pp. illustrated catalog, B-1, issued by De Laval Steam Turbine Co., Trenton, N. J.

Electrical Equipment. Electric Controller & Mfg. Co., Cleveland, Ohio, has issued the following illustrated bulletins: Type ZHS 2300-Volt Magnetic Contactors for A.C. Motors, Non-Reversing and Reversing; Bulletin 1062. EC&M Separator Magnets for Removal of Tramp Iron; Bulletin 910. 110-550 Volt Automatic Compensators for A.C. Squirrel-Cage and Synchronous Motors; Bulletin 1042-G.

Coal Cutter. Catalog 2a, 44 pp., illustrated, issued by Mavor & Coulson, Ltd., Glasgow, Scotland, covers the Samson coal cutter as a shortwall and as an arcwall machine. Other coal-mining machinery also is included.

Electrical Equipment. Bulletin No. 209, 32 pp., illustrated, issued by Reliance Electric & Engineering Co., Cleveland, Ohio, describes Type T Heavy-Duty Reliance Motors for Direct Current.

Elevating and Conveying Machinery. Freeman-Riff Co., Terre Haute, Ind.—Pp. 17, illustrated.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

•

Dispatcher's Information Is Utilized In Daily Time Keeping

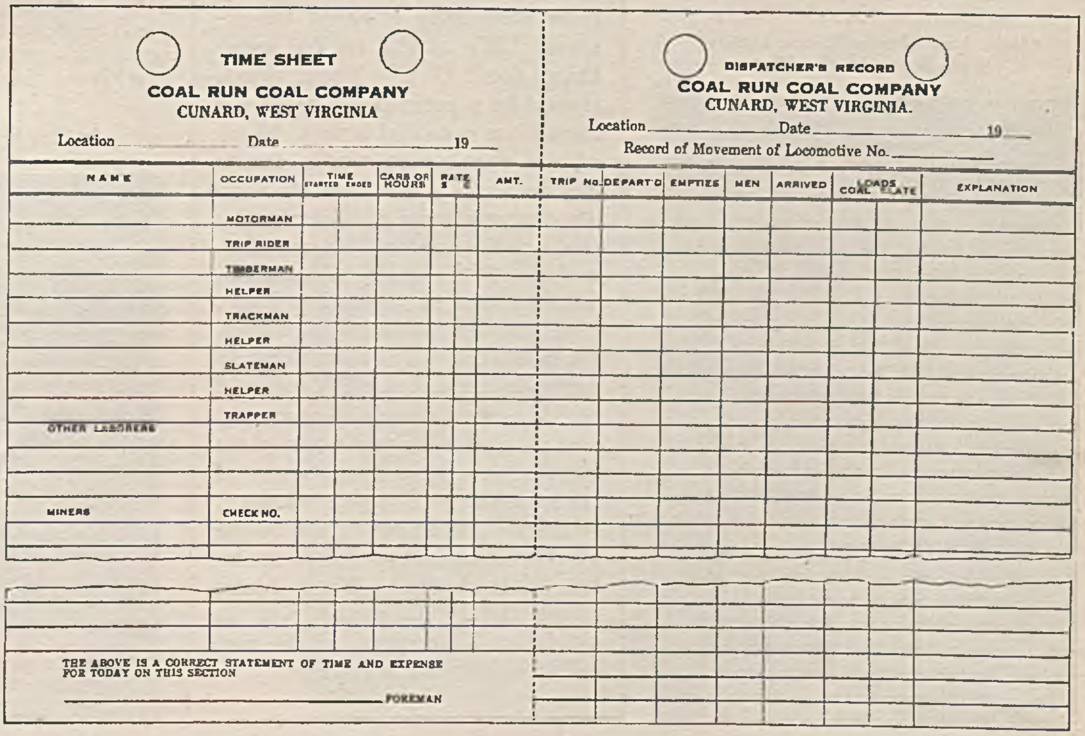
FEW, if any, phases of inside work can be carried on with creditable efficiency unless the other phases are put on the same plane. A check-up covering the use of power in the Cunard (W. Va.) mine of the Coal Run Coal Co. indicated the need of a car dispatching system, which was installed and now is credited with being the principal factor in increasing the unit production of inside equipment 30 per cent. By a unique combination of the dispatcher's record and a time sheet a great improvement was effected in the method of time keeping of day men.

C. L. Garvin, superintendent of the mine, gives credit to J. O. Cree, electrical engineer, West Virginia Engineering Co., for the suggestion that resulted in the general raise of efficiency. After making an inspection of the mine, Mr. Cree reported a number of abuses of power with haulage equipment and suggested the inauguration of a dispatching system as a means of definitely limiting the number of cars per trip for each locomotive. As a result, mine production was increased from 1,000 tons per day to 1,300 tons with practically no change in the amount of equipment in use.

The dispatcher is located inside the mine, approximately a mile from the drift mouth, and at a point outby most of the active territory. The form of combination time and dispatcher's sheet which he uses is shown in the accompanying illustration. Eleven of these sheets are employed each day. Those include one for the three main haulage locomotives, one for each section of the mine, and one for the tipple and other outside labor. The eleven active sheets are kept in labeled pigeon holes in front of the dispatcher so that he can conveniently pull them out on the desk for posting.

Sheets are furnished each day from the mine office to the dispatcher with the names and check numbers of the regular force already typed in the proper columns. By inquiring of the various motormen, the dispatcher calls the roll and indicates whether a man is working or absent by a suitable check mark opposite his name.

At the end of the day each sheet is



TIME SHEET
COAL RUN COAL COMPANY
CUNARD, WEST VIRGINIA
Location ______ Date ______ 19__

DISPATCHER'S RECORD
COAL RUN COAL COMPANY
CUNARD, WEST VIRGINIA.
Location ______ Date ______ 19__
Record of Movement of Locomotive No. ______

NAME	OCCUPATION	TIME STARTED	TIME ENDED	CARS OR HOURS	RATE $	RATE ¢	AMT.	TRIP No.	DEPART'D	EMPTIES	MEN	ARRIVED	LOADS COAL	LOADS SLATE	EXPLANATION
	MOTORMAN														
	TRIP RIDER														
	TIMBERMAN														
	HELPER														
	TRACKMAN														
	HELPER														
	SLATEMAN														
	HELPER														
	TRAPPER														
OTHER LABORERS															
MINERS	CHECK NO.														

THE ABOVE IS A CORRECT STATEMENT OF TIME AND EXPENSE FOR TODAY ON THIS SECTION
______ FOREMAN

Combination Time Sheet and Dispatcher's Record checked by the mine foreman and by the respective section boss. The left-hand part, or time sheet section, is then torn off and these sheets are delivered to the mine office, where they are filed and then constitute the time books. Carbon copies of the whole sheet are kept by the dispatcher.

The system has eliminated practically all of the difficulties which were encountered with the old method of supplying each foreman or boss with a time book and depending entirely on each boss to keep proper check of the time worked by his men. Nearly every pay day one or more men would complain of being short. Now such complaints are rare.

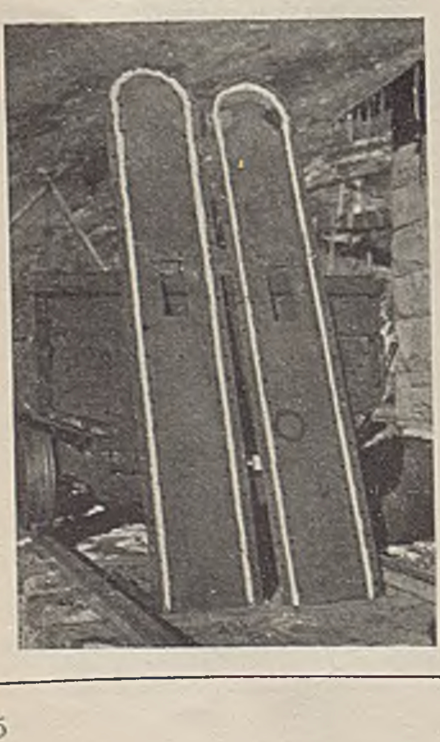
In so far as the original purpose of the dispatching system is concerned, it served its purpose well. Many abuses of power and of haulage equipment were eliminated with a resulting per-ton saving in demand, energy consumption, and locomotive maintenance.

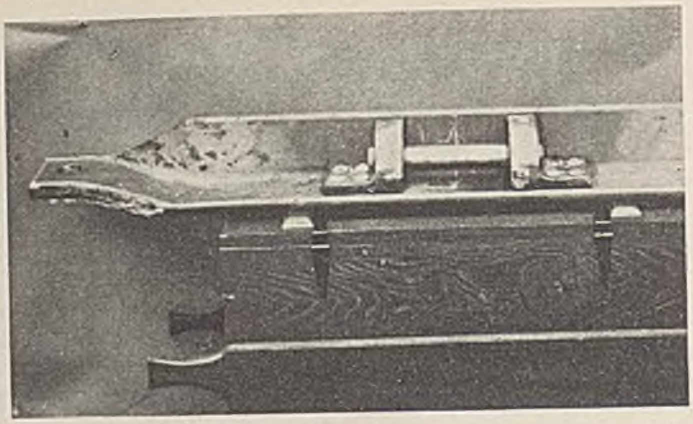
The mine is in 4-ft. Sewell coal and is worked by undercutting and hand loading. With the exception of one battery locomotive, the gathering equipment consists of locomotives of the cable reel type.

Cutter-Bar Plates Reconditioned By Welding

In time, cutting machine chains wear grooves in the cutter-bar guide plates, and periodically this trouble must be corrected either by replacement or by some other remedy. The most practicable suggestion is the welding method. In the May issue of *Oxy-Acetylene Tips* is described the welding method for this job used by one of the bituminous mines in the repair of three pairs of the guides from a $7\frac{1}{2}$-ft. arcwall machine. The grooves were filled in and built up with bronze welding rod, which is said to increase the wearing resistance of the guides. The broken guide ends were welded back in place with Oxweld No. 1 high test rod.

Chalk Line Shows Where Groove Was Worn in the Plate





Showing One End and the Center of the Improved Suspension Bar

Improving the Weak Points Cuts Maintenance

Only by constantly improving weak points of equipment can maintenance cost be cut below that made possible by giving the equipment the maximum advantage possible by careful operation and inspection. An example of such improvement to design of a 10-ton locomotive is shown in the accompanying illustration from the Jenkins (Ky.) shop of the Consolidation Coal Co.

The motor suspension bars of the original locomotives soon wore too thin at the ends and the suspension pin lugs also wore rather quickly. Replacement bars made at the shop have lugs that are $1\frac{1}{2}$ in. thick instead of $\frac{1}{2}$-in., and the ends of the $\frac{1}{2}$-in. bar material are thickened to 1 in. by welding on short lengths of plate. Increased thickness and larger bearing surfaces add more than 100 per cent to the former life.

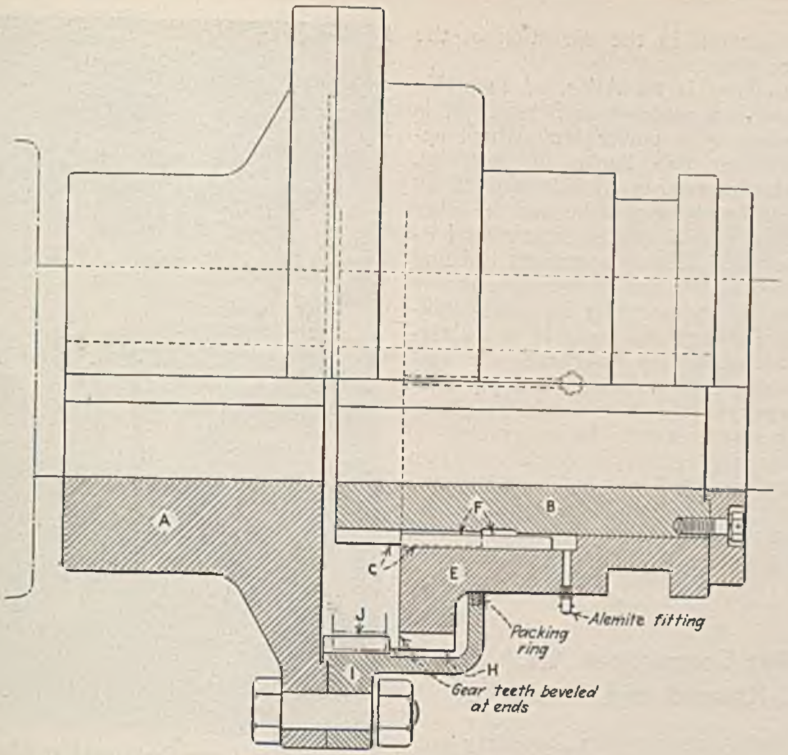
Operating References

How frequently is heard the remark, "We ought to do something about this." Those words should be a peremptory order for immediate remedial action. Many of the changes in works details can be made simultaneously with the determination of necessity, by the application of known formulas, data, and information. These pages of operating ideas, covering all types of problems, are in the category of immediately useful information. They should be filed away, month after month, and used as reference when plant problems arise. Your sense of cooperation, if acknowledged, will lead you to contribute to the further compilation of this operating knowledge. Your ideas, appropriately illustrated, will be paid for, if accepted, at the rate of $5 or more for each.

Sliding Gear Clutch Is Better Than Jaw Type for Fan

Plain jaw clutches originally installed on No. 1 mine fan at Nemacolin gave trouble. The fan has a motor on each side, one for regular operation and the other for a spare, which meant that power was being transmitted through one of the two clutches all of the time. Wear on the jaw clutches caused misalignment strains on the shaft and bearings, so a search was made for a positive mechanical coupling that could be engaged or disengaged

Clutch in Use on No. 2 Fan



Showing the Arrangement of Parts on the Clutch Mechanism

without stopping the fan and which would suffer practically no wear in continuous operation.

None could be found, so the master mechanic had one built according to a general design which he proposed. This is shown in accompanying drawing. Part *A* is keyed to the fan shaft and part *B* is keyed to the pulley shaft. To engage the clutch, sleeve *E* is moved to the left, causing the external teeth *E* to mesh with the internal teeth *J*. The engaging ends of these teeth are beveled like the teeth in an automobile transmission, so that the clutch can be engaged easily if the two parts are brought to about the same speed. Sleeve *E* is driven by part *B* through the external and internal teeth *C* and *F* which slide on each other but do not disengage.

The first of these new-type clutches, designed to transmit 400 hp. at 158 r.p.m., was installed on No. 1 fan in November, 1929, and so far has given perfect satisfaction. Since that date the other side of this fan also was equipped, and a second fan using two of the clutches was installed.

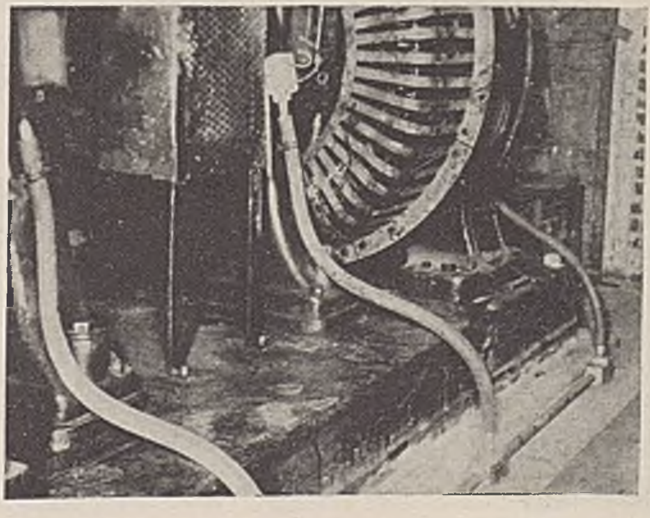
The halftone shows one of the clutches on No. 2 fan. It is on the fan shaft next to the bearing. On the other side of the fan is another clutch in a similar position. The clutch is operated by the handwheel at the left. A locking device, mounted on the side of the handwheel stand near the bottom, holds the movable clutch sleeve in a given position.

To shift the drive from one motor to the other, the fan need not be stopped. The substitute motor is started and its clutch gears are slipped in when the two parts come to the same speed. This can be judged by allowing the clutch gears to rub slightly and listening to the decreasing noise as the parts approach the same speed. These clutches were built by the Bartlett Hayward Co., Baltimore, Md.

Rubber Hose Used as Conduit On Stationary Machine

In the rewiring of a 150-kw. full-automatic motor-generator set recently moved from Mine 151 to a new location inside of Mine 153, the Consolidation Coal Co., Van Lear, Ky., used rubber hose in place of rigid iron conduit for certain control connections to the machine. The picture shows the use of the hose for the curved risers from the rigid conduit on the floor to the bearing thermostats. This installation was made with minimum labor, but gave adequate protection to the control wires. Three-braid $\frac{3}{4}$-in. rubber pneumatic tool hose was used.

Hose Used for Control Wire Risers



Jack Pipe Acts as Lock for Cutter Chain Clamp

Keeping mining-machine cutter chains locked except during actual cutting is now a relatively common safety practice, but there has been no standardization in

Fig. 1—Clamped, and Locked by Jack Pipe

the method. A type of locking device which was developed at the Leslie (W. Va.) mine of the Nelson Fuel Co., now part of the New River & Pocahontas Consolidated Coal Co., and which has been adopted by most of the mines of the latter company is shown in the accompanying illustrations.

Fig. 1 shows the lock in place near the end of the cutter bar of a shortwall machine. The ring of the center-bolt serves as a bracket for holding a jack pipe during tramming and, when in this position, the jack pipe acts to prevent

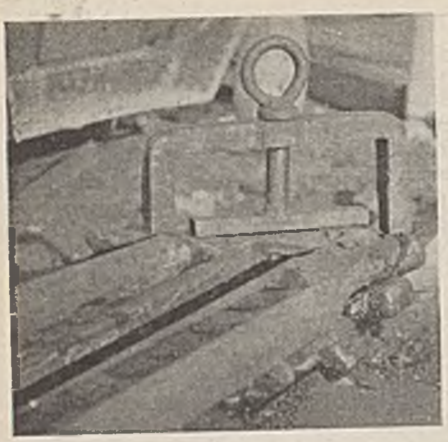


Fig. 2—Showing Construction of Clamp

the bolt from turning and unlocking. Fig. 2 shows the locking device standing disengaged on the end of the cutter bar. The inverted U consists of two pieces of steel each 1x1$\frac{1}{2}$ in. forged to shape and welded electrically. The crosspiece on the bottom of the center bolt is narrow enough to go down through the opening in the center of the cutter bar. After the lock is dropped into position, the bolt is given a quarter turn and the jack pipe put through the eye.

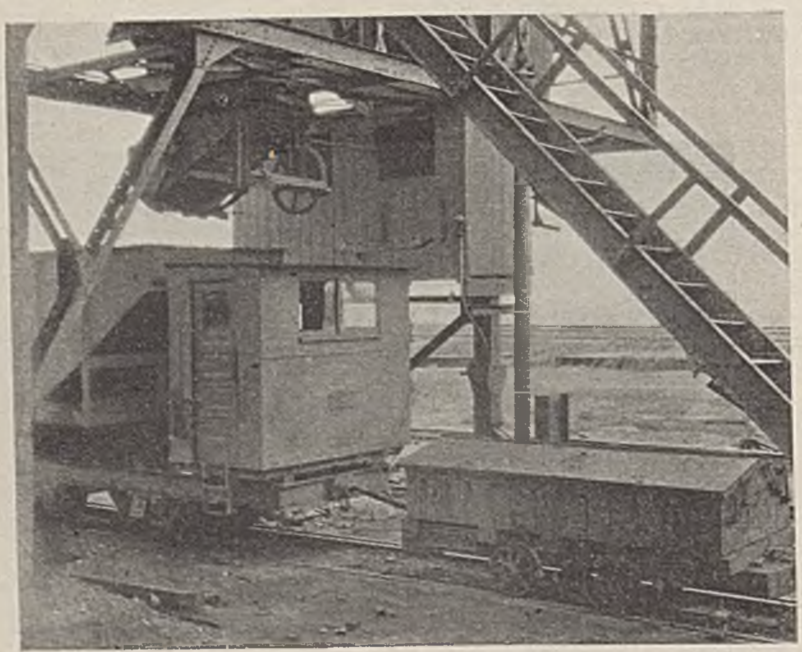
Rock Larry Is Propelled By Power Tank

In the Valier mine of the Valier Coal Co., operating in southern Illinois, another mine has been added to the list of those plants which utilize storage batteries for propelling rock larries from tipple to dump. The application in this case is of particular merit, inasmuch as it eliminates the last primary need for direct current in the operation of the surface plant.

The larry is an Atlas, of turntable type, with a capacity of 5 tons. It is energized by a power tank which accommodates two banks of batteries. One bank consists of 42 cells of 19 plates of one battery make, and the other of 42 cells of 23 plates of another battery make. This arrangement is being followed to test the comparative merits of the two makes under identical conditions. Though still capable of delivering a satisfactory discharge, the batteries used have passed the point of efficiency where they would stand up under severe service below ground.

Charging energy is conducted from the underground by a cable in the man shaft. Note in the illustration the energizing shoe above the cab of the larry, through which the batteries are charged.

Power Tank Eliminates Last Primary Need for Direct Current on the Surface

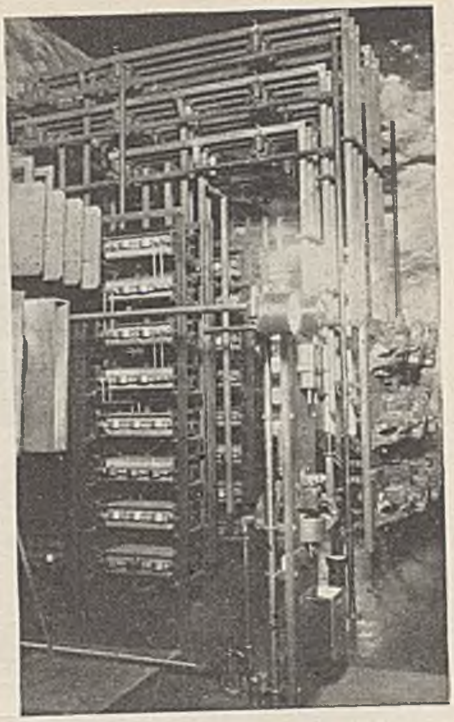


Bar Connections Are Neat, Rugged, and Accessible

Connections between secondary contactors and grid resistors on the hoist at Brier Hill mine of the Buckeye Coal Co. attract attention because of their unusual construction. Instead of cables with fireproof insulation, the connections are bare copper bars carried overhead so as to leave an aisle between the contactor panel and the resistance group.

The hoist motor rate is 2,300 volts 600 hp., and the secondary voltage is approximately 220. As indicated by the illustration, the copper bars, measuring $\frac{1}{4}$x2 in., cross at a height which leaves generous headroom in the aisle. At the extreme left can be seen the air-break 2,300-volt primary contactors.

Vertical risers are braced by clamps made from asbestos board, but most of the weight is carried by the porcelain insulators of the horizontal bars. All parts of every conductor are visible and accessible. The installation was made in 1924 when the mine was electrified and has operated without trouble since. Of course, first cost was greater than it would have been had cables been used.



Secondary Control of 600-Hp. Hoist

Copper Vs. Steel Bonds In Arcwelding

Three methods of bonding being available—mechanical, copper arcweld, and steel arcweld—a wide opportunity is offered for the selection of a method which best fits particular requirements. Preferences often are justified by circumstances, but each method is possessed of characteristics which may make it more desirable under certain conditions than either of the other two.

In the July issue of the *O-B Haulage Ways*, of the Ohio Brass Co., are discussed the points that should be considered in the application and use of the steel arcweld bond. Steel welds, because of their great strength, are not readily sheared by derailments. They require only a small welding area, a point which is important when the bonds are to be installed on worn or small-size rails.

Another advantage of this type of bond is that it requires low welding current value, approximately 125 amp. using a $\frac{5}{32}$-in. diameter welding rod, as against a minimum of 175 amp. needed with the copper arcweld bond. The practice of some bonding engineers is to use the steel bond at points where voltage conditions are not the best, and copper arcweld bonds elsewhere, except where gas conditions dictate the use of mechanically applied bonds.

It is necessary, in the application of

When Installed on the Base of a Rail, as at *A*, the Steel Arcweld Bond Should Be Held by Two Layers of Welding Metal. One Layer Would Result in a High Resistance Joint. Where the Bond Is Applied to the Ball of the Rail, as at *B*, Three Layers of Welding Metal Should Be Deposited

the steel bond, to make certain that sufficient welding rod is deposited around each terminal, as steel rod has a much higher resistance than copper. There is little or no difference in the installed costs of the copper arcweld bond and that of steel; the material cost of the copper type is higher, but the steel type requires more time for installation.

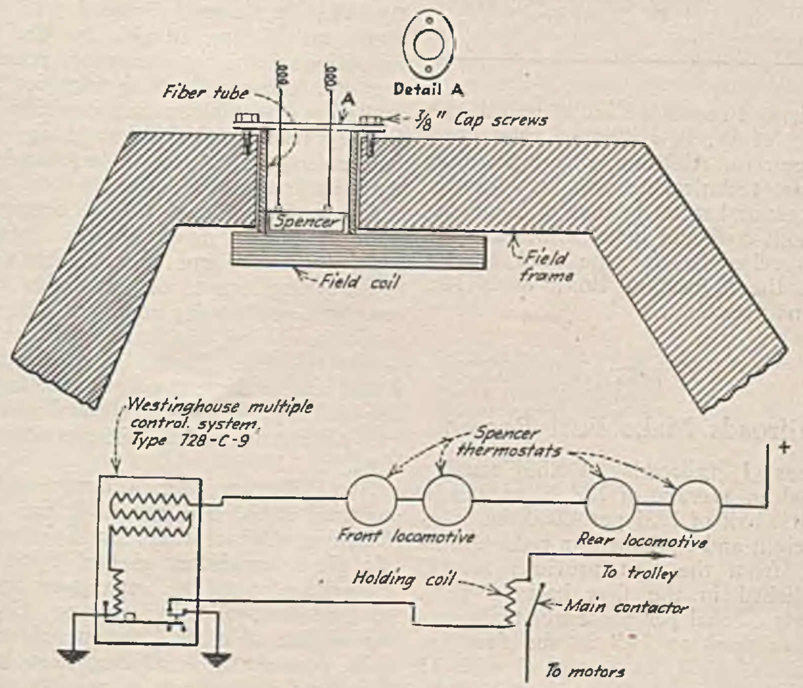
Flatiron Thermostats Protect Mine Locomotives

To meet specifications of the purchaser, locomotives recently delivered to mines of the Koppers Coal Co. are equipped with thermostatic overload protection. The same company also has equipped a number of old locomotives with this protective feature. In both instances Spencer thermostats, the type used in Westinghouse automatic electric flatirons, are employed.

The accompanying sketch indicates the method of installation on two 10-ton locomotives which were rebuilt with "Arcmaster" control and permanently connected for tandem operation. The thermostat proper is but $\frac{3}{8}$ in. thick and $1\frac{3}{8}$ in. outside diameter. A $1\frac{1}{2}$-in. hole drilled through the field frame allows inserting the thermostat to a position against the bottom of a field coil. The small capacity of the thermostat contacts requires that a relay be used between it and the coil of the main breaker.

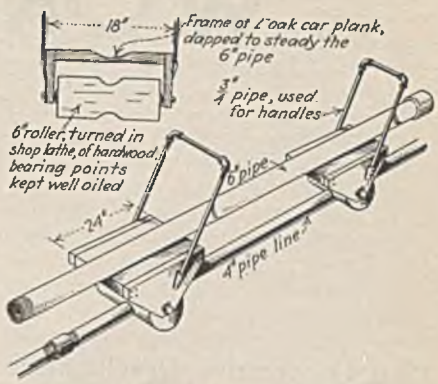
On several new gathering locomotives purchased equipped with the Spencer thermostats the circuits are arranged so that overheating and consequent opening of the main contactor does not make it impossible to move the locomotive under its own power before cooling takes place. A nipping cable, which is part of the regular equipment, can be used to move the locomotive to a location where it will not obstruct traffic. The locomotive becomes inoperative only through the trolley pole and cable reel.

Installation on Type 34B Motors of Tandem Locomotive



Two Men Transport Heavy Pipe In Aircourse

In a recent job of laying heavy pipe in an aircourse at the Indianola mine of the Inland Collieries Co., dollies were constructed by the use of which only two men were required to distribute the pipe to location. In giving the details, Lloyd Bush, mine foreman, states that the job became necessary because of the need of a larger pump and discharge line in one section of the mine. The new line, 2,500 ft. long, was made up of 6-in. steel pipe, in lengths averaging 20 ft. and weighing 400 to 600 lb. each.



Details of Pipe-Carrying Dolly

The usual question of safety and minimum cost was considered. Hard going in the aircourse, coupled with the fact that 4-in. pipe already had been laid in this opening, suggested the use of dollies of the type shown in the accompanying sketch. Three of these were made up in the carpenter shop, two for active use and one for a spare. With these, the two men could easily handle a 600-lb. pipe, letting it rest on the conveyances, which in turn rode on the 4-in. pipe.

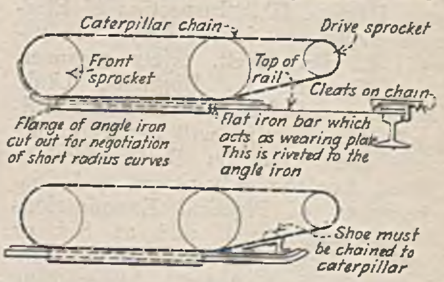
Slide Shoes Simplify Moving Of Caterpillar Machine

When caterpillar-type loading machines are hauled long distances from the working face to the shop for repairs, much time may be lost in guiding the machine over frogs and switches. The cleats on the caterpillar will catch these track members and cause derailment unless some arrangement is made to elevate the cleats above the rail level. One scheme is to block these transfer points; but obviously this is an inconvenient, slow, and tedious process.

D. Stanchina describes a simpler method of solving this problem. It is used in the Adena (Ohio) mine of the Wheeling Township Coal Mining Co. The machine is put on slide shoes which elevate the caterpillar-chain cleats above the rail level and thus the machine is hauled over the mine track.

This scheme calls for the making of four shoes, a right- and a left-hand shoe for travel inby, and a right- and a left hand shoe for travel outby. Details of the design are given in the sketch.

Details of Outby and Inby Slide Shoes



WORD from the FIELD

Plan Cooperative Development Of Heating Equipment

The Anthracite Institute testing laboratory, at Primos, Pa., has completed arrangements with prominent manufacturers of automatic heating equipment for the cooperative development of automatic heating equipment for installation in small apartment houses and commercial buildings, according to Allen J. Johnson, director of the laboratory. Innovations that are expected to result from future concerted effort are: grate shakers that work automatically without regard to the size of the fuel; mechanical ash removers; self-feeding equipment for all sizes of anthracite; improved draft-controls; and automatic equipment for removing ashes from the cellar.

Safety Congress Program

Safety in all branches of the mining industry will hold the spotlight at the Twentieth Annual Safety Congress, to be held at Chicago, Oct. 12-16. The first of the technical sessions will take place on the morning of Oct. 13, at which time Dr. R. R. Sayers, U. S. Bureau of Mines, Washington, D. C., will talk on the "Relation Between Illness and Safety." Speakers at the afternoon session will be: William Conibear, safety engineer, Cleveland-Cliffs Iron Co., Ishpeming, Mich., "Educative Process in Accident Prevention Work," and Milton H. Fies, vice-president, DeBardeleben Coal Corporation, Birmingham, Ala., "The Safety Plan of the National Coal Association." W. H. Comins, manager, National Lead Co., St. Francois, Mo., will lead the discussion on the "Question Box" topic of "What Is a Lost-Time Accident?"

One session will be held on Oct. 14. Speakers and subjects scheduled are: Prof. A. C. Callen, University of Illinois, Urbana, Ill., "Inspection of Electrical Equipment in the Mining Industry"; L. Fern Pett, safety engineer, Utah Copper Co., Bingham, Utah, "Mechanical Safety in Mining and Milling." Mr. Comins will again preside while the "Question Box" topic of "What Are the Advantages and Disadvantages of Physical Examinations Before Employment and at Six or Twelve Month Intervals During Employment" is discussed. "Preventing Accidents From Roof Falls" will be the subject of W. B. Hillhouse, chief mine inspector for Alabama, Birmingham, at the last technical session on Oct. 15. The best and safest method of illuminating both coal and metal mines are the topics scheduled for the final session about the "Question Box," with Mr. Comins presiding.

Howard N. Eavenson

Of Eavenson, Alford & Hicks, mining engineers, Pittsburgh, Pa., has been elected vice-president of the Boone County Coal Corporation, with mines at Sharples, W. Va. It is understood that Mr. Eavenson, who is president of the Clover Splint Coal Co., Closplint, Ky., will assume some of the duties formerly performed by the late Col. W. M. Wiley.

Railroads Make Fuel Record

Class 1 railroads of the country burned an average of 122 lb. of fuel in the first half of 1931 per 1,000 ton-miles of freight and equipment, a reduction of 3 lb. from the best previous record, established in the first half of 1931. Pounds of coal per passenger-train car-mile dropped to 14.8 in the first six months of 1931, as compared with 15 lb. in the corresponding period in 1930.

Kentucky Holds Statewide Meet

Fifty-one first-aid and mine-rescue teams participated in the Kentucky Statewide First-Aid and Mine-Rescue Contest, held at Jenkins, Ky., Aug. 15. District winners in the first-air competition were: Big Sandy district—Mine 206, Consolidation Coal Co., Jenkins; Harlan—Harlan Wallins Coal Corporation, Verda; Hazard—Kenmont Coal Co., Jeff; Southern Appalachian—Kentucky Utilities Co., Pineville. The Kentucky Utilities Co., which operates no mines, also carried off the first prize for all districts. The team of the Black Mountain Coal Corporation took first honors in the mine-rescue competition, and also won the combination prize as the group with the highest number of points in both the first-aid and mine-rescue events. First prize for the colored teams went to Clover Splint Coal Co., Closplint.

New Plant Construction

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

Pemberton Coal & Coke Co., Affinity, W. Va.; contract closed with the Fairmont Mining Machinery Co. for extension of mixing conveyor, rebuilding of house-coal loading facilities, installation of equipment for an additional loading track, and the furnishing of a belt conveyor; project to be completed early in September.

West End Coal Co., Mocanaqua, Pa.; construction of a new breaker started in which one 15-ft. Chance cone for cleaning egg to pea, inclusive, and two 8-ft. rectangular cones for cleaning buckwheat, rice, and barley will be installed by the Chance Coal Cleaner. Plant and equipment will have a capacity of 250 gross tons of cleaned product per hour, and will be completed about Dec. 1.

W. J. Rainey, Inc., Uniontown, Pa.; contract closed with the American Coal Cleaning Corporation for a complete air plant, consisting of two Type RA American pneumatic separators and a cyclone dust-collecting system. Capacity of the tables is 150 tons of minus ½-in. coal per hour. Completion is set for Oct. 15.

Coal Conference Called Off by Administration; Labor Troubles Diminish in Some Fields

ASSEMBLY of a representative number of soft-coal operators to attend a conference with the miners for the purpose of stabilizing the industry is impossible at the present time, according to a letter sent on Aug. 31 to John L. Lewis, president of the United Mine Workers, by Secretary of Labor Doak. The Secretary, who stated that he also spoke for Secretary of Commerce Lamont, declared that he would make a similar report to President Hoover, on whom the final decision would rest. The text of the letter to Lewis is as follows:

Some weeks ago you requested that a general conference of bituminous operators and miners be called to consider your plan for stabilization of the industry. In a desire to explore any suggestion that would be of assistance to the coal industry in its difficult situation, the Secretary of Commerce and I, on July 22, jointly addressed the inclosed letter to the list of operators furnished by you as men who, you felt, should join in such a conference. These invitations were sent out to 160 operators. Replies have been received from 38 favoring the calling of such a conference; 21 have replied questioning the value of such a conference but expressing willingness to attend. The remaining 101 have either indicated that they would not attend or have failed to reply at all.

Inspection of the rated daily tonnage of the mines represented shows that the combined number of those favoring the conference and those willing to attend while questioning its value, would represent about 450,000 tons. Those who declined or failed to reply would represent a rated tonnage around 2,000,000 tons. Thus, with operators representing the great bulk of the total labor employed unwilling to cooperate, and since the responses indicate that, at this time, it is not possible to assemble a conference representative of the industry generally, it does not appear that the calling of the conference to consider this plan would have any result. The responses and records are open for inspection if you so desire.

Quiet generally prevailed in western Pennsylvania and eastern Ohio in August, though Governor White, after a conference with Pomeroy and Gallipolis miners and business men, ordered an inquiry into the administration of justice in Meigs County, Ohio, in which the Pomeroy district is located. Protests were directed specifically at the actions of county officers in eviction cases. A delegation of Athens County miners also requested the Governor to intercede in a dispute between the Western Fuel Co. and its employees at Nelsonville over the employment of a checkweighman.

Miners and business men met at Glouster, Ohio, Aug. 23, and after addresses by officials of the United Mine Workers, dispatched a telegram to President Hoover urging him to call a national conference of the miners and operators to stabilize the industry. The end of the month also brought a virtual stoppage of guerilla warfare in the northern Panhandle of West Virginia, though a few minor clashes occurred at mines attempting to operate with imported labor.

The principal development in the Fairmont region was the decision of seventeen companies to operate their mines non-union, announced on Aug. 14 by T. N. Moran, secretary, Fairmont Coal Operators' Association, following a meeting in Clarksburg, W. Va. The names of the companies were not revealed. On Aug. 21, Mr. Moran reported that nine companies had resumed operation. He did not name them, but reports indicated that the Maryland Coal Co. of West Virginia, Wendel; Simpson Creek Collieries Co., Galloway; Montfair Gas Coal Co., Kilarm; and Bethlehem-Fairmont Coal Co., Shinnston, had reopened. The Hutchinson Coal Co., on Aug. 13, applied for an injunction to restrain the union from interfering with the operation of its McCandlish mine, at Meadowbrook.

As a result of the resumption, Van A. Bittner, international representative of the United Mine Workers, offered, on Aug. 17, to call off the strike in northern West Virginia provided the operators would agree to submit the whole controversy to the "President of the United States or the Secretary of Labor to act as sole arbitrator."

The attempt of the Connellsville By-Product Coal Co. to resume operations in Monongalia County brought forth bitter opposition from union officials, particularly Mr. Bittner, who said that if the miners permitted the resumption they would allow "everything that has been done in the Scotts Run and Maidsville coal fields to be undone." The Connellsville mines started up on Aug. 24, and operation in the last days of the month was featured by clashes between pickets and mine guards.

Representatives of the National Miners' Union invaded the Scotts Run field early in August, but met with little success in their drive for members, with the result that activities died out shortly after the fifteenth of the month.

Striking miners in the Kanawha field returned to work at eight operations on Aug. 18, following negotiations between C. Frank Keeney, president of the West Virginia Miners' Union, and the Kanawha Coal Operators' Association. Faced with the problem of taking care of miners evicted from several towns, Keeney offered to order his members back to work provided the operators agreed to maintain the present wage scales, permit membership in the union, and halt pending eviction proceedings. In reply, D. C. Kennedy, executive secretary of the association, stated that its members were willing "to go beyond their actual needs for labor and employ all the men that it is practicable for them to use," and that the applications of any of the men at Keeney's call would be considered "on their merits." Strikes were being continued at six operations, union officials said, because of the unwillingness of the companies to reemploy men "without discrimination."

Tension in the Harlan field was heightened in August with the bringing to trial of the 31 men indicted for murder as the result of a clash at Evarts, Ky., May 5. In addition, the Grand Jury sitting at Harlan returned numerous indictments against persons charged with criminal syndicalism and banding and confederating, and evidenced its intention of continuing its investigations until it gets to the bottom of the trouble in the field. Feeling grew so high by the middle of the month, however, that the prosecuting attorney asked for a change of venue in fifteen of the murder cases on the ground that a fair trial could not be obtained in a region sick with the general economic depression and afflicted with long-drawn-out labor troubles. Representatives of the National Miners' Union were actively capitalizing on the unrest throughout the month. Production, however, was little affected, reports indicating that only five mines are closed down; none on account of labor trouble.

Miners employed by the Rocky Mountain Fuel Co., which operates under a contract with the United Mine Workers, voted on Aug. 24 to authorize the company to withhold half their wages for August, September, and October and suggested that the money be used to meet the competition of non-union operations in Colorado, which the men stated are attempting to "crush the right of the workers to fair wages and decent American living standards." The miners also declared that "we and the Rocky Mountain Fuel Co. will mine and put

Anthracite Prices at New York, Effective Sept. 1, 1931*

	Broken (Grate)	Egg (Furnace)	Stove	Chestnut	Pea	Buckwheat	Rice	Barley
Delaware, Lackawanna & Western Coal Co.	$7.50	$7.75	$8.00	$8.00	$5.75	$3.25[1]	$1.85[2]	$1.40
Philadelphia & Reading Coal & Iron Co.....	7.50	7.75	8.00	8.00	5.75	3.25[3]	1.85[4]	1.40
Lehigh Valley Coal Sales Co..............	7.50	7.75	8.00	8.00	5.75	3.25	1.85	1.40
Lehigh Navigation Coal Co..............	7.50	7.75	8.00	8.00	5.75	3.25	1.85	1.40
Hudson Coal Co.[5]....................	7.50	7.75	8.00	8.00	5.75	3.25	1.85	1.40
M. A. Hanna Co..........................	7.50	7.75	8.00	8.00	5.75	3.25	1.85	1.40
Dickson & Eddy..........................	7.50	7.75	8.00	8.00	5.75	3.25	1.85	1.40
Madeira, Hill & Co......................	7.50	7.75	8.00	8.00	5.75	3.25	1.85	1.40
Payne Coal Co...........................	7.50	7.75	8.00	8.00	5.75	3.25	1.85	1.40
General Coal Co.:								
Raven Run, Maryd, Westwood.........	....	7.75	8.00	8.00	5.75	3.25	1.85	1.40
Hazle Brook..........................	....	8.00	8.25	8.25	6.00	3.50	2.05	1.60
Midvalley............................	....	7.90	8.15	8.15	5.90	3.40	2.00	1.60
Cross Creek..........................	....	7.85	8.10	8.10	5.85	3.25	1.85	1.40
Fuel Service Co.:								
Beaver Meadow, Kingston, Westwood....	....	7.75	8.00	8.00	5.75	3.25	1.85	1.40
Jeddo................................	....	8.25	8.50	8.50	6.65	3.50	2.00	1.50
Highland.............................	....	8.10	8.35	8.35	6.65	3.55	2.10	1.50
Cross Creek..........................	....	7.85	8.10	8.10	5.85	3.25	1.85	1.40

[1]Domestic buckwheat, $3.70. [2]Stoker rice, $2.30. [3]Stoker buckwheat, $3.75. [4]Stoker rice, $2.35. [5]Birdseye, $1.50. *Terms, 30 days net. Discounts are allowed as follows for payment within 15 days of shipment: Broken, egg, stove, and chestnut, 20c.; pea, 15c.; buckwheat, 10c.; rice, barley, and birdseye, 5c.

coal on the market at prices which will meet any and every price made by non-union operators," and that each of them would act as a salesman for the company's product. In addition, a committee of 25 miners was organized to appeal publicly for support of the union-mined coal. Miss Josephine Roche, president of the company, indicated that the miners' offer would be accepted.

The Canon Imperial, Colorado & Utah, Clark, Newlan Creek, Double Dick, and Orrecchio coal companies, and the Juanita Coal & Coke Co., American Smelting & Refining Co., Minnequa Fuel Co., and Calumet Fuel Co. filed notice with the Colorado Industrial Commission of intention to reduce the former basic wage scale of $6.62 per day approximately 20 per cent. The Commission held several hearings on prospective reductions, but arrived at only one decision, finding the Clayton Coal Co. guilty of a violation of the state industrial law through failure to notify the Industrial Commission of a wage cut 30 days in advance. The Colorado Fuel & Iron Co., which filed notice of reduction in July, announced a decrease of 20 per cent in the rent of houses occupied by the miners, and additional cuts in the cost of electricity, water, garages, miners' lamps, and smithing charges.

The smoldering revolt against the officers of District 1 of the United Mine Workers, fostered by Thomas Maloney, Wilkes-Barre, Pa., who was defeated for the district presidency in the last election, broke out anew in August. Attempts to call a "rump" convention in the district took on new life on Aug. 1.

When a meeting of the general grievance committee of the Glen Alden Coal Co. with delegates from several locals voted to take steps to organize a tri-district convention, the union officials took action to expel the insurgents on Aug. 5. There the matter rested until Aug. 11, when adherents of both factions in the Archbald local, Taylor, Pa., indulged in a free-for-all fight lasting several hours over the question of whether or not the men should pay dues to the regular collectors.

Coal Stocks Rise

Commercial stocks of bituminous coal, used largely for industrial purposes, amounted to 30,100,000 tons on July 1, 1931, according to the U. S. Bureau of Mines. This is an increase of 600,000 tons over the total on hand on April 1, but a decrease of 2,100,000 tons from the quantity in storage on the same date last year. Exports during the second quarter of 1931 averaged 234,000 tons a week, against 322,000 tons during the same period last year. The weekly rate of consumption within the United States during the second quarter amounted to 6,273,000 tons a week, as compared with 8,868,000 tons in the previous quarter. In comparison with the same period last year, the rate of home consumption plus exports shows a decrease of 18.1 per cent.

In addition to the tonnage in the hands of commercial consumers there was 5,317,000 tons of bituminous coal in storage at the head of the Lakes, 1,467,000 tons standing in cars unbilled at the mines, and an unknown quantity amounting to several million tons in cars en route to destination.

Failure of Coal Conference A Foregone Conclusion

By Paul Wooton
Special Correspondent

When President Hoover received the resolution of the United Mine Workers asking that he call a conference to discuss the coal situation, he could have replied at the time to the effect that, in his judgment, it would be impossible to assemble at such a meeting the producers of the greater part of the bituminous tonnage.

The President, however, was confronted with a formal resolution adopted by the representatives of the organized portion of mine workers. He apparently saw no reason why proof stronger than his personal opinion should not be obtained before such a reply went forward. Incidentally, he followed the usual method of referring inquiries to the respective departments and did not allow the union to dictate how the matter should be handled.

When Secretary Lamont established to his own satisfaction that the operators were not willing to meet Mr. Lewis in a conference of the type suggested, Mr. Lewis countered with the assertion that Secretary Lamont had not conferred with representative operators. Secretaries Lamont and Doak then suggested that Mr. Lewis furnish them with the names of men whom he regarded as representative. When that list was submitted it was arranged in the order of the United Mine Worker districts, which gave further flavor to the proposal that its sole purpose was to discuss resumption of relationships with the United Mine Workers. With this evidence that the conference was being staged in an effort to extend union recognition, no one wonders that four-fifths of the tonnage was unwilling to be a party to the conference.

It also has been made abundantly clear that the administration has no desire or intention of initiating any movement looking to a reorganization of the coal business. In fact, it could do nothing to that end, because it has no such power and, moreover, does not want any such authority. There is nothing the United Mine Workers can do but make noise. In its present enfeebled state no one is paying much attention to its noise. Consumers are well satisfied with present conditions, so that the only thing of consequence that could happen would be some step initiated by the coal industry itself.

Explosives Approved

Five additions to the active list of permissible explosives were made by the U. S. Bureau of Mines in August, as follows:

(1) Burton Explosives, Inc., Burton, 2, L.F.; volume of poisonous gases, less than 53 liters; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1¼x8-in. cartridge, 143 grams; smallest permissible diameter, ⅞ in.; unit deflective charge, 217 grams; rate of detonation of 1¼-in. diameter cartridge, 10,460 ft. per sec.

(2) Burton Explosives, Inc., Burton 10, L.F.; volume of poisonous gases, between 53 and 106 liters, inclusive; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1¼x8-in. cartridge, 124 grams; smallest permissible diameter, 1 in.; unit deflective charge, 218 grams; rate of detonation of 1¼-in diameter cartrige, 8,860 ft. per sec.

(3) Burton Explosives, Inc., Burton, F, L.F.; volume of poisonous gases, less than 53 liters, characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1¼x8-in., cartridge, 143 grams; smallest permissible diameter, ⅞ in.; unit deflective charge, 217 grams; rate of detonation of 1¼-in. diameter cartridge, 10,460 ft. per sec.

(4) General Explosive Corporation, Gen-Gel No. 2; volume of poisonous gases, less than 53 liters; characteristic ingredient, nitroglycerin gelatinized with guncotton; weight of 1¼x8-in. cartridge, 217 grams; smallest permissible diameter, 1¼-in.; unit deflective charge, 283 grams; rate of detonation of 1¼-in. diameter cartridge, 9,970 ft. per sec.

(5) General Explosives Corporation, Genite C-1; volume of poisonous gases, between 53 and 106 liters, inclusive; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1¼x8-in. cartridge, 116 grams; smallest permissible diameter, 1 in.; unit deflective charge, 216 grams; rate of detonation of 1¼-in. diameter cartridge, 9,090 ft. per sec.

Pipe Line Completed

The 805-mile natural-gas pipe line of the Panhandle Eastern Pipe Line Co., running from the Texas Panhandle to Rockville, Ind., was completed late in July, and tests were started in preparation for putting the line in operation about the middle of September. Connection has been made at Rockville with the Columbia Gas & Electric System, which supplies gas as far east as Newark, N. J. Initial capacity of the line is 80,000,000 cu.ft. per day, which can be doubled by adding additional compressors.

Other pipe-line projects completed, under way, or proposed in August were:

Mason City, Iowa, to Minneapolis and St. Paul: Northern Natural Gas Co. acquiring right-of-way for extension of lines from Texas.

Pike County, Kentucky, to Coatesville, Pa., via Washington, D. C.: Columbia Gas & Electric Co's. 20-in. line, 80 per cent completed.

Kettleman Hills to Long Beach, Calif.: Southern Fuel Co.'s. 26-in., 210-mile line, 50 per cent completed.

Jackson to Brownsville, Tenn.; 150-mile extension to be blown in in September.

Amarillo field, Texas, to Chicago; Continental Construction Co. planning to start laying 30-in. pipe line, to parallel the present line, in 1932.

Chicago to Milwaukee, Wis.; Continental Construction Co. planning to start 20-in. extension of Texas-Chicago line early in the coming winter.

Use of Police Power Proposed To Curb Coal Output

Immediate consideration of a plan to use the police powers of the states of Pennsylvania, West Virginia, and Ohio to curb production was proposed on Aug. 22 by J. T. M. Stoneroad, president, Carnegie Coal Corporation, Pittsburgh, Pa., who requested that Governor Pinchot, of Pennsylvania, call a conference of the governors of the three states to consider some curtailment action based on the right of the states to conserve a natural resource. He recommended a four-day week to insure equitable distribution of labor, fair wages, and reasonable profits.

Governor Pinchot manifested interest in the plan and requested further details, which Mr. Stoneroad promised to supply after canvassing other operators. Governor White, of Ohio, announced that he was favorably disposed toward the proposition, but recommended that it be held in abeyance pending the holding of a national conference of miners and operators, at that time still in prospect. Governor Conley, of West Virginia, however, declared on Aug. 29 that curtailment of production in that state would be contrary to the statutes.

Reports that the operators in the Pittsburgh district were in favor of government regulation of the bituminous industry were numerous early in August, and gained wide credence in spite of the denials of the men said to be back of the move, among whom was J. D. A. Morrow, president of the Pittsburgh Coal Co. Operator support in the region proved to be meager, however, and public interest soon evaporated, though the stir caused the miners to propose a federal fuel board and resulted in an announcement on Aug. 12 by Representative Clyde Kelly that he would sponsor legislation looking to government control at the next session of Congress. Reports that operators in northern West Virginia were meeting to consider the question proved to be unfounded.

Twenty-seven communities in eastern Ohio, western Pennsylvania, and northern West Virginia were represented at a conference of mayors and business men which met in Wheeling, W. Va., Aug. 19 to consider plans for the stabilization of the coal industry in the Tri-State area. The conference adopted the plan for the formation of a new competitive field announced by a group of Wheeling and Ohio Valley business men early in July (*Coal Age*, August, 1931, p. 453), and formed the Tri-State Civic Association to further the aims of the conference. The Allied Boards of Trade for Pittsburgh, Pa., and vicinity approved the stabilization plan on Aug. 21, as a result of the meeting.

Coal Conference Call Issued By Kentucky Governor

Following a plea for cooperation made by the officers of the Hazard Coal Exchange and individuals "representing the labor organization in Kentucky," Governor Flem D. Sampson, in a statement issued Aug. 31, announced that he had written the governors of Pennsylvania, Alabama, Illinois, Indiana, Ohio, Tennessee, Virginia, and West Virginia suggesting a conference at Lexington, Ky., early in September to develop "a plan of action which will be in the interest of the consumer, the owners of the coal mines, and the laboring man."

Representatives of both the miners and operators, Governor Sampson said, declared that "conditions of producing and marketing coal in these neighboring states have come to be so deplorable that nothing short of methods similar to those employed by Governor Murray of Oklahoma will meet the situation." J. E. Johnson, secretary of the Hazard exchange, in commenting on the action of Governor Sampson, stated that in his belief "some workable plan can be gotten up along the line of using the police power of the states to correct the present deplorable condition. It is a matter, in my judgment, of getting cooperation among the governors, mine workers, and mine owners in these nine coal-producing states."

Coal Men Oppose Rate Rise

Hearings in the request of the railroads for a blanket increase of 15 per cent in freight rates brought out the fact that both anthracite and bituminous operators and retailers fear much sharper competition from substitute fuels if the rise is approved. Testimony was almost unanimous to the effect that any addition to the cost to the consumer in the form of higher rates would give just that much aid and comfort to fuel oil, natural gas, and water power. Export interests also testified that an increase in rates would mean the virtual disappearance of all foreign business. Practically all of the producing fields of the country were represented at the various hearings, as well as the National Retail Coal Merchants' Association and local retailers' groups.

Death Takes A. H. Tait

Alexander Hardy Tait, pioneer coal operator in the Scotts Run field in northern West Virginia and lately president of Tait Bros. Coal Co., died at his home at Morgantown, W. Va., Aug. 10, at the age of 88. Mr. Tait was born in Scotland and came to this country at the age of sixteen. He was connected with the H. C. Frick Co. before going to the Scotts Run region.

The Late Louis F. Lumaghi

Louis F. Lumaghi Dies

Louis F. Lumaghi, president of the Lumaghi Coal Co., died at St. Luke's hospital, St. Louis, Mo., Aug. 24, of complications following an operation. Mr. Lumaghi, who was 68, directed the company founded by his father in 1871 for almost 50 years, and took an active interest in the business up to within two weeks of his death. He was a member of the executive board of the Illinois Coal Operators' Association for many years and was one time president of the Fifth and Ninth District Coal Operators' Association.

Plan Aid for Maryland Coal

Officials of coal companies in western Maryland, Baltimore business men, and other interested persons met in conference with Governor Ritchie Aug. 13 to discuss plans for reviving the coal business in Maryland. It was decided to request the secretaries of the Maryland Coal Aid Association and the Baltimore Association of Commerce to name a joint committee of members of the coal-aid association and the Maryland Development Bureau to study the coal trade of the state, with particular reference to marketing in Baltimore and other regions.

O'Neill Appointed

Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., New York City, will represent the National Coal Association at the National Conference on the Relation of Law and Business With Specific Emphasis on Anti-Trust Laws, which will convene in New York on Oct. 26. Mr. O'Neill will present the situation in the bituminous industry from the standpoint of the layman, and will discuss particularly proposals to amend the anti-trust laws. Oil, lumber, and other basic industries also will be represented at the meeting.

European Fuel Men to Take Part In International Meet

The economic side of the coal industry will be emphasized at the Third International Conference on Bituminous Coal, to be held at the Carnegie Institute of Technology, Pittsburgh, Pa., Nov. 16-21, according to a preliminary announcement. Topics scheduled for consideration include: competition between coal, oil, and natural gas; hydro-electric generation of power as compared with generation by steam plants; the future of coal for use in locomotives and steamships; cost of transporting energy in the form of natural gas, coal, or superpower; actual status of the development of low-temperature carbonization throughout the world; origin of coal; problems of combustion, gasification, and liquefaction of coal; smoke elimination; and preparation.

In response to invitations extended by Dr. Thomas S. Baker, president of Carnegie, the following German fuel technologists will attend or contribute papers to the third conference: Dr. Friedrich Bergius, Heidelburg; Franz Fischer, Kaiser Wilhelm Institute for Coal Research; Prof. Ernst Berl, Darmstadt; Dr. Aufhauser, Thermo-chemical Research Institution, Hamburg; Dr. Kurt Baum, Verein zur Uberwachung der Kraftwirtschaft der Ruhrzechen, Essen; Dr. M. Dolch, Direktor des Universitatsinstitut für Technische Chemie, Halle-Saale; Dr. Karl S. Glinz, Technische Hochschule, Charlottenburg; Dr. C. Krauch, I. G. Farbenindustrie Aktiengesellschaft, Ludwigshafen; Dr. Karl Lehmann, Bergswerksdirektor der Rheinischen Stahlwerke, Essen; Dr. Friedrich Münzinger, Allgemeine Elektricitats Gesellschaft, Berlin; Rudolf Pawlikowski, "Kosmos" Maschinenbauanstalt, Görlitz; Dr. Paul Rosin, Mining Academy of Freiberg, Dresden; Dipl. Ing. Friedrich Schulte, Direktor des Vereins, Uberwachung der Kraftwirtschaft der Ruhrzechen, Essen; Dr. Ernst Terres, Technisch-Chemisches Institut der Technischen Hochschule, Berlin-Charlottenburg; and Dr. Ing. A. Thau, Berlin-Grunwald.

England will be represented by Dr. M. Barash, West's Gas Improvement Co., Manchester; Dr. W. H. Cadman, Anglo-Persian Oil Co., London; Geoffrey M. Gill, consulting engineer, London; J. Ivon Graham, deputy director, Mining Research Laboratory, The University Edgebaston, Birmingham; Dr. E. S. Grumell, Imperial Chemical Industries, Ltd., Northwick; Prof. H. G. A. Hickling, department of geology, University of Durham, Newcastle-upon-Tyne; Harald Nielsen, consulting engineer, London; P. C. Pope, secretary, The Institute of Fuel, London; N. E. Rambush, general manager, Power-Gas Corporation, Stockton-on-Tees; Dr. F. S. Sinnatt, assistant director, Fuel Research Board, London; Prof. William A. Bone, Imperial College of Science and Technology, London; Dr. Cecil Lander, director of the Fuel Research Board, London; and Dr. R. Lessing, consulting chemist, London.

The list of French technicians who will participate includes the following: C. M. Abder-Halden, Administrateur-Délégué, Proabd, Nancy; C. Berthelot, consulting engineer, Paris; Prof. G. Hugel, Université de Strasbourg, Faculté des Sciences, Strasbourg; Daniel Florentin, Paris; Profs. Mailhe and Camille Matignon, of the Sorbonne, Paris; and M. André Kling, director of the Municipal Laboratory of Paris. Other countries and their representatives are: Austria, Dr. Bartel Granigg; Belgium, Prof. A. Gillet, Université de Liége; Holland, Prof. Dr. J. P. Wibaut, director, Organisch-Chemisch Laboratorium der Universiteit, Amsterdam; Poland, Prof. D. Wieluch, Katowice; Spain, A. de Alvarado and L. Menendez Puget; and Switzerland, Prof. P. Schlaepfer.

Coal Bids Opened

The low bid on mine-run coal for New York state institutions and agencies, according to a tentative compilation issued Aug. 6, was 93c. per ton, f.o.b. mines, for 13,500 net tons. The contractor was the Quinlivan Coal Co., and the coal is to be produced by the Minerd Coal Co., Nilan, Pa., and the Shinnston Gas Coal Co., Shinnston, W. Va. Other low bids ranged from $1.01 to $1.168. The Atlas Fuel Corporation bid $1.27 for $\frac{3}{4}$-in. lump from mines of the Andrew Coal Co., Morgantown, W. Va., and the Pine Bluff Coal Co., Shinnston. The low bid on slack was entered by the Pittsburgh Coal Co., which secured 12,000 tons for the Houston and Carnegie (Pa.) mines of the producing company at 85c. per ton. The Shawmut Coal & Coke Co. offered 5,000 tons of slack and 6,000 tons of $1\frac{1}{4}$-in. nut-and-slack at 90c. per ton, to be produced by the Weedville and Elben (Pa.) mines of the Shawmut Mining Co.

Hanna Celebrates Safety Record

All employees were the guests of the Hanna Coal Co. at a picnic at Belmont, Ohio, last month, tò celebrate a reduction of 57 per cent in the number of accidents in the first half of 1931, as compared with half the total number in the year 1930. The goal set by the Hanna company for the first half of 1931 was a 50 per cent reduction in the number of compensable accidents. In that period, 55 compensable and 39 non-compensable accidents occurred in the mining of 928,541 tons of coal. In the first six months of 1930, the total tonnage was 859,916. Half of the total accidents in the year 1930 was 120 for the compensable and 98.5 for the non-compensable types, making the reductions in 1931 as follows: compensable, 54 per cent; non-compensable, 61 per cent; total 57 per cent.

Coming Meetings

International Railway Fuel Association; annual meeting, Sept. 15 and 16, Hotel Sherman, Chicago.

Coal Division American Institute of Mining and Metallurgical Engineers; Oct. 9-10, Bluefield, W. Va.

National Safety Council; annual meeting, Oct. 12-16, Stevens Hotel, Chicago.

International Conference on Bituminous Coal; Nov. 16-21, Pittsburgh, Pa.

King Coal's Calendar for August

Aug. 3—Organization of the 1,000 collieries in Great Britain into six units, each to operate in its own field, is proposed by Sir Ernest Gower's coal mines reorganization committee, appointed by the government in 1930. The plan was offered to the owners for discussion, and provides for control of each unit by a central directorate, which would supervise production, set prices, and regulate transportation, research, financing, and policies.

Aug. 3—Representatives of the coal miners and owners in Scotland reach a wage agreement after months of negotiations. Miners will receive a minimum daily wage of $1.92, and will work $7\frac{1}{2}$ hours per day.

Aug. 14—A concerted attempt on the part of seventeen coal companies in northern West Virginia to operate their mines, now closed by strikes, on a non-union basis is announced following a meeting at Clarksburg, W. Va.

Aug. 18—Van A. Bittner, international representative of the United Mine Workers, expresses to Secretary of Labor Doak his willingness to order an end to the strike in northern West Virginia provided the operators agree to submit the entire controversy to the President or the Secretary of Labor as arbitrator.

Aug. 19—Representatives of 27 communities meet in Wheeling, W. Va., and adopt a plan for the formation of a new competitive field in western Pennsylvania, the high-volatile districts of West Virginia, and eastern Ohio under the supervision of a tribunal appointed by the governors of the states. They also form the Tri-State Civic Association to further the stabilization aims of the conference.

Aug. 20—Omaha Better Heating Association, to cooperate with the Committee of Ten—Coal and Heating Industries, organized.

Aug. 22—J. T. M. Stoneroad, president, Carnegie Coal Corporation, proposes that a conference of the governors of Pennsylvania, West Virginia, and Ohio be called by Governor Pinchot of the first-named state to consider the possibility of using the police powers of the states to curb production. Mr. Stoneroad suggested the establishment of a four-day week.

Aug. 24—Miners employed by the Rocky Mountain Fuel Co., vote to allow the company to defer payment of half their wages in August, September, and October, and suggest that the money be used to meet the competition of non-union operations in Colorado.

Aug. 31—Secretary of Labor Doak advises John L. Lewis, president of the United Mine Workers, that a joint conference of coal operators and miners would not be called by the administration for the reason that the majority of the operators sounded out on their willingness to participate indicated that they would not attend.

International Planning Favored As Economic Solution

Social and economic planning on an international scale was the theme of the First World Social Economic Congress, held in Amsterdam, Holland, Aug. 23-29, under the auspices of the International Industrial Relations Association. Five hundred people, composed largely of persons interested in sociology and economics, were in attendance from 30 countries. Dr. H. S. Person, managing director, Taylor Society, New York City, proposed world-wide application of the principles of scientific management as a solution of the present economic dilemma. He foresaw serious difficulties in the way of national stabilization of industry in the United States because of legal obstacles and lack of experience on an industry-wide scale.

Higher standards of living and permanent prosperity for both capital and labor can be achieved through higher wages for workers and lower prices for commodities resulting from scientific mass production and mass distribution of goods, declared Edward A. Filene, Boston, Mass. He condemned mergers and cartels aimed at the maintenance of high prices as short-sighted and, in the long run, destructive of profits. A five-year moratorium on all war debts and reparations; issuance of international loans to promote production and stimulate purchases; and the division of the world markets among the various nations were proposed by Dr. Lewis Lorwin, Institute of Economics of the Brookings Institute, Washington, D. C. A delegation from the U.S.S.R. presented a voluminous report on the five-year plan, and severely criticized Dr. Lorwin's proposals.

Recommendation that the present arbitration plan used to settle disputes in the electrical industry of the United States be adopted throughout the world was made by H. H. Broach, Washington, D. C., president, International Brotherhood of Electrical Workers. The National Council on Industrial Relations for the Electrical Construction Industry, he explained, is composed of ten members, five appointed by the employers and five by the men. All disputes are submitted to the council when the individual employer fails to agree with his men, and any decision made by the council must be unanimous. Both sides agree to take no action to upset any decision. The ten years in which the plan has been in operation, Mr. Broach asserted, has been almost a strikeless decade.

Tremendous difficulties confront any international or national plan, discussion at the various sessions brought out. Adoption would involve the subordination of private interests to mass control in the hands of a national or international council, which German and French industrialists stated would be impossible of attainment by voluntary relinquishment of individual rights. Results, they contended, could be obtained only as a result of dire distress, as in Germany, or terroristic compulsion, as employed in Russia. Participants were in general agreement that the first essential of any plan is more research and more reliable statistics.

The Late Conrad E. Spens

Conrad E. Spens Dies

Conrad E. Spens, executive vice-president of the Chicago, Burlington & Quincy R.R., died suddenly in England on Aug. 14 at the age of 56. Mr. Spens entered the employ of the Burlington in 1892 as a stenographer. During the War and post-war periods, he was director of transportation for the U. S. Food Administration, assistant director of traffic for the Railroad Administration, and federal Fuel Administrator. His appointment to the position he held at his death came to him in 1929. Mr. Spens was widely known in the coal industry and was long keenly interested in its welfare.

Receivers Appointed

The United Electric Coal Cos., operators of the Fidelity and Freeburg strip mines in Illinois, was placed in receivership by the circuit court at Nashville, Ill., Aug. 20. M. C. Cook, DuQuoin, Ill., was appointed receiver, and it is expected that operation of the properties will be continued. The receivership followed the filing of foreclosure proceedings by holders of a $900,000 bond issue, on which interest payments are alleged to have been defaulted.

Following unsuccessful attempts to complete a financial reorganization of the Electric Shovel Coal Corporation, operating three strip mines in Indiana, J. B. F. Melville, vice-president, of Danville, Ill., and Woods H. Martin were appointed receivers by the U. S. Circuit Court on Aug. 27. The action was taken as the result of application for receivership by the stockholders and creditors for the purpose of conserving the assets of the company and continuing the operation of the plants.

Coal Division to Meet

The National Mining Act of Great Britain, as it relates to the coal industry, will be discussed at the fall meeting of the Coal Division, American Institute of Mining and Metallurgical Engineers, to be held at Bluefield, W. Va., Oct. 9-10, by Dr. R. V. Wheeler, head of the Mines Research Board of Great Britain. George S. Rice, chief mining engineer, U. S. Bureau of Mines, will present an account of the recent meeting at Buxton, England, of representatives of England, Germany, France, Belgium, and the United States to formulate a general plan and to correlate work now in progress in the various countries. Howard N. Eavenson, chairman of the division, will present a paper on "Low-Volatile Coal Field of Southern West Virginia." Authors of other papers to be submitted are: T. W. Guy, R. F. Roth, R. N. Hosler, A. C. Fieldner, W. A. Selvig, and F. H. Gibson.

To Sell Stoker

The Pocahontas Fuel Co., Inc., has taken over the sale of the bituminous Motorstokor in the Cleveland (Ohio) territory and is now inaugurating a sales campaign there. The Motorstokor is manufactured by the Motorstokor Corporation, headed by Walter Barnum, New York City, president of the Pacific Coast Co.

Personal Notes

J. E. Lyman, Glen Carbon, Ill., has been made vice-president of the Madison Coal Corporation, and will be in active charge of future operations. Mr. Lyman, who was formerly general superintendent, will take over the duties of A. J. Moorshead, who retired from the presidency a few weeks ago.

J. Earl Schrout, for two years superintendent of the Maidsville (W. Va.) mine of the Rosedale Coal Co. and a veteran mining man in northern West Virginia, has resigned to accept a position with the Willard Coal & Coke Co., Beckley, W. Va.

Joseph J. Walsh, mine inspector, Wilkes-Barre, Pa., has been appointed deputy secretary of the Pennsylvania Department of Mines in charge of the anthracite division. Mr. Walsh went with the department in 1905.

Arthur Allen has been made superintendent of the Republic mine of the Republic Steel Corporation, Republic, Pa., vice Wm. Fowler, resigned.

Franklin K. Day has been made manager of the mining properties of the Pardee & Curtin Lumber Co., near Webster Springs, W. Va. Mr. Day was formerly division manager of the Pocahontas-New River division of the Consolidation Coal Co.

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

To Fight U. S. in Business

A nation-wide movement to get the government out of business was officially launched with the filing of an application for a charter for the Federation of American Business at Springfield, Ill., Aug. 26. A temporary organization has been functioning for months, it is stated, but an application for a charter was withheld until twenty states had been brought into the fold. Twenty-two major industries were present at a meeting in Chicago, Aug. 25, at which a permanent organization was approved. Headquarters of the federation will be in Chicago.

Smoke Ordinance Effective

The smoke ordinance adopted by the city of Baltimore, Md., which provides for the appointment of a smoke-control commissioner and a five-member appeal and advisory board, went into effect on Aug. 20. No fines will be imposed during the first year. Emission of a smoke denser than "No. 3 of the Ringelman chart" constitutes a violation. All types of buildings are affected, and no combustion plant may be erected or remodeled except upon approval of the plans by the smoke-control commissioner.

Maryland Contest Held

Twenty-five teams, representing eleven coal-mining companies, participated in the Fourth Annual State First-Aid Contest of Maryland, held at Frostburg, Aug. 22. First, second, and third prizes were won by teams of the Consolidation Coal Co., as follows: first, Ocean No. 1 team, Ocean, captained by Stanley Alexander; second, Mine No. 10 team, Eckhart Mines, headed by Philip Thomas; third, Borden Shaft No. 12 team, Borden Shaft, captained by John Struntz.

Omaha Heating Group Formed

The Omaha Better Heating Association, to cooperate with the Committee of Ten—Coal and Heating Industries, was formally launched at a meeting at the Fontenelle Hotel, Aug. 20. Eighty persons attended the meeting and the following officers were elected: president, Gilbert Olson, representing the warm-air heating industry; vice-president, Clifton Wood, Central Coal & Coke Co.; and secretary-treasurer, Perry J. Rushlan, Omaha Coal Bureau. It was announced that a fifteen-week course in combustion would be started after Sept. 14.

Trade Codes Accepted

Changes in their trade-practice conference rules have been accepted by bituminous coal operators in Utah and in the Kansas-Missouri district. The two coal groups are among a list of 42 industries that have accepted the revised codes. Thirty-eight other industries have been given time extensions in which to act on the changes promulgated by the Federal Trade Commission. In its revisions, the Commission has followed the Supreme Court decision that for a trade practice to constitute unfair competition it must be shown to have a tendency to injure competitors, and has added wording to that effect to each rule not already containing it. A provision against price discrimination virtually copies a section of the Clayton Act relating to secret payment of rebates in an attempt to deceive customers, and the shipment of goods on consignment is condemned when such practice tends to lessen competition or create a monopoly.

Fuel Research on Tour List

Fuel research has been placed on the program of the laboratory tour to be made this autumn by 100 business men and executives under the auspices of the division of engineering and industrial research of the National Research Council, New York City. Thirteen laboratories, including the Battelle Memorial Institute, Columbus, Ohio, founded to carry on research in fuels and metals, will be visited to show the group how the nation's industries, large and small, are turning to scientific research for aid in solving problems in the present era of rapid economic change. The tour will start from New York City on Oct. 5, and will end Oct. 15.

Industrial Notes

Pittsburg Boiler & Machine Co., Pittsburg, Kan., has closed a contract with Nortons (Tividale), Ltd., Tipton, Staffordshire, England, for the manufacture and sale of the Norton coal-cleaning system in the United States. Letters patent for the system, which incorporates the Baum process, were granted in the United States in April. The Pittsburg organization also has opened an office at 205 Wacker Drive, Chicago, in charge of C. W. Waterman, vice-president in charge of sales.

Westinghouse Electric & Mfg. Co. has made the following appointments: assistant to the commercial vice-president of the Atlantic division, William F. James, formerly Middle Atlantic district sales manager, Philadelphia, Pa.; Middle Atlantic district manager with headquarters in Philadelphia, E. W. Loomis, lately manager of the Northeastern industrial division.

Interstate Equipment Corporation, New York City, announces that B & B and Automatic aerial tramways have been consolidated, and that both tramways will hereafter be handled through the tramway department of the Interstate company. B & B tramways were manufactured by the Broderick & Bascom Rope Co., and F. W. Grice, formerly in charge for the rope company, will act as consulting engineer, retaining his headquarters at St. Louis.

John S. Bleecker, engineer in industrial and public utility work, has been appointed manager of sales for Lukenweld, Inc. (division of the Lukens Steel Co.), Coatesville, Pa.

Elliott Service Co., New York City, announces that R. T. Solenstein, manager of the industrial division, has been elected vice-president, and that J. O. Emerson, editor of the National Board of Foremanship, succeeds Mr. Solenstein.

L. S. Hamaker, advertising manager, Republic Steel Corporation, Youngstown, Ohio, has been made manager of sales promotion, with headquarters in the home city of the company.

Lakewood Engineering Co., Columbus, Ohio, has sold the industrial division of its business to the Easton Car & Construction Co., Easton, Pa.

Worthington Pump & Machinery Corporation, New York City, has acquired the manufacturing and marketing facilities of Metalweld, Inc., Philadelphia, Pa., builders of a complete line of air compressors. The Worthington company has made the following additions to its staff: special sales representative, Buffalo, N. Y., Otto Nonnenbruch, formerly chief engineer, diesel department, I. P. Morris and De La Vergne, Inc., Philadelphia, Pa.; electrical sales engineer, H. G. Wood, formerly assistant manager, New England division, Westinghouse Electric & Mfg. Co.; electrical sales engineer, Cincinnati, Ohio, E. M. Paullin, Jr., formerly synchronous motor specialist for the General Electric Co.

Fuller Lehigh Co., New York City, has removed its Boston (Mass.) office to 49 Federal St.

Reading Iron Co., Reading, Pa., has consolidated its general executive and sales offices in the Terminal Commerce Building, Philadelphia, Pa.

Newark Wire Cloth Co., Newark, N. J., has appointed F. C. Ryan as sales manager. Mr. Ryan was formerly staff manager for the Johns-Manville Sales Corporation.

H. E. Chilcoat, sales manager of the air-dump car department, has been made general sales manager of the Koppel Industrial Car & Equipment Co., Koppel, Pa.

Norma-Hoffman Bearings Corporation, Stamford, Conn., has opened a sales office in the American Bank Building, Cincinnati, Ohio. C. D. Kilham, sales engineer for many years, will be in charge.

Rockbestos Products Corporation, New Haven, Conn., has appointed Russel G. Meyerand, former assistant to the chief electrical engineer, Stone & Webster Engineering Corporation, as sales engineer in the New England territory.

Coal Mine Deaths Total 105 in July; Fatality Rate Declines

REPORTS received from state mine inspectors by the U. S. Bureau of Mines, covering fatal accidents at coal mines in the United States during July, 1931, showed that 105 men were killed, an increase of 18 over June, but a gratifying decrease of 50 from the total in July, 1930. Coal production during July of the present year was 33,744,000 tons, practically the same as the 33,729,000 tons mined in the preceding month of June, but a decrease of 6,595,000 tons from July, 1930, total. The death rate per million tons of coal produced during July was 3.11, as compared with 3.84 for July a year ago, and 2.58 for June, 1931.

For bituminous mines alone, the fatality rate for July was 2.92 per million tons, as compared with 2.26 for the preceding month and 3.40 for July a year ago. There were 87 men killed in bituminous mines in July of the present year, as compared with 66 in June, 1931, and 118 in July, 1930. In the anthracite mines of Pennsylvania 18 men lost their lives in July, as compared with 21 in the preceding month and 37 in July, 1930. The death rates were 4.55 for July, 1931; 6.58 for July, 1930; and 4.62 for June of the present year.

Reports for the first seven months of 1931 show a total of 838 deaths from accidents in coal mines, as compared with 1,159 for the same period in 1930. While the 1931 period showed a decrease of 321 deaths, there also was a decrease in production, the output for 1931 being 255,083,000 tons and that for the 1930 period being 304,563,000 tons. The death rates per million tons decreased from 3.81 in 1930 to 3.29 in 1931. The death rate for bituminous mines alone, which showed 608 fatalities for the period from January to July, 1931, was 2.77, as compared with 3.42 for the same period in 1930, when 908 deaths occurred. The difference in the anthracite records for the two periods was not so marked, that for the present year showing 230 deaths, or a rate per million tons of 6.48, against 251 deaths and a rate of 6.40 for the 1930 period.

No major disaster occurred in July—that is, no disaster occurred in which five or more lives were lost. Three such disasters in January and one in May caused a total of 46 deaths. In the 7-month period from January to July, 1930, there were seven major disasters in which 88 men lost their lives. Based exclusively on these disasters, the death rates were 0.180 and 0.289, respectively, for 1931 and 1930. The major disasters thus far in 1931 occurred at the rate of 1.57 separate disasters (as distinguished from the number of deaths resulting from the disaster) for each hundred million tons of coal mined. The rate for the corresponding period in 1930 was 2.30.

Comparing the accident record for the first seven months of 1931 with that of the same months of 1930, a reduction is noted in the death rates from falls of roof and coal, haulage, gas or dust explosions, explosives, and electricity, which are the principal causes of fatalities in coal mines. The comparative rates are as follows:

Cause	1930 Fatalities	1930 Rate	Jan.-July, 1930 Fatalities	Jan.-July, 1930 Rate	Jan.-July, 1931 Fatalities	Jan.-July, 1931 Rate
All causes	2,014	3.793	1,159	3.805	838	3.285
Falls of roof and coal	1,067	2.009	630	2.068	479	1.878
Haulage	303	.571	193	.633	147	.576
Gas or dust explosions:						
Local explosions	61	.115	43	.141	11	.043
Major explosions	214	.403	85	.279	46	.181
Explosives	78	.147	47	.155	24	.094
Electricity	76	.143	42	.138	32	.125
Miscellaneous	215	.405	119	.391	99	.388

Coal-Company Dividends

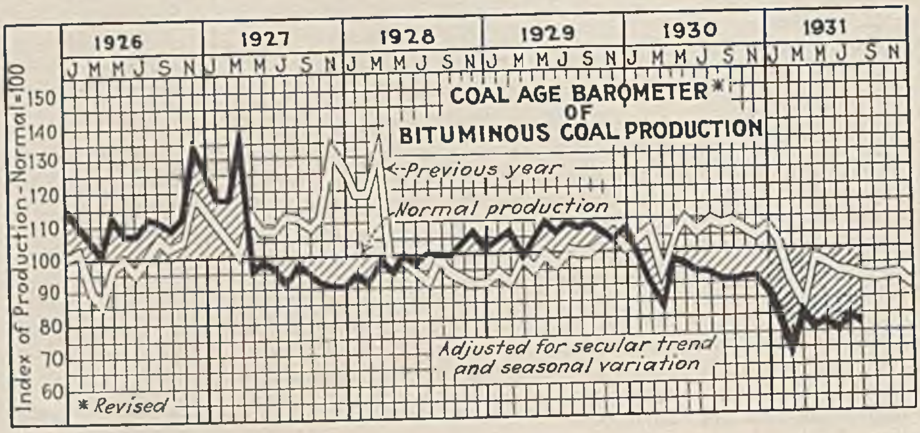
Dividends paid by coal companies in July amounted to $2,398,612, according to the Standard Statistics Co., New York City. Total cash dividend payments made by domestic corporations in July were $516,095,367.

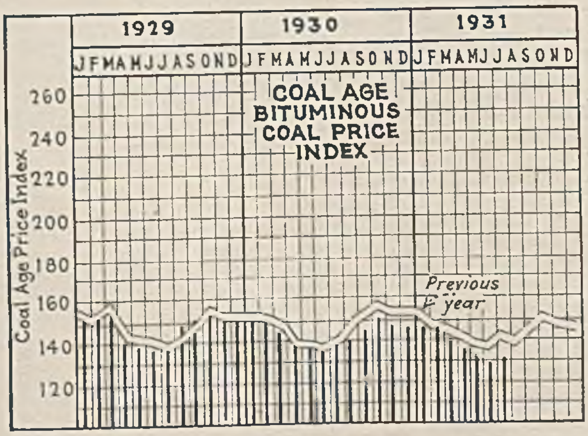
Coal-Mine Fatalities During July, 1931, by Causes and States

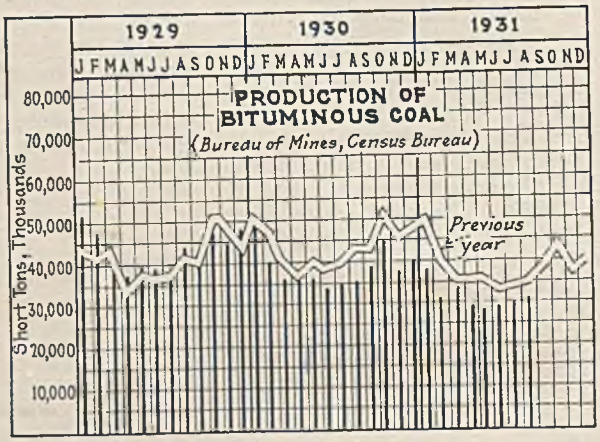
(Compiled by Bureau of Mines and published by *Coal Age*)

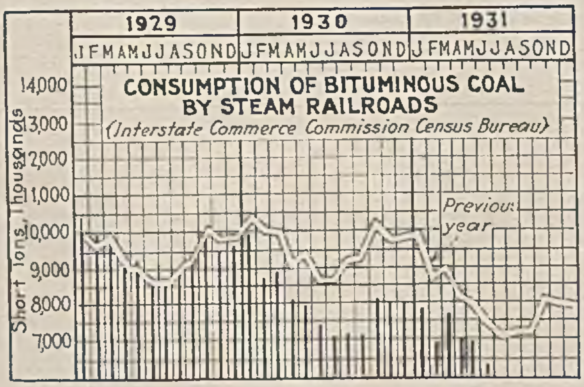
State	Underground: Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Shaft: Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip, or bucket	Other causes	Total	Surface: Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	Total by States: 1931	1930
Alabama	1		2									3													3	5
Alaska																									0	0
Arkansas	2											2													2	2
Colorado				1								1													1	0
Illinois	3		1				1					5													5	5
Indiana	2		1				1					4													4	0
Iowa																									0	1
Kansas																									0	0
Kentucky	6	1	1									8								1				1	9	11
Maryland	1											1													1	0
Michigan																									0	1
Missouri																									0	0
Montana																									0	0
New Mexico																									0	2
North Dakota																									0	0
Ohio	5		2									7													7	3
Oklahoma																									0	3
Pennsylvania (bituminous)	9	2	3				1					15						1						1	16	28
South Dakota																									0	0
Tennessee	2											2													2	1
Texas																									0	0
Utah																									0	3
Virginia																									0	3
Washington																									0	0
West Virginia	19	3	7				3				1	33							1			1		2	35	50
Wyoming	1						1					2													2	0
Total (bituminous)	51	6	17	1			7				1	83						1	1	1		1		4	87	118
Pennsylvania (anthracite)	8	4	3								1	16											2	2	18	37
Total, July, 1931	59	10	20	1			7				2	99						1	1	1		1	2	6	105	
Total, July, 1930	65	21	30	4	13		4		2		3	142					1	1	3	3			5	12		155

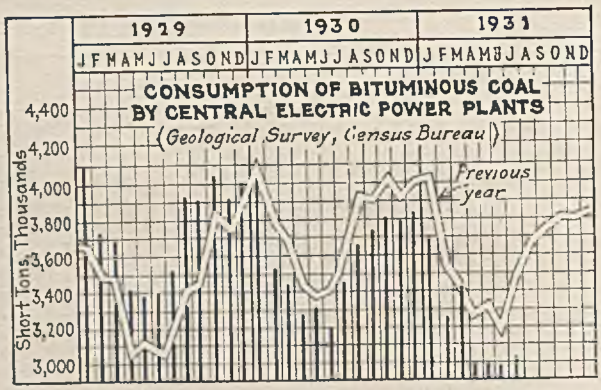
Indicators of Activities in the Coal Industry

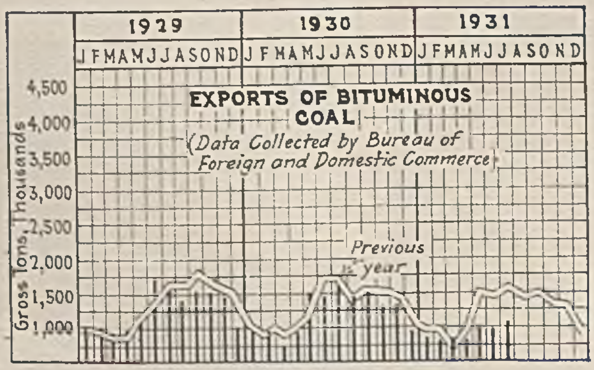


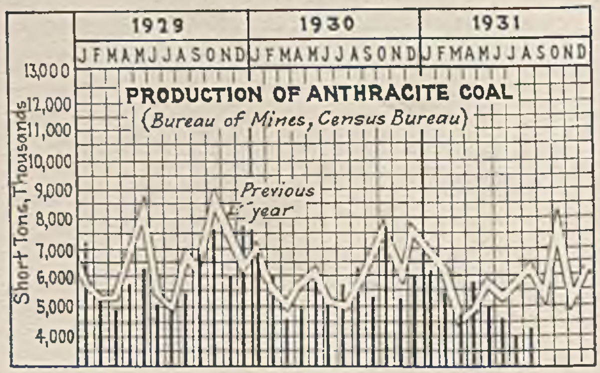












MARKETS in Review

SIGNS that the summer slump had run its course in the Middle Western bituminous markets became apparent in August. An increase in the demand for prepared sizes caused prices to stiffen in the closing weeks of the month, and retailers, in general, showed more willingness to add to stocks. Steam sizes failed to gain in the face of light industrial takings, with the result that slack and screenings prices eased slightly as the weeks went by. August brought no relief to Eastern marketing centers, however. Both domestic and steam demand languished, and prices, in a number of cases, slid off in the closing weeks.

Increased buying in the last week of August rescued the anthracite markets of the country from an otherwise slow month. The demand was confined largely to domestic sizes, however, as the steam trade continued in its long-standing slump. Production curtailments made buckwheat scarce at times, and shortened the supply of rice. Demand for stove picked up, while there was a let-up in the call for egg. Chestnut was embarrassingly plentiful, and pea also proved too abundant at times.

August production of bituminous coal is estimated by the U. S. Bureau of Mines at 30,517,000 net tons, an increase of 727,000 tons over the July production of 29,790,000 tons, but a decline of 5,144,000 tons from the August, 1930, output. Anthracite production is estimated at 4,314,000 net tons. This compares with 3,954,000 tons in the preceding month and 6,081,000 tons in August, 1930.

Coal Age Index of spot bituminous prices (preliminary) was: 130, Aug. 1 and 8; 131, Aug. 15; 127, Aug. 22; and 130, Aug. 29. Corresponding weighted average prices were: $1.57, Aug. 1 and 8; $1.58, Aug. 15; $1.54, Aug. 22; and $1.57, Aug. 29. Revised Index figures for July were: 131, July 4, 11, and 18; and 130, July 25. Corresponding weighted average prices were: $1.59, July 4 and 11; $1.58, July 18; and $1.57, July 25. The monthly Index for July was $130\frac{3}{5}$, as compared with the unrevised figure of $129\frac{1}{2}$ for August.

Shipments to the lower Lake ports in August were approximately equal to the rate prevailing in the same month in 1930. For the season to Aug. 30, inclusive, dumpings were as follows: cargo, 17,985,869 tons; fuel, 591,572 tons; total, 18,577,441 tons. Dumpings in the same period in 1930 were: cargo, 24,081,201 tons; fuel, 864,394 tons; total, 24,945,595 tons.

HIGHER prices in the last two weeks of August quickened demand in the Chicago market, with the result that many producers of the better grades were oversold from one to three weeks on lump. Steam coals, however, were weak. Advances in quotations were made as follows: Southern Illinois lump and furnace, 5@15c.; Indiana No. 4 domestic sizes, 25c., West Kentucky lump, 20c.; Eastern high-volatile block, 25c. The stronger position of the smokeless coals brought in a number of retail orders, with the result that mine-run advanced 25c. Prepared sizes were unchanged, while the slow demand for slack caused quotations to weaken to as low as 35c. Eastern high-volatile slack met with a slight fillip in demand, and was fairly firm over the month. Illinois, Indiana, and western Kentucky screenings were slow, but prices were well maintained, rising slightly at several mines at the end of the month.

A slight but steady increase in the call for coal was noticeable in the St. Louis market in August, leading many interests to prophesy price advances in September. Domestic sizes led the procession, though steam varieties shared in the increased demand to a limited extent. Prices on steam sizes were held firmly at previous levels.

AUGUST brought a gradual increase in demand in the Southwestern market, with the result that there was a resumption of operation at a number of Arkansas and Oklahoma shaft mines. Country retail yards, it was reported,

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

		Week Ended						
		Aug. 1, 1931		Aug. 8, 1931	Aug. 15, 1931	Aug. 22, 1931	Aug. 29, 1931	
	Market Quoted	Independent	Company	Independent	Independent	Independent	Independent	Company
Broken	New York	....	$7.30	....	....	....	....	$7.30
Broken	Philadelphia	$7.30@$7.55	7.55	$7.30@$7.55	$7.30@$7.55	$7.30@$7.55	$7.30@$7.55	$7.30
Egg	New York	7.55	7.55	7.55	7.55	7.40@7.55	7.40@7.55	7.55
Egg	Philadelphia	7.55@7.80	7.55	7.55@7.80	7.55@7.80	7.55@7.80	7.55@7.80	7.55
Egg	Chicago	7.55	7.55	7.55	7.55	7.55	7.55	7.55
Stove	New York	7.60@7.80	7.80	7.60@7.80	7.80	7.80	7.80	7.80
Stove	Philadelphia	7.80@8.05	7.80	7.80@8.05	7.80@8.05	7.80@8.05	7.80@8.05	7.80
Stove	Chicago	7.80	7.80	7.80	7.80	7.80	7.80	7.80
Chestnut	New York	7.25@7.80	7.80	7.25@7.80	7.25@7.80	7.25@7.80	7.35@7.80	7.80
Chestnut	Philadelphia	7.80@8.05	7.80	7.80@8.05	7.80@8.05	7.80@8.05	7.80@8.05	7.80
Chestnut	Chicago	7.80	7.80	7.80	7.80	7.80	7.80	7.80
Pea	New York	5.25@5.55	5.55	5.25@5.55	5.15@5.55	5.15@5.55	5.25@5.55	5.55
Pea	Philadelphia	5.55@5.80	5.55	5.55@5.80	5.55@5.80	5.55@5.80	5.55@5.80	5.55
Pea	Chicago	5.55	5.55	5.55	5.55	5.55	5.55	5.55
Buckwheat	New York	3.25	3.25†	3.25	3.25	3.25	3.25	3.25†
Buckwheat	Philadelphia	3.25@3.50	3.25	3.25@3.50	3.25@3.50	3.25@3.50	3.25@3.50	3.25
Buckwheat	Chicago	3.25@3.75	3.25	3.25@3.75	3.25@3.75	3.25@3.75	3.25@3.75	3.25
Rice	New York	1.75@1.85	1.85	1.75@1.85	1.75@1.85	1.85	1.85	1.85
Rice	Philadelphia	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Rice	Chicago	1.85@2.35	1.85	1.85@2.35	1.85@2.35	1.85@2.35	1.85@2.35	1.85
Barley	New York	.90@1.25	1.40	.90@1.25	.90@1.25	.90@1.25	.90@1.25	1.40
Barley	Philadelphia	1.40	1.40	1.40	1.40	1.40	1.40	1.40

†Domestic buckwheat, $3.70 (D. L. & W.)

were laying in winter stocks, but city dealers continued to delay buying. Circular prices were largely nominal. Some Arkansas semi-anthracite slack sold as high as $1.75; a few lots of Oklahoma varieties went as low as 50c. In Kansas, the $1.50 circular on crushed mine-run and screenings was gradually whittled away to 65c. in some cases. The majority of sales, however, were made at $1@$1.25.

Extreme dullness featured the trade at the Head of the Lakes in September. Shipments are expected approximately to equal the figure of 9,411 cars for July. Shipments in August, 1930, were 13,290 cars. Receipts of bituminous coal, anthracite, and coke at the Duluth-Superior docks for the season to Aug. 1 totaled 3,021,426 tons, against 5,908,737 tons in the same period in 1930. Total receipts of soft coal in July were 1,094,690 tons.

Summer slackness in the Colorado market was a little relieved in August by a slight increase in the call for coal in Kansas-Nebraska harvest territory. Retail business continued to wallow in the summer doldrums, however, and dealers persisted in their disregard for storage coal. Subnormal industrial demand served to accentuate seasonal slowness. Ruling prices were unchanged from those prevailing in previous months.

August brought an increase in the demand for block coals to the Louisville market, with the result that prices on these sizes advanced 10@15c. in most instances, with some increases of as high as 50c. Increased production depressed slack prices 10@15c., however. Movement to the Lakes was fairly brisk over the month, but industrial, utility, and railroad demand was light.

Volume and prices both showed some improvement in the last weeks of August in the Cincinnati market, though the general situation was reported to be the worst in a decade. Lake business failed to render its usual assistance, while retailers continued in their abstention from buying. Price advances were led by the smokeless coals, with domestic sizes rising 10@25c. at the end of the month. Mine-run and nut were slow and weak, however, while slack prices slid off until sales were made in accordance with high-volatile offerings under the strain of a growing scarcity of orders.

Kentucky shippers, particularly in the Hazard and Harlan fields, were able to raise quotations on medium grades of block to $1.25 and above, while West Virginia high-volatile lump failed to get above a low of $1.10 Advances in higher grades were in proportion, and premium and specialty coals took the usual August leap to $3. Egg was erratic, while mine-run, after a dip in July, recovered to some extent.

August brought a good movement of domestic sizes to the Columbus market, and retailers began to replenish their stocks in anticipation of fall and winter demand. Prices were steady. The steam trade dragged, and industrial users persisted in their refusal to consider stocking. Slack prices weakened slightly.

THE prevailing dullness in the Cleveland market was relieved by a slight increase in demand for domestic sizes in August. Prices advanced as much as 25c. in some instances. Slack, in the face of light industrial takings, declined 10@20c.

Prices continued to break in the Pittsburgh market in August with a light domestic demand and a low movement of steam coal to industries and railroads. Shipments to the lakes eased off at the end of the month.

An increase in demand for Fairmont lump brought higher prices in its train in August, while at the same time mine-run and slack drifted downward. Inquiries for the large size were frequent, and buyers insisted on prompt shipment.

The central Pennsylvania trade, in the throes of a slow demand, marked time in August. Prices drifted downward slightly to the following: Pool 1, $1.90@$2.25. Pool 71, $1.80@$1.95; Pool 9, $1.70@$1.75; Pool 10, $1.50@$1.65; Pool 11, $1.40@$1.50.

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

	Market Quoted	Week Ended Aug. 1, 1931	Aug. 8, 1931	Aug. 15, 1931	Aug. 22, 1931	Aug. 29, 1931
LOW-VOLATILE, EASTERN						
Smokeless lump	Chicago	$2.75@$3.25	$2.75@$3.25	$3.00@$3.50	$3.00@$3.50	$3.00@$3.50
Smokeless egg	Chicago	2.75@3.40	2.75@3.40	3.25@3.75	3.25@3.75	3.25@3.75
Smokeless stove	Chicago	2.50@2.75	2.50@2.75	2.50@2.75	2.50@2.75	2.50@2.75
Smokeless nut	Chicago	2.25@2.50	2.25@2.50	2.25@2.50	2.25@2.50	2.25@2.50
Smokeless pea	Chicago	1.50@2.25	1.50@2.25	1.25@2.25	1.25@2.25	1.25@2.25
Smokeless mine-run	Chicago	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
Smokeless slack	Chicago	.50@1.10	.50@1.10	.50@1.10	.50@1.10	50@1.10
Smokeless lump	Cincinnati	2.50@2.75	2.75@3.00	2.75@3.00	2.75@3.00	2.75@3.00
Smokeless egg	Cincinnati	2.75@3.00	2.75@3.25	2.75@3.25	2.75@3.25	2.75@3.25
Smokeless stove	Cincinnati	2.25@2.50	2.50@2.75	2.25@2.75	2.25@2.75	2.25@2.75
Smokeless nut	Cincinnati	1.50	1.35@1.50	1.25@1.50	1.25@1.50	1.25@1.50
Smokeless mine-run	Cincinnati	1.60@1.75	1.65@1.75	1.60@1.75	1.60@1.75	1.60@2.00
Smokeless slack	Cincinnati	.65@1.00	.60@.90	.50@.85	.50@.85	.50@.85
*Smokeless mine-run	Boston	4.00@4.10	3.90@4.10	3.90@4.10	3.90@4.10	3.85@4.10
*Smokeless nut-and-slack	Boston	3.10@3.20	3.10@3.20	3.10@3.20	3.00@3.10	3.00@3.10
Clearfield mine-run	Boston	1.50@1.75	1.50@1.75	1.50@1.75	1.40@1.65	1.40@1.65
Clearfield mine-run	New York	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
Cambria mine-run	Boston	1.65@2.00	1.65@2.00	1.65@2.00	1.60@1.90	1.60@1.90
Somerset mine-run	Boston	1.60@1.90	1.60@1.90	1.60@1.90	1.50@1.85	1.50@1.85
Pool 1 (Navy Standard)	New York	1.90@2.25	1.90@2.25	1.90@2.25	1.90@2.25	1.90@2.25
Pool 1 (Navy Standard)	Philadelphia	1.90@2.20	1.90@2.20	1.90@2.20	1.90@2.20	1.90@2.20
Pool 9 (super low-vol.)	New York	1.60@1.80	1.60@1.80	1.60@1.80	1.60@1.80	1.60@1.80
Pool 9 (super low-vol.)	Philadelphia	1.65@1.75	1.65@1.75	1.65@1.75	1.65@1.75	1.65@1.75
Pool 10 (h. gr. low-vol.)	New York	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60
Pool 10 (h. gr. low-vol.)	Philadelphia	1.40@1.60	1.40@1.60	1.40@1.60	1.40@1.60	1.40@1.60
Pool 11 (low.-vol.)	New York	1.35@1.45	1.35@1.45	1.35@1.45	1.35@1.45	1.35@1.45
Pool 11 (low-vol.)	Philadelphia	1.35@1.45	1.35@1.45	1.35@1.45	1.35@1.45	1.35@1.45
HIGH-VOLATILE, EASTERN						
Pool 54-64 (gas and st.)	New York	$1.10@$1.35	$1.10@$1.35	$1.00@$1.25	$1.00@$1.25	$1.00@$1.25
Pool 54-64 (gas and st.)	Philadelphia	1.00@1.15	1.00@1.15	1.00@1.15	1.00@1.15	1.00@1.15
Pittsburgh sc'd gas	Pittsburgh	1.60@1.70	1.60@1.70	1.60@1.70	1.50@1.60	1.40@1.60
Pittsburgh steam lump	Pittsburgh	1.50@1.70	1.50@1.70	1.50@1.70	1.40@1.60	1.35@1.60
Pittsburgh egg	Pittsburgh	1.60@1.75	1.60@1.75	1.60@1.70	1.60@1.70	1.60@1.70
Pittsburgh gas mine-run	Pittsburgh	1.40@1.50	1.40@1.50	1.40@1.50	1.30@1.40	1.30@1.40
Pittsburgh steam mine-run	Pittsburgh	1.25@1.50	1.25@1.50	1.25@1.50	1.25@1.50	1.25@1.50
Pittsburgh gas slack	Pittsburgh	.90@1.10	.90@1.10	.90@1.10	.80@1.00	.75@.95
Pittsburgh steam slack	Pittsburgh	.75@1.00	.75@1.00	.65@.85	.60@.75	.55@.60
Connellsville coking coal	Pittsburgh	1.25@1.65	1.25@1.65	1.25@1.65	1.25@1.65	1.25@1.55
Westmoreland lump	Philadelphia	1.70@1.95	1.70@1.95	1.70@1.95	1.70@1.95	1.70@1.95
Westmoreland ¾-in. lump	Philadelphia	1.65@1.80	1.65@1.80	1.65@1.80	1.65@1.80	1.65@1.80
Westmoreland egg	Philadelphia	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60
Westmoreland mine-run	Philadelphia	1.50@1.65	1.50@1.65	1.50@1.65	1.50@1.65	1.50@1.65
Westmoreland slack	Philadelphia	1.00@1.15	1.00@1.15	1.00@1.15	1.00@1.15	1.00@1.15
Fairmont lump	Fairmont	1.20@1.40	1.20@1.40	1.20@1.45	1.25@1.50	1.25@1.50
Fairmont ¾-in. lump	Fairmont	1.05@1.15	1.05@1.15	1.10@1.20	1.10@1.25	1.10@1.25
Fairmont egg	Fairmont	1.00@1.10	1.00@1.10	1.00@1.10	1.00@1.20	1.00@1.20
Fairmont mine-run	Fairmont	.95@1.05	1.00@1.15	.95@1.10	.90@1.05	.90@1.05
Fairmont slack	Fairmont	.75@1.00	.75@.95	.60@.90	.50@.85	.50@.85
Kanawha lump	Cincinnati	1.10@1.50	1.10@1.50	1.10@1.50	1.15@1.60	1.15@1.60
Kanawha egg	Cincinnati	1.00@1.35	1.10@1.35	1.10@1.35	1.10@1.35	1.10@1.35
Kanawha mine-run (gas)	Cincinnati	1.35@1.60	1.35@1.60	1.35@1.50	1.35@1.50	1.35@1.60
Kanawha mine-run (st.)	Cincinnati	.90@1.25	.90@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Kanawha nut-and-slack	Cincinnati	.50@.75	.60@.90	.60@.90	.60@.90	.60@.90
Williamson (W. Va.) lump	Cincinnati	1.10@1.50	1.10@1.50	1.15@1.50	1.15@1.60	1.15@1.60
Williamson (W. Va.) egg	Cincinnati	1.00@1.35	1.00@1.35	1.10@1.40	1.10@1.40	1.10@1.40
Williamson (W.Va.) mine-run (gas)	Cincinnati	1.40@1.60	1.40@1.60	1.35@1.65	1.35@1.65	1.35@1.65
Williamson (W.Va.) mine-run (st.)	Cincinnati	1.00@1.25	1.00@1.25	1.00@1.30	1.00@1.30	1.00@1.30
Williamson (W.Va.) nut-and-slack	Cincinnati	.60@.85	.60@.85	.60@.85	.60@.85	.60@.85
Logan (W.Va.) lump	Cincinnati	1.10@1.50	1.10@1.50	1.10@1.50	1.10@1.50	1.10@1.50
Logan (W.Va.) egg	Cincinnati	1.00@1.30	1.00@1.35	1.00@1.30	1.00@1.30	1.00@1.35
Logan (W.Va.) mine-run	Cincinnati	.90@1.35	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Logan (W.Va.) nut-and-slack	Cincinnati	.50@.75	.50@.75	.50@.75	.50@.75	.50@.75
Logan (W.Va.) slack	Cincinnati	.50@.75	.50@.75	.50@.75	.50@.75	.50@.75
Hocking (Ohio) lump	Columbus	1.70@1.85	1.70@1.85	1.70@1.85	1.70@1.85	1.70@1.85
Hocking (Ohio) egg	Columbus	1.50@1.65	1.50@1.65	1.50@1.65	1.50@1.65	1.50@1.65
Hocking (Ohio) mine-run	Columbus	1.35@1.50	1.35@1.50	1.35@1.50	1.35@1.50	1.35@1.50
Hocking (Ohio) nut-and-slack	Columbus	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Pitts. No. 8 (Ohio) lump	Cleveland	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
Pitts. No. 8 (Ohio) ¾-in. lump	Cleveland	1.15@1.30	1.15@1.30	1.15@1.30	1.15@1.30	1.15@1.30
Pitts. No. 8 (Ohio) egg	Cleveland	1.20@1.35	1.20@1.35	1.20@1.35	1.20@1.35	1.20@1.35
Pitts. No. 8 (Ohio) mine-run	Cleveland	1.10@1.15	1.10@1.15	1.10@1.15	1.10@1.15	1.10@1.15
Pitts. No. 8 (Ohio) slack	Cleveland	.65@.75	.65@.75	.65@.75	.65@.75	.65@.75

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

Encouraging signs appeared in New England in August. Demand for prepared coal was better, and many of the smaller steam users made purchases in anticipation of cold weather. Prices showed little change, with the best grades of smokeless mine-run available from $4.10 down to $3.85, f.o.b. vessels, Hampton Roads. On cars at Boston, the usual quotation was $5.25, with some sales at $5. Stoker prices continued to drag bottom at $3@$3.10 at Norfolk and $4.25 on cars at Boston. All-rail steam coals from central Pennsylvania dropped in price in the last two weeks.

SIGNS of recovery in the New York market were absent in August. Industrial consumption failed to increase, and users continued to postpone additions to stockpiles, as did retail dealers. A slight increase in the movement of prepared sizes brought about greater weakness in slack quotations without causing a rise in quotations on the former.

Demand for fuel continued to shrink in the Philadelphia market in August, and prices softened slightly as the month wore on. Users refused to add to stocks. Both the tidewater and bunkering trade were quiet.

While some gains in the demand for domestic coal were marked up in the Birmingham market in August, they were not sufficient to change materially the generally depressed status of the trade. Mine prices were advanced Sept. 1 to the following: Big Seam and Carbon Hill lump and egg, $2.15@$2.25; nut, $2.15@$2.20; Cahaba lump and egg, $3@$4.25; nut, $3@$3.25; Black Creek lump and egg, $3.50@$3.75; nut, $3; Corona lump and egg, $2.60; nut, $2.35; Montevallo-Aldrich lump, $4.75; egg, $4.50; nut, $3; Dogwood lump, $4.75; egg, $4.50; Straven lump, $4; egg, $3.75; nut, $2.75. Sharp competition for the relatively small amount of steam business resulted in considerable price shading in August. Prevailing quotations in August were: Big Seam and Carbon Hill mine-run, $1.40@$1.60; washed, $1@$1.25; Cahaba washed, minus 3-in., $1.65@$1.75; minus 1-in., $1@$1.35; Black Creek washed, $1.75@$2.

The last week of August brought a refreshing stir to the New York anthracite market after four weeks of inactivity. The price advance of 20c. scheduled for September was given a large share of credit for the increased demand, though home-coming vacationists were a stimulating factor. Curtailed output very nearly created a scarcity in buckwheat; rice also was short at times. Concessions were made on other sizes by the independents. Demand for stove picked up as the month wore on, while there was a let-up in the call for egg. Nut was present in an embarrassing abundance, and pea also was a trifle too plentiful at times.

Conditions in the Philadelphia anthracite market in August closely paralleled those prevailing in New York. Demand was light until the prospects of a price advance on Sept. 1 brought a number of reluctant buyers into the fold. The rush was not as great as was anticipated, however, with the result that producers found themselves with a number of unsold cars on hand even in the midst of the spurt. All domestic sizes of coal were in free supply, with nut leading the list. Buckwheat was the only size in either the steam or domestic lists where a scarcity threatened, and even here it failed to materialize. Rice lost a little of its favorable position.

Exports of coal and coke rose slightly in July, the last month for which data are available, while shipments of anthracite to foreign countries declined. Totals were as follows: bituminous coal, 1,087,412 gross tons, against 994,363 tons in June and 1,590,488 tons in July, 1930; anthracite, 109,540 tons, compared with 145,737 tons in the preceding month and 129,033 tons in the same month last year; coke, 50,308 tons, against 45,148 tons in June and 92,862 tons in July, 1930. Imports in July were: bituminous coal, none; anthracite, 55,448 tons; coke, 4,895 tons. Imports in June were: bituminous, 38 tons; anthracite, 50,864 tons; coke, 7,167 tons. Figures for July, 1930, were: bituminous, 844 tons; anthracite, 28,671 tons; coke, 10,430 tons.

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

	Market Quoted	Week Ended Aug. 1, 1931	Aug. 8, 1931	Aug. 15, 1931	Aug. 22, 1931	Aug. 29, 1931
MIDDLE WEST						
Franklin (Ill.) lump	Chicago...	$2.75	$2.75	$2.75	$2.75	$2.75
Franklin (Ill.) egg	Chicago...	2.40@2.60	2.40@2.60	2.40@2.60	2.40@2.60	2.40@2.60
Franklin (Ill.) mine-run	Chicago...	2.15	2.15	2.15	2.15	2.15
Franklin (Ill.) screenings	Chicago...	1.10@1.60	1.10@1.60	1.20@1.60	1.20@1.60	1.20@1.60
Central Ill. lump	Chicago...	1.50@1.90	1.50@1.90	1.50@1.90	1.90@2.05	1.90@2.05
Central Ill. egg	Chicago...	1.50@1.90	1.50@1.90	1.50@1.90	1.90@2.05	1.90@2.05
Central Ill. mine-run	Chicago...	1.70@1.80	1.70@1.80	1.70@1.80	1.70@1.80	1.70@1.80
Central Ill. screenings	Chicago...	.55@1.00	.55@1.00	.85@1.00	.85@1.00	.85@1.00
Ind. 4th Vein lump	Chicago...	2.10@2.50	2.10@2.50	2.10@2.50	2.10@2.50	2.10@2.50
Ind. 4th Vein egg	Chicago...	2.00@2.50	2.00@2.50	2.00@2.50	2.00@2.50	2.00@2.50
Ind. 4th Vein mine-run	Chicago...	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Ind. 4th Vein screenings	Chicago...	1.00@1.40	1.00@1.40	1.00@1.30	1.00@1.30	1.00@1.30
Ind. 5th Vein lump	Chicago...	2.00@2.10	2.00@2.10	2.00@2.10	2.00@2.10	2.00@2.10
Ind. 5th Vein egg	Chicago...	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Ind. 5th Vein mine-run	Chicago...	1.20@1.75	1.20@1.75	1.20@1.75	1.20@1.75	1.20@1.75
Ind. 5th Vein screenings	Chicago...	.55@ .90	.55@ .90	.55@ .90	.55@ .90	.55@ .90
Mt. Olive (Ill.) lump	St. Louis..	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75
Mt. Olive (Ill.) egg	St. Louis..	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60
Mt. Olive (Ill.) mine-run	St. Louis..	1.30@1.50	1.30@1.50	1.30@1.50	1.30@1.50	1.30@1.50
Mt. Olive (Ill.) screenings	St. Louis..	.80@1.15	.80@1.15	.80@1.15	.80@1.15	.80@1.15
Standard (Ill.) lump	St. Louis..	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60	1.50@1.60
Standard (Ill.) egg	St. Louis..	1.40@1.60	1.40@1.60	1.40@1.60	1.40@1.60	1.40@1.60
Standard (Ill.) mine-run	St. Louis..	1.25@1.40	1.25@1.40	1.25@1.40	1.25@1.40	1.25@1.40
Standard (Ill.) screenings	St. Louis..	.70@1.00	.70@1.00	.70@1.00	.70@1.00	.70@1.00
West Ky. lump	Louisville..	1.15@1.25	1.15@1.50	1.15@1.50	1.15@1.50	1.15@1.70
West Ky. egg	Louisville..	1.15@1.25	1.15@1.40	1.15@1.40	1.15@1.40	1.15@1.60
West Ky. nut	Louisville..	1.00@1.15	1.15@1.40	1.15@1.40	1.15@1.40	1.15@1.60
West Ky. mine-run	Louisville..	.85@1.00	.85@1.25	.85@1.25	.85@1.25	.85@1.25
West Ky. screenings	Louisville..	.60@ .75	.50@ .75	.50@ .75	.50@ .75	.35@ .60
West Ky. lump	Chicago...	.90@1.15	.90@1.15	.90@1.15	1.10@1.50	1.25@1.35
West Ky. egg	Chicago...	.90@1.15	.90@1.15	.90@1.15	1.10@1.35	1.25@1.35
West Ky. nut	Chicago...	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.15
West Ky. screenings	Chicago...	.55@ .75	.55@ .75	.45@ .75	.45@ .75	.40@ .75
SOUTH AND SOUTHWEST						
Big Seam lump	Birmingham	$2.00	$2.00	$2.00	$2.00	$2.00
Big Seam mine-run	Birmingham	1.40@1.50	1.40@1.50	1.40@1.50	1.40@1.50	1.40@1.50
Harlan (Ky.) block	Chicago...	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75
Harlan (Ky.) egg	Chicago...	1.50@1.65	1.50@1.65	1.50@1.65	1.50@1.65	1.50@1.65
Harlan (Ky.) slack	Chicago...	.85@1.10	.85@1.10	.85@1.10	.85@1.10	.85@1.10
Harlan (Ky.) block	Louisville..	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00
Harlan (Ky.) egg	Louisville..	1.25@1.50	1.25@1.50	1.35@1.60	1.40@1.65	1.40@1.65
Harlan (Ky.) mine-run	Louisville.	1.25@1.50	1.25@1.50	1.25@1.50	1.25@1.50	1.25@1.50
Harlan (Ky.) nut-and-slack	Louisville..	.65@1.00	.60@ .90	.60@ .90	.60@ .90	.65@ .90
Harlan (Ky.) block	Cincinnati.	1.25@2.25	1.25@2.25	1.25@2.25	1.25@2.25	1.25@2.25
Harlan (Ky.) egg	Cincinnati.	1.10@1.75	1.10@1.75	1.10@1.75	1.10@1.75	1.10@1.75
Harlan (Ky.) mine-run	Cincinnati.	1.00@1.35	1.00@1.35	1.00@1.35	1.00@1.40	1.00@1.40
Harlan (Ky.) nut-and-slack	Cincinnati.	.60@ .85	.60@ .85	.60@ .85	.60@ .85	.60@ .85
Hazard (Ky.) block	Chicago...	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
Hazard (Ky.) egg	Chicago...	1.15@1.30	1.15@1.30	1.15@1.30	1.15@1.30	1.15@1.30
Hazard (Ky.) slack	Chicago...	.70@ .75	.70@ .75	.70@ .75	.70@ .75	.70@ .75
Hazard (Ky.) block	Louisville..	1.15@1.50	1.15@1.75	1.15@1.75	1.15@1.85	1.25@2.00
Hazard (Ky.) egg	Louisville..	1.15@1.25	1.15@1.25	1.15@1.25	1.15@1.35	1.15@1.35
Hazard (Ky.) mine-run	Louisville..	1.00@1.15	1.00@1.25	1.00@1.25	1.15@1.25	1.15@1.25
Hazard (Ky.) nut-and-slack	Louisville..	.60@ .75	.50@ .75	.50@ .75	.50@ .75	.50@ .75
Hazard (Ky.) block	Cincinnati.	1.10@1.65	1.10@1.50	1.10@1.60	1.10@1.60	1.25@1.75
Hazard (Ky.) egg	Cincinnati.	1.00@1.35	1.10@1.40	1.10@1.40	1.10@1.40	1.10@1.50
Hazard (Ky.) mine-run	Cincinnati.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.30
Hazard (Ky.) nut-and-slack	Cincinnati.	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Elkhorn (Ky.) block	Chicago...	1.50@1.85	1.50@1.85	1.50@1.85	1.50@1.85	1.75@2.25
Elkhorn (Ky.) egg	Chicago...	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75	1.50@1.75
Elkhorn (Ky.) slack	Chicago...	.90@1.25	.90@1.25	.90@1.25	.90@1.25	.75@1.25
Elkhorn (Ky.) block	Louisville..	1.25@2.00	1.25@2.00	1.25@2.00	1.25@2.00	1.50@2.00
Elkhorn (Ky.) egg	Louisville..	1.25@1.50	1.25@1.50	1.25@1.50	1.25@1.50	1.25@1.50
Elkhorn (Ky.) mine-run	Louisville..	1.10@1.25	1.00@1.25	1.00@1.25	1.10@1.50	1.15@1.50
Elkhorn (Ky.) nut-and-slack	Louisville..	.65@1.00	.60@ .90	.60@ .90	.60@ .90	.60@ .90
Elkhorn (Ky.) block	Cincinnati.	1.25@3.00	1.25@3.00	1.25@3.00	1.25@3.00	1.25@3.00
Elkhorn (Ky.) egg	Cincinnati.	1.10@1.75	1.10@1.75	1.10@1.75	1.10@1.75	1.10@1.75
Elkhorn (Ky.) mine-run	Cincinnati.	1.00@1.50	1.00@1.50	1.00@1.50	1.00@1.50	1.00@1.50
Elkhorn (Ky.) nut-and-slack	Cincinnati.	.60@ .90	.60@ .90	.60@ .90	.60@ .90	.60@ .90
Kansas shaft lump	Kansas City	3.00@3.25	3.00@3.25	3.00@3.25	3.00@3.25	3.00@3.25
Kansas strip lump	Kansas City	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25
Kansas mine-run	Kansas City	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Kansas screenings	Kansas City	.85@1.50	.85@1.50	.65@1.50	.75@1.25	.75@1.25

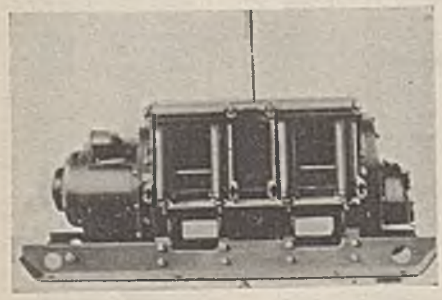
WHAT'S NEW

IN COAL-MINING EQUIPMENT

Slushing Hoist Is Electric

A double-drum electric hoist for slushing in metal and coal mines, and for general scraping and dragline operations, has been developed by the Ingersoll-Rand Co., New York City. The hoist, known as Size 215, is rated at 15 hp., according to the company, and will give a rope pull of 2,000 lb. at 240 ft. per min. Either a.c. or d.c. motors are available. Capacity of each of the drums is 300 ft. of $\frac{1}{2}$-in. cable or 500 ft. of $\frac{3}{8}$-in. cable.

A feature of the design, the company observes, is the use of a strong cylindrical steel housing, which incloses the working parts and also provides a rigid support. This construction, it is asserted, insures perfect alignment of the working parts and results in safer operation. Other features pointed out by the maker are: drive to each drum consists of three-shoe, internal-expanding, friction-type clutch, which prevents



Ingersoll-Rand Size 215 Slushing Hoist

overloading and allows of slippage to vary the speed of the pull; only one drum at a time can be engaged, thus preventing locking of the hoist; gears are inclosed in a dust- and oil-tight chamber and run in grease; separate brake shoes are provided for each drum; cable guide rollers are equipped with Timken bearings, and may be tilted or inverted for "winding under"; and steel skids are furnished with the hoist.

New Safety Switch

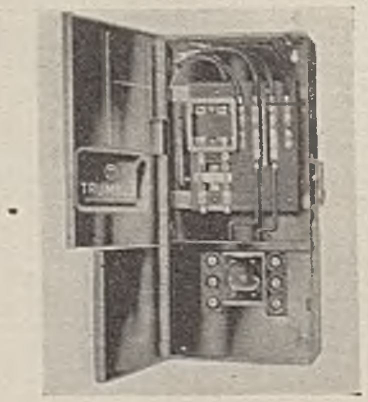
Trumbull Electric Mfg. Co., Plainville, Conn., has announced the new "R.B." safety switch with receding blade construction, designed, it is stated, for long life in heavy-duty service. A double break contact which ruptures the current on the outside of the current-carrying surface allows the switch to operate thousands of times without deterioration of the contact surfaces, the company says. The current does not pass through any hinged, soldered, or riveted connections, making, it is asserted, a stronger and more compact unit, and reducing the voltage drop.

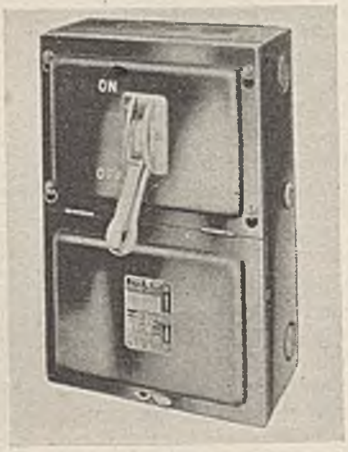
Trumbull "R.B." Safety Switch

The Trumbull company also offers a front-operated "R.B." safety switch, identical with the side-operated type but with the following additional advantages, according to the company: convenient for close gaging and for mounting on industrial switchboards where space is limited; lower half of cover is hinged at the center and interlocked with the switch handle—switch handle is lifted to the "off" position to renew fuses; slot in the end of the handle provides for "stick operation"; handle lays close to the cover in both "off" and "on" positions; handle guard is equipped with slots for use in locking the switch in either position; and the entire cover may be removed for inspection by taking out four screws.

A combination range and meter service switch is a new addition to the Trumbull line, and can be furnished with either 2-, 4-, or 6-branch circuit cutouts. The switch is rated at 60 amp. at 125-250 volts, and, according to the company, has the following features: one box contains the entire equipment, with separate covers over the switch and branch circuit fuses; range circuit is equipped with 60-amp. deadfuse puller; ample wiring room is provided; and the links are so arranged that the load wires go in at the bottom, leaving only the meter connection wires at the top. This construction conforms to one of the requirements of the NELA meter committee.

Combination Range and Meter Switch



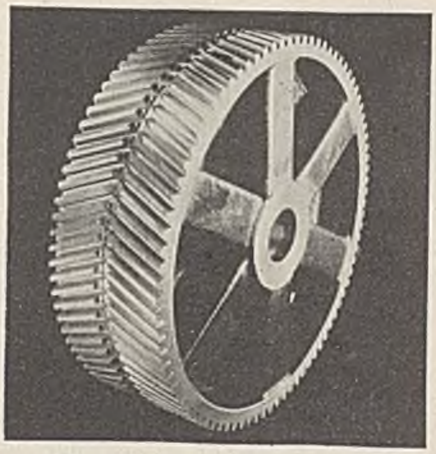


"R.B." Front-Operated Safety Switch

Welded Steel Gears

The Philadelphia Gear Works, Philadelphia, Pa., offers a new line of welded steel gears under the trade name "Philweld." Diameter of the gears varies from 15 to 168 in., and they are especially adapted to heavy-duty service, the company says. Life is 30 to 50 per cent longer than cast-steel gears, it is claimed, and the welded gears have 50 per cent greater strength. Using dense, homogenous, rolled-steel plate (1040 S.A.E.) throughout, the rim is cut in the form of a solid ring from a flat plate by means of a gas torch. A solid, rolled-steel disk forms the web of the gear, against which channel-shaped, pressed-steel arms are welded on both sides. The hub is a forged-steel bar drilled to receive the shaft. Hub, web, arms, and rim are welded into the finished structure and then normalized before machining to prevent warping.

Advantages stressed by the company are: metal can be distributed to the



"Philweld" Welded Steel Gear

best advantage because the gears are welded and not cast; blow holes are eliminated by the use of closely-knit rolled steel, thus guarding against tooth failure; internal casting strains are done away with; wear due to metal-to-metal contact is lessened because the material used in the gears is less abrasive than cast steel; weight is 10 per cent less; natural balance is secured because of the use of metal of a uniform density and the fact that each part is rolled and cut to size before installation. Spur, helical, herringbone, bevel, internal, spiral, and continuous herringbone (Sykes type) gears are now offered in the welded steel construction, and heavy-duty speed reducer units can be obtained with "Philweld" gears if desired.

Another development of the Philadelphia Gear Works is the welded, rolled-steel, speed reducer housing, available on all models of the Philadelphia speed reducer line. These casings, according to the company, are 75 to 100 per cent stronger, and will prevent accidental crushing of reducer units by falling weights or blows. In addition, they exclude dirt, rust, moisture, acid fumes, and other external dangers.

Locomotive for Stripping

The Vulcan "Duplex" steam locomotive for stripping service, said to be the only one of its type in America, has been developed by the Vulcan Iron Works, Wilkes-Barre, Pa., for stripping service. The design according to the company, results in a comparatively heavy locomotive, with, however, the weight distributed over a greater length of rail and a greater number of ties to reduce track maintenance. It is equipped with two swiveling trucks, thus, it is claimed, giving it an advantage over the rod engine in that it can negotiate sharper curves and can exert a greater traction on poorly-constructed roadbeds.

The locomotive shown in the accompanying illustration has a gross weight of 55 tons, distributed over eight driving wheels. The driving wheels are arranged in two four-wheel swiveling trucks. Each truck is a complete unit in itself, and obtains its steam from the boiler through a flexible connection. Driving wheels are 33 in. in diameter. The truck wheelbase is 5 ft. and the over-all wheelbase is 26 ft. 5 in. Length of the locomotive over the bumpers is 32 ft. 6 in.

Boiler, cab, tank, and upper structure are carried on a main frame of structural steel. The boiler is of the extended wagon-top type with charcoal iron tubes. Working pressure is 200 lb. per sq.in. The water tank, located

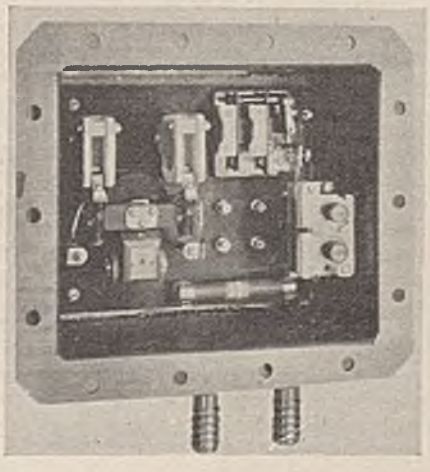
Vulcan, "Duplex," 55-Ton Stripping Locomotive

over the rear engine truck, holds 1,400 gal. Space is provided for 5,000 lb. of coal. The locomotive is equipped with a Westinghouse Modified No. 6-ET air-brake apparatus. Tractive effort of the 55-ton machine is greater than 30,000 lb., the company states. By means of a special arrangement of the steam line, both trucks may be operated simultaneously, or the steam to either truck may be partly or completely shut off to prevent slippage of the wheels. This control operates independently of the main throttle, and does not interfere with it.

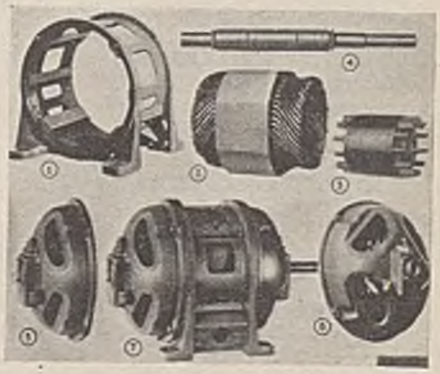
Explosion-Tested Linestarter

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has developed a new explosion-tested magnetic starter for "linestarting" 1- to 5-hp., 230- and 550-volt motors. Inverse time limit overload protection is supplied by a thermal overload relay with characteristics which permit the short high current peaks caused by "linestarting" while retaining accuracy and sensitivity to overloads of long duration. The time-saving feature of automatic reset is supplied on this relay, the company says. Other features pointed out are: Fuse connected in the positive lead gives short-circuit protection; low voltage protection prevents unexpected or unsupervised starting; "start" and "stop" pushbuttom unit is mounted in the case and operated by plungers from the front; light-weight, explosion-proof compartment is made of $\frac{1}{4}$- to $\frac{3}{8}$-in. rolled sheet steel and has over-all dimensions, including the outside flange, of 13½x 15½x8 in.; and the electrical circuit is broken by a two-pole magnetic contactor which has an arc-rupturing capacity of 150 amp. at 500 to 550 volts when totally inclosed in a permissible compartment.

Westinghouse, Explosion-Tested Magnetic Starter, Cover Removed



This starter has passed the Bureau of Mines test for "permissible" or "explosion-tested" equipment and their adequacy test for application up to and including 5-hp. continuous rated motors, the company says. The company also has developed a line of 230- and 500-volt explosion-tested motors to be used in conjunction with this starter.

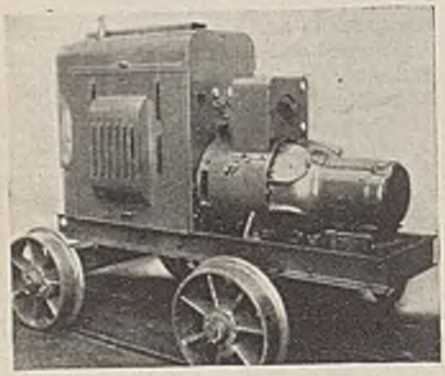


Standard Cast Frame (1), Standard Pre-Wound Core (2), Standard Die-Cast Rotor (3), Sealed Sleeve-Bearing Shaft (4), Standard Sealed Sleeve-Bearing Brackets (5) and (6), and a New Westinghouse Type CS Motor (7) Equipped With Sealed Sleeve-Bearings

Different parts of the motor have been made as entirely separate units in the new W-frame, Type CS, squirrel-cage, induction motor designed by the Westinghouse company. This type of construction, the company says, makes maintenance simpler and less expensive because damaged electrical parts can be replaced without replacing or rewinding the motor. The stator core with its windings is pressed into the frame of the new motor, and can be replaced by pressing it out and substituting a new core. Like the stator, the rotor is a complete unit.

Both the stator and rotor can be supplied as such for built-in motor or repair purposes. This feature, it is said, makes it possible to vary both the electrical and mechanical characteristics of a given machine. In addition. separate-frame construction makes it possible to supply any one of a number of different frames to meet the needs of the buyer. Applications which can be made without a great number of mechanical variations are: vertical or horizontal mounting; vertical or flush-mounting of motors without feet against the side of the machine; and choice of open, semi-inclosed, or totally inclosed motors.

A gas-engine-driven welding set, equipped with flanged wheels for track service, is offered by the Westinghouse



"Flexarc" Welder

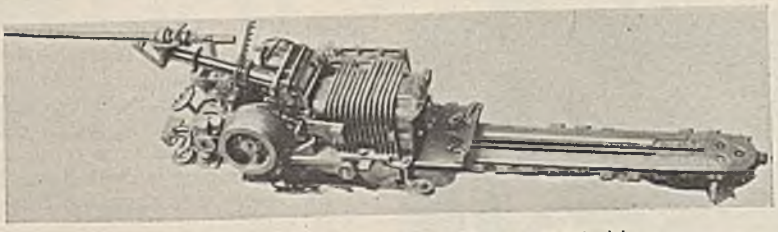
company. It is adaptable, the company says, for service on railroad lines or in mines. Capacity of the equipment, designated as the "Flexarc" welder, is 2,000 amp. It is self-contained and can be operated by one man.

Shortwall Power Drills; Detachable Bits

To meet the demand for a strong and powerful drill with a long life and performance equal to that of modern coal-cutters, the Goodman Mfg. Co., Chicago, states that it has developed two new drilling attachments for its shortwall mining machines.

The Type "E" drill is designed to fit all low-vein machines of the 212 series, and is driven by a spur gear meshing with the intermediate spur gear of the shortwall gear train. The Type "F" drill is designed to fit all machines in the 12 and 112 series, and receives its power directly from the armature pinion of the cutting motor. The new drills, which may be installed on all types of Goodman shortwalls in the field and eliminate the commonly-used high-speed motor, are recommended by the company for drilling shotholes even

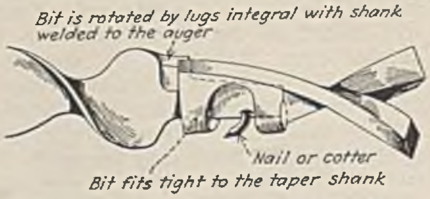
Guard Tube Removed and Thread Bar Slid Back Over the Machine



Type "F" Drill Mounted on Shortwall Machine

larger than those required for Cardox shells.

In both drills the strongarm which supports the drilling head is inclined away from the face, thus giving ample space to start a suitable length of auger, the company states. By removing the guard tube over the thread bar and sliding the latter back over the machine, the drill will not overhang, except where very long thread bars or strongarms are used. The attachments are bolted to the tops cf the machines, and increase the over-all height from 9 to 12 in. One hand lever controls the thread bar. When it is in neutral, all parts are at rest except for the gear meshing with the shortwall gear. Rate of feed can be changed from zero to maximum by adjusting a hand nut on the drilling head, and the thread bar



Goodman Detachable Bit

may be slid through the drilling head by opening the split boxing.

The strongarm is held at various angles to the machine by a rack, and the drilling head may be turned at an angle to the strongarm or revolved around it by loosening and tightening one nut. The drilling head, together with the handling of the cutting machine itself, provides for adjustment to drill the face from any required position, the company asserts.

The Goodman Mfg. Co. is now prepared to furnish what it states to be a strong and economical detachable bit for augers. The new bit is made in 2-, $2\frac{1}{4}$-, and $2\frac{1}{2}$-in. sizes, is 4 in. long, and weighs a little over $\frac{1}{2}$ lb. It is made of $\frac{5}{16}$-in. tool steel which does not require exceptional handling, and may be resharpened many times before it is discarded. Special steels can be furnished. Difficulty with former bit designs has been overcome, the company says, by forming the twist to fit over a shank welded to the auger, thus assuring a smooth joint and free passage of the cuttings.

The bit fits tightly over a taper shank, thus maintaining, it is claimed, perfect alignment with the auger and assuring a straight hole. A cotter or nail passing through the end of the shank retains the bit should it come loose in withdrawing the auger. Rotation is transmitted to the bit by lugs integral with the shank of the auger. Shanks are identical for the three sizes of bits, and are welded into a $\frac{5}{8}$-in. slot cut into the end of the auger twist. Consequently, they may be replaced or reforged as necessary. Detachable bits are convenient and safe, the company says, as they eliminate the transportation of full-length augers for resharpening. The bit is made of a small amount of material, hence the grade can be raised, giving longer service per sharpening.

Shovel Is Convertible

Bucyrus-Erie Co., South Milwaukee, Wis., has developed a new convertible shovel-dragline-crane-clamshell, known as the 32-B. Capacity of the equipment is 1 cu.yd. Choice of gasoline, electric, or diesel power is available, and the company states that either rope or

32-B Shovel-Dragline-Crane-Clamshell

chain crowd can be had on the shovel, and that extra-long and extra-wide mountings are provided for dragline work. Weight, it is claimed, has been held down by simplicity and the elimination of unnecessary bulk where bulkiness does not contribute needed strength. The machine is said to be exceptionally strong, and special attention has been given to balancing the hoisting, crowding, swinging, and dumping motions to secure a minimum time for a complete digging and loading cycle. Stability, accessibility, quick convertibility, and efficient transmission of power also are emphasized by the manufacturers.

Bucyrus-Erie also has added to its line the 37-B shovel-crane-dragline-clamshell, with a capacity of $1\frac{1}{4}$ to $1\frac{1}{2}$ cu.yd. Construction details are in general similar to those of the 32-B machine, and the same choice of power is available. In addition, according to

37-B Shovel-Dragline-Crane-Clamshell

the company, the 37-B machine has the following features: operating levers toggle in; brakes are oversize, operate smoothly, and are equipped with cooling fins; steering can be accomplished from the operator's stand with the cab in any position; double-operating chocking brakes are provided on the caterpillar mountings; a swing brake is provided for operating on grades; three-side vision is provided in the steel cab; dipper trip is power-operated; and the dipper is of the inserted-tooth type.

The Bucyrus-Erie Co. also has developed a new 3-yd. diesel dragline, designated as Class III, which it declares has great mobility. This is secured, the company says, by the crawler mounting, which has an ex-

Class III, Diesel Dragline Excavator Equipment

tremely large bearing area, thus enabling the machine to move safely over soft ground. The power unit is a six-cylinder, full diesel engine, said to have high torque even at slow speeds. Complete air control is included.

Another addition to the Bucyrus-Erie line is the 43-B, 1½-1¾ yd., shovel-crane-dragline-clamshell equipment. The

43-B Universal Machine With Shovel Equipment

manufacturer offers a choice of diesel, gasoline engine, or electric drive; rope or crowd chain on the shovel; or regular or special mountings for soft ground dragline work. Conversion from one type of work is said to be simple and easily accomplished.

Pump for Liquids Carrying Solids

DeLaval Steam Turbine Co., Trenton, N. J., now offers the "Clogless" pump for use with liquids carrying solids which tend to cause clogging. The casing is split in the plane of the shaft, with the discharge connection in the lower half so that the casing cover can be lifted off without disturbing the connections. A handhole is located on the cover half of the suction nozzle for quick access to the suction side of the impeller. The suction nozzle, it is claimed, is designed for a large-size suction pipe, with its attendant advantages.

The lower half of the casing is cast integrally with the pedestal, which is designed for bolting directly to the bedplate of motor- or engine-driven units. Passages through the impeller, both through the side plates and between the vanes are extra-wide, the company says. Ordinarily, only two vanes are used, proper guiding of the liquid without cavitation or shock being attained by proper selection of speed and impeller diameter. The pumps ordinarily operate at a slow speed, yet the efficiency, it is claimed, compares favorably with standard, high-speed, clear-water pumps. Where pump capacity or the nature of the liquid permits, the number of impeller blades is increased to three or four, permitting higher speeds.

The impeller is protected at the joint between it and the casing by a bronze ring threaded upon it, while the casing is protected by a stationary bronze ring seated in recesses in the casing and cover and, therefore removable when the cover is lifted. Provision is made for sealing the joint between the rings with clear water. For some services, an open impeller with special removable side plates may be secured. The knife-like edges of the impeller running close to the side plates cut or shear stringy material. Efficiencies, the company says, are nearly as high as those with the inclosed impeller. To avoid too great overhang of the shaft, the stuffing box is located over the impeller hub, which is protected by a renewable bronze sleeve. Clear-water sealing is provided. Ball bearings are used throughout.

Protective Cap

The "Skullgard," a new protective head covering, is now offered by the Mine Safety Appliances Co., Pittsburgh, Pa., in sizes from 6 to 7⅝, inclusive. The shell is made of micarta, is a non-conductor of electricity, and entire cap,

M-S-A "Skullgard"

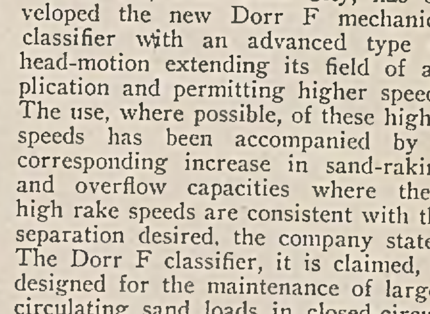
it is claimed, is durable, waterproof, acid-resisting. The crown is reinforced, and the peak is rigid, offering face and eye protection from falling materials. The reinforced edge of the cap is flared to protect the ears. A substantial lamp-holder is fastened to the shell with three insulated rivets, and is arranged to carry the most common types of lamps at the best angle for light distribution. The soft, tough, sweat-proof, leatherette lining is cushioned with four felt pad spacers, placed so as to provide proper ventilation and comfort. Six ventilation holes are added in the crown.

Classifier Has New Head-Motion

Dorr Co., New York City, has developed the new Dorr F mechanical classifier with an advanced type of head-motion extending its field of application and permitting higher speeds. The use, where possible, of these higher speeds has been accompanied by a corresponding increase in sand-raking and overflow capacities where these high rake speeds are consistent with the separation desired, the company states. The Dorr F classifier, it is claimed, is designed for the maintenance of larger circulating sand loads in closed-circuit grinding and also for coarser separations at the primary classification stage in multiple-stage grinding.

The new head-motion, according to the company, gives a speed 50 per cent higher than the previous maximum, or up to 50 strokes per minute. Simplification in design, it is stated, has decreased moving parts 22½ per cent; regularly lubricated parts, 33 per cent; and infrequently lubricated parts, 50 per cent. The new head-motion also has permitted a material reduction in

Dorr F Classifier



the headroom required. The Dorr F classifier is offered with or without the bowl for all separations from 10 to 325 mesh. Widths range from 3 to 16 ft., and lengths vary according to the mills with which the classifiers are to operate in closed circuit. Raking mechanisms are furnished in simplex, duplex, and quadruplex types.

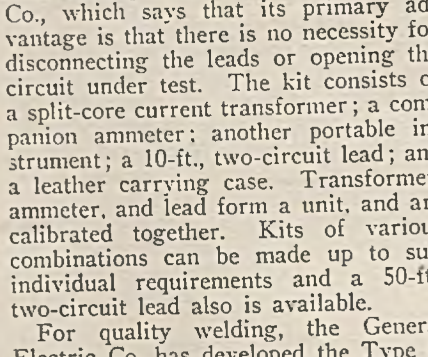
Mine Hoist Pedestal Designed

General Electric Co., Schenectady, N. Y., has developed a new mine hoist pedestal, consisting in general of a wrought pipe standard supporting a panel. The latter can be tilted to the desired angle, and is formed of ⅛-in. sheet steel. Provisions for mounting one or two instruments, together with a pressure gage, have been incorporated in the construction of the panel. It is mounted by fastening it to a horizontal, 1¼-in. pipe by means of switchboard panel fittings. The pipe supporting the panel is in turn fastened to the 2½-in. pedestal or standard by using one-half of a floor flange.

Exact agreement between the operating speeds of two or more non-synchronous electric motors can be maintained by a new control system, the General Electric Co. announces. This system, in which "selsyns" (small, self-synchronizing motors) play an important part, can be used to maintain predetermined proportional speed relations between two or more machines driven by non-synchronous motors of widely differing speeds, the company declares.

To maintain the feed of raw material in exact proportion to the speed of the kiln in the cement plant, the speed of the feeder motor is synchronized with that of the kiln motor. Kiln and feeder driving motors have adjustable speeds providing for a wide range of operation. "Selsyns" are mechanically connected to the shafts of the motors driving the kiln and feeder. When conditions are normal, the two "selsyn" generators are in synchronism. A "selsyn" differential motor has its stator electrically connected to one generator and its rotor to another.

When the generators are in synchronism, the "selsyn" motor has no rotary tendency. Any deviation in speed between the two generators will cause the differential motor to rotate in a forward or reverse direction, depending upon which generator is ahead, the motor speed being equal to the difference between the generator speeds. The "selsyn" motor is geared to a cam actuating a carbon-pile resistor connected in the field circuit of the feeder motor. Resistance of the carbon-pile changes with the pressure, and thus changes the speed of the feed motor to establish a balanced condition.

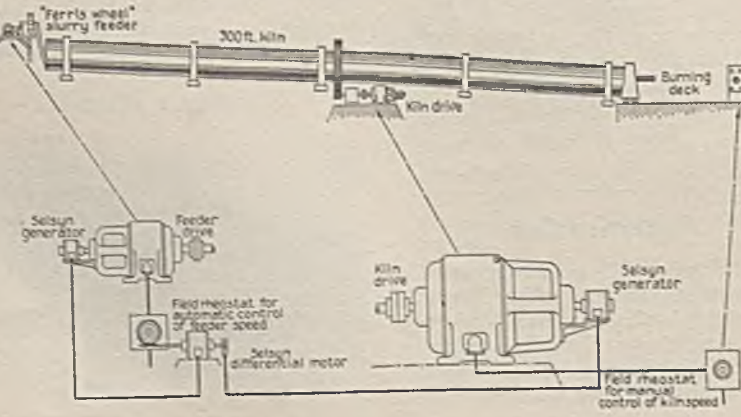


Portable Testing Kit

A new, portable testing kit for checking alternating current and voltage has been developed by the General Electric Co., which says that its primary advantage is that there is no necessity for disconnecting the leads or opening the circuit under test. The kit consists of a split-core current transformer; a companion ammeter; another portable instrument; a 10-ft., two-circuit lead; and a leather carrying case. Transformer, ammeter, and lead form a unit, and are calibrated together. Kits of various combinations can be made up to suit individual requirements and a 50-ft., two-circuit lead also is available.

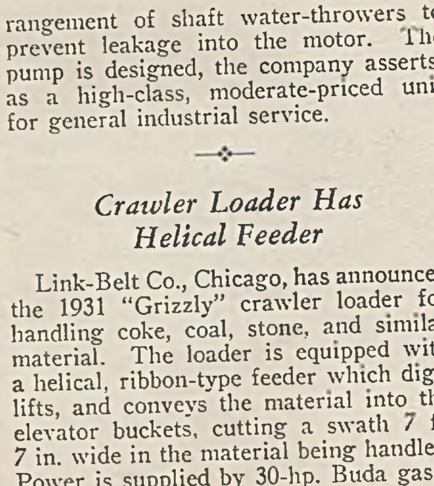
For quality welding, the General Electric Co. has developed the Type R coated electrode, composed of 0.13 to 0.18 carbon steel, covered with a heavy coating of cotton braid impregnated with an arc-stabilizing flux. Metal deposits from this electrode will have a high tensile strength and a homogeneous structure, the company states. In addition, the arc stability and high arc voltages permissible will produce an unusually high welding speed for certain types of work.

"Selsyn" System of Control for a Cement Kiln



Pump and Motor in One Unit

Good efficiency, low initial cost, and low maintenance cost are advantages claimed for the new "Monobloc" (Type D), centrifugal pumping unit of the Worthington Pump & Machinery Corporation, Harrison, N. J. The pump is bolted to the extended motor frame and the impeller is mounted on the end of the motor shaft, which is continuous. The bronze impeller contains the shaft sleeve as an integral part as one of the latest shaft protection developments of the Worthington Co. Other construction features are: cadmium-plated, steel locking device for the impeller; forged bronze packing gland; and the arrangement of shaft water-throwers to prevent leakage into the motor. The pump is designed, the company asserts, as a high-class, moderate-priced unit for general industrial service.



"Monobloc" (Type D) Centrifugal Pumping Unit

Crawler Loader Has Helical Feeder

Link-Belt Co., Chicago, has announced the 1931 "Grizzly" crawler loader for handling coke, coal, stone, and similar material. The loader is equipped with a helical, ribbon-type feeder which digs, lifts, and conveys the material into the elevator buckets, cutting a swath 7 ft. 7 in. wide in the material being handled. Power is supplied by 30-hp. Buda gasoline engine with an automatic speed governor or by a 20-hp. standard electric motor. The elevator has a rated capacity of 1¾ cu.yd. per min. Traveling speeds are: forward, 30 or 60 ft. per min.; reverse, 27 ft. per min.

Link-Belt, "Grizzly" Crawler Loader