COAL AGE

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

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Long-Term Planning

The industrial depression which started late in 1929 is a distinct challenge to the American economic system and business philosophy. Progressive leadership in industry recognizes this fact and is seeking to meet the challenge.

No help can be expected from believers in the easy fatalism of the cyclic school of recurring periods of commercial disaster with their widespread human suffering. Little assistance is to be had from those infected with itinerant pack-peddler opportunism.

The challenge, if successfully met at all, can be met only through long-term planning which will lift the valleys by depressing the peaks. Management must expand its vision beyond the complex problems of today to anticipate the unending tomorrows.

Such a campaign calls, first, for analysis of underlying principles; second, a program for future action, and, finally, individual and group effort which will relentlessly follow through. Such a campaign demands clear-cut definition of major objectives and understanding of where responsibility for achievement lies.

As a contribution to the crystallization of constructive policies and encouragement to progressive leadership in meeting the challenge of the cyclic attack upon the American economic system, the McGraw-Hill Publishing Co. has formulated "A Platform for American Business." This document is published as a supplement to this issue of *Coal Age*.

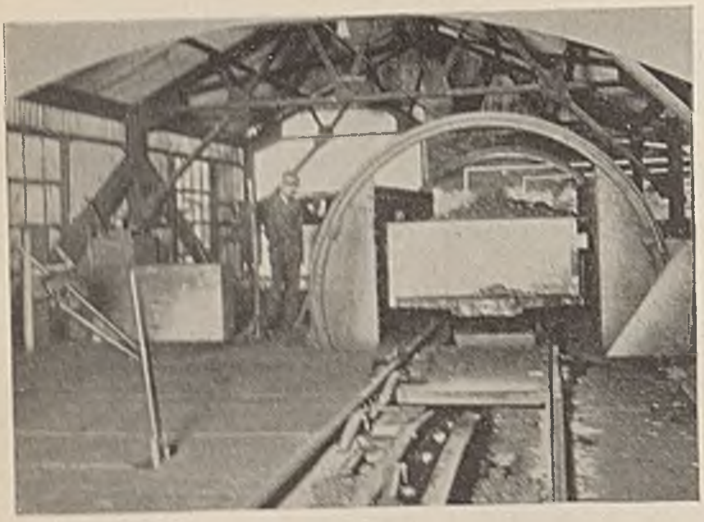
This platform is offered neither as a panacea for the automatic curing of all business ills nor as the counsel of perfection. It cannot even claim the cheap virtue of complete novelty. But the general objectives which it sets down are fundamental to the preservation of our present economic system.

Without steady raising of living standards, long-term planning for future business growth, promotion of international business co-operation, and continued encouragement of private initiative, American business can hardly hope for sound commercial and social development. With them, there should be few brakes on progress.

Whether industrial society can completely eliminate peaks and valleys is, of course, debatable. But it is an ideal worth striving for, despite the croakings of the fatalists and the indifference of the opportunists.

The platform furnishes a starting point for the drive toward this ideal. Broad as it necessarily is, since it is addressed to American business as a whole, the objectives it states should be common to all business—to coal as well as to drygoods.

Coal has much to gain by the application of these principles to the conduct of its own business. General adoption of the platform by industry in the mass would be a boon to coal, since much of the present instability in mining has its roots in the general business uncertainty which long-term planning would eliminate.

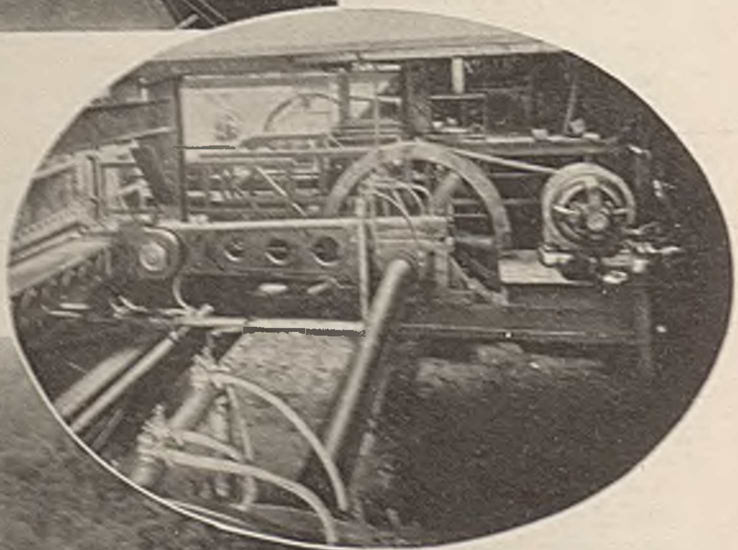


Electrically Operated Rotary Dump Built to Allow Passage of a 15-Ton Locomotive

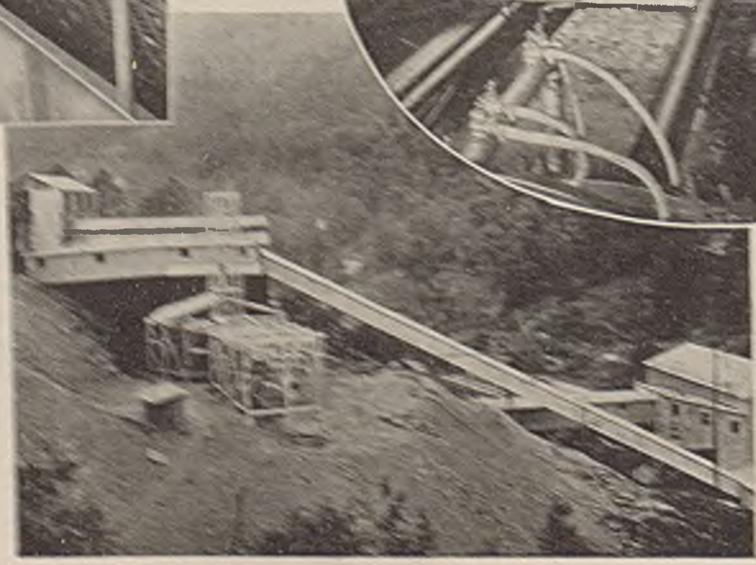
Inside View of the Bradford Breaker

Construction View of Primary Table Before Wooden Decks and Zoning Cloth Were Applied. Note Refuse Discharge Openings Along the Sides

Main Shaker With Picking Surface at Lower End Emptying Directly Into the Bradford Breaker, the Drive Chain Housing of Which Blocks the View of the End of the Breaker



Primary Table Drive Showing Ideal Lubricators



Refuse Loading Terminal of Continuous Aerial Tram

MECHANIZATION

+ Of Loading and Top Preparation Recaptures Lost Market

NOW comes West Virginia with a mine newly equipped for complete inside mechanization and for mechanical cleaning 100 per cent of the mine output. This is No. 9, a 2,500-ton operation of the Carbon Fuel Co. at Wevaco, on Cabin Creek, in Kanawha County. The entire project is based on the maintenance of uniform quality to satisfy a market for a high grade byproduct coal.

The company was organized in 1905 and reached a peak tonnage of 900,000 in 1927. This entire output was from the splint seam, and the same was true for 17 of the 25 years of the company's history. In 1916 the company first started mining the Powellton seam, which is well known for its high quality as a byproduct coal. In 1924, mining of this coal was stopped because of high cost of hand loading and the inability to secure uniform preparation by hand methods.

Relative scarcity of this particular high-volatile byproduct coal, because of the limited total acreage, caused the officials to keep close watch on progress in the industry which would point to an economic plan for reentering this market. In 1928 it was concluded that mechanization was beyond the experimental stage, so an investigation was launched to determine the economic possibility of a combination of the most favorable methods of mining and outside preparation. After more than a year of study and consultation with experts it was decided to open a new mine equipped with mechanical loaders and a Peale-Davis dry cleaning plant.

No. 9 is spoken of as a new mine, although headings which were driven some years ago are used as the main entry. Fifty thousand dollars was spent for grading and new track. To date, over $500,000 has been invested in the new project and the final total will approximate three-quarters of a million. The cleaning plant was completed May 1, 1930, and the present production, practically all development work, is 800 tons per day. Rated capacity of the cleaner is 250 tons per hour. It is the intention to mine 2,500 tons in an eight-hour shift but to operate the cleaner for ten hours.

As the entire output of the mine is crushed to 1 in. in a Bradford breaker, prevention of breakage was not a consideration in design of the plant. A 1,000-ton concrete storage bin at the top of the hill, a portion of a retarding conveyor, and two 50-ton steel loading bins of the former plant were utilized in the new layout.

Mine cars are unloaded without uncoupling in a single-car rotary dump operated by electricity. Weights are automatically recorded as a source of data for cost keeping rather than for computing wages, as all men are on a day rate. By the proper setting of a fly gate, mine refuse is directed over a reciprocating feeder and a pan conveyor into a 200-ton refuse bin at the loading terminal of an aerial tram, and the coal is directed over a distributing-type pan conveyor into the 1,000-ton bin. This conveyor, extending above the center of the bin, is equipped with several unloading plows.

From the bottom of the bin, the coal is carried down the hill on a pan conveyor to a shaker located high in the cleaning-plant structure. This shaker is equipped with a 2½-in. lip screen to facilitate hand-picking of the lump. This product and a 1x2½-in. size discharge directly into the

Flow Sheet, Carbon Fuel Co. Preparation Plant

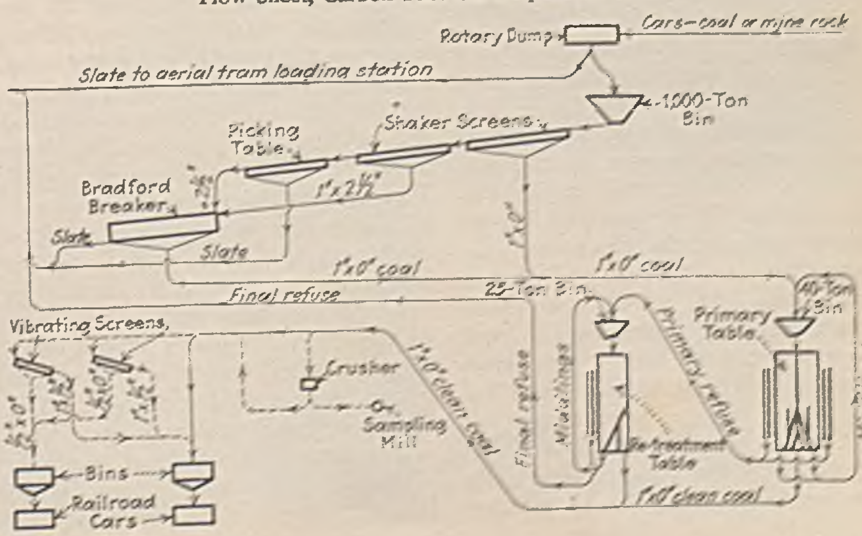
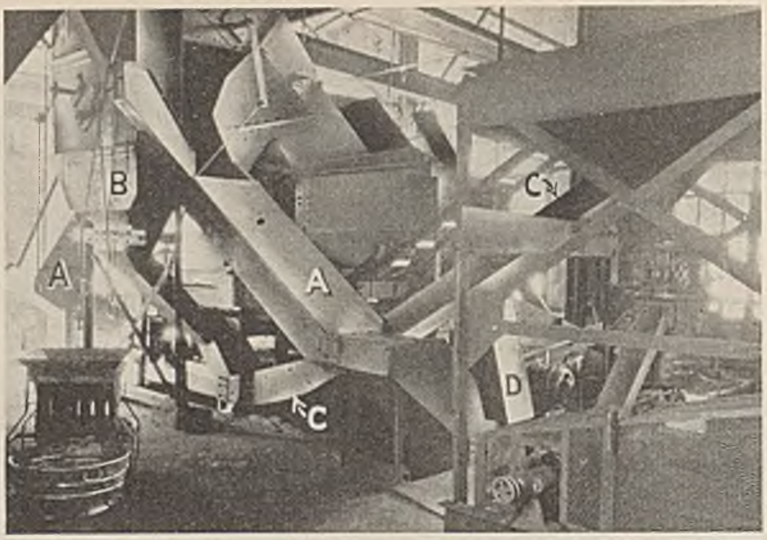


Illustration on table of contents page shows cleaning plant buildings. Sampling equipment, vibrating screens and loading bins are in the smaller building at the left. Coal is brought from the concrete bin by the conveyor having the vertical angle. Refuse is taken back up the hill by the straight conveyor.



Sampling Room. *A* and *A* Are Chutes to Two Loading Bins; *B*, Sample Hopper; *C-C-C*, Sample Conveyor to Vertical Cone Crusher; *D*, Chute for Drawing Samples From Conveyor for Float and Sink Tests

Bradford breaker, which acts as a crusher and as the second step in the rejection of impurities.

The 1-in. to 0 from the breaker and a product of the same size from the main shaker go to a 40-ton bin feeding the primary table. Refuse from the primary table passes through a 25-ton bin and onto a re-treatment table. Middlings from both tables are returned to the feed bins of the respective tables. Air blown through the tables is recirculated after relief into the huge expansion space above the tables. Escape, if any, of dust to the outside air from the circulating system is imperceptible.

FROM the cleaning plant, the cleaned coal is carried by a pan conveyor to a separate building containing sampling equipment, vibrating screens, and the two 50-ton bins above the loading tracks. By means of the vibrating screens the product can be separated into 1x½ and ½x0 if a special market should develop for these sizes. At present the screens are bypassed and the production is being shipped as 1-in. to 0.

The sampling equipment deserves special mention because of the provision for obtaining truly representative samples. In a chute just beyond the discharge of the clean coal conveyor there is a fly gate and stopper arrangement by which the entire stream can be deflected into a small two-compartment bin. The lever actuating this gate is on a floor below, where the operative cannot see the coal on the conveyor and therefore is spared the possible temptation of selecting the sample by appearance.

Three 500-lb. samples are taken while each railroad car is being loaded. In a crusher each sample is reduced to ¼-in., and 95 per cent is automatically rejected. The remaining 25 lb. is reduced to 20-mesh in a grinder and is then collected in a 2½-gal. pail. The three pailfuls are then mixed and halved several times in a Jones sampler until a 2-lb. sample remains. This goes to a laboratory which the company maintains near by, at Carbon. The laboratory is equipped for running complete proximate analyses.

Cleaning results of the plant have fulfilled all expectations as to ash reduction and uniformity. This is especially gratifying to the officials, in view of the fact that they realize that the mechanical loading complicates the attaining of this much desired uniformity. As is usually the case, the inherent ash varies slightly in different sections of the mine. With hand loading the coal making up one railroad car would come from fifteen to twenty different places in the mine, but with mechanical loading a mine-car trip carrying sufficient coal to load one railroad car usually comes from about two places in close proximity. The latter is true because the activity of a gathering locomotive is confined to one working place until that place is cleaned up. Although the coal in two railroad cars may come from widely separated places in the mine, the average difference in ash content seldom exceeds 0.5 per cent. The averages of daily analyses never vary over approximately 0.2 per cent ash.

Refuse from the picking table, Bradford breaker, and re-treatment table is carried up the hill on a flight conveyor to the 200-ton refuse bin. The aerial tram is a Trenton-Bleichert continuous type manufactured by the American Steel & Wire Co. The present capacity of 60 tons per hour can be increased to 90 tons by adding buckets and installing a larger traction rope.

The entire plant, including the items of old equipment utilized, is of concrete and steel. The rotary dump and hillside conveyors were built by the Kanawha Manufacturing Co., and the cleaning plant, including sampling apparatus and vibrating screens, by the Fairmont Mining Machinery Co. The coal company specified the electrical equipment and purchased and installed the wiring.

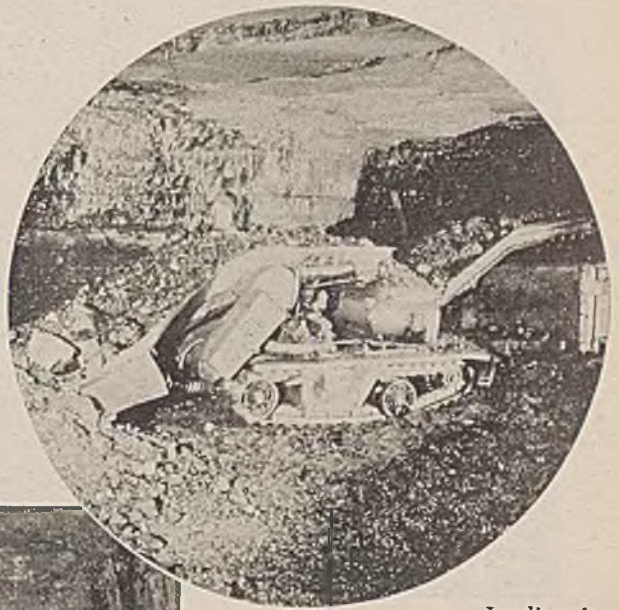
The 29 electric motors operating the plant, and totaling 582½ connected horsepower, are all of General Electric manufacture and are wound for 220 volts a.c. Most of them are 900 r.p.m. Nineteen are type FTR squirrel-cage and the largest of this type is 25 hp. Eight are the type MT slip-ring ranging from 20 to 60 hp., and one, that driving the primary fan, is a 100-hp. type TS 80-per cent power-factor synchronous motor. Each of the two MT motors driving the primary table is rated 25 hp. continuous, and 40 hp. for 8 minutes. The actual operating demand of the plant is 320 kw.

Three 100-kva. and three 25-kva. transformers handle the plant load. Motor-starting equipment consists of Trumbull safety switches and General Electric magnetic controllers. Push buttons controlling the cleaning plant are grouped on a panel between the two tables. Pilot lamps indicate when motors are in operation. All wiring is in rigid conduit. In the plant complete, including headhouse, there was used 5,670 ft. of conduit in sizes from ½ to 4 in. inclusive, and 83,000 ft. of insulated wire.

SIX types of motor-drive connections are used. These are nine gear reducers, six V-belts, ten flat belts, two Reeves variable-speed belts, one gear train, and one silent chain. The silent chain is used on the Bradford breaker, the Reeves transmissions are used on the table feeders, and the gear train is on the aerial tram. Most of the flat belts are on the old equipment that was utilized in the new layout. Two Ideal lubricators handle the remote greasing of all bearings in the cleaning plant, except motor bearings.

Working height in the mine averages 9 ft. 2 in. Eighteen to twenty-

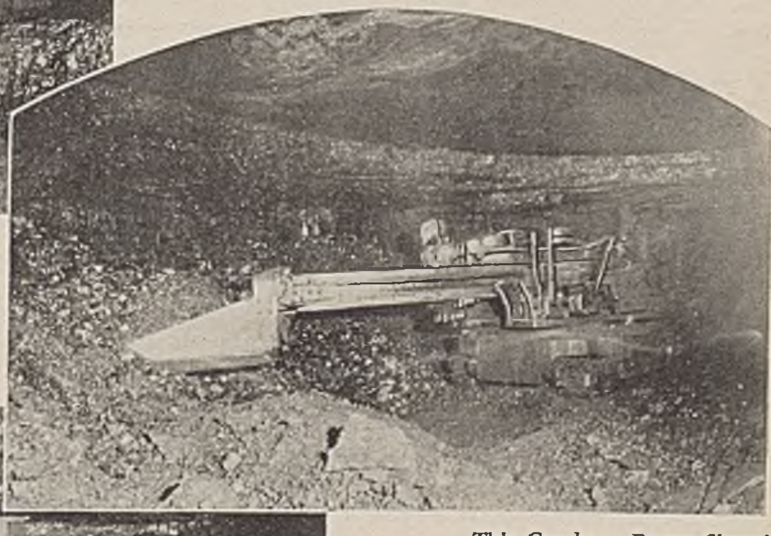
Underground at Mine No. 9 of Carbon Fuel Co.



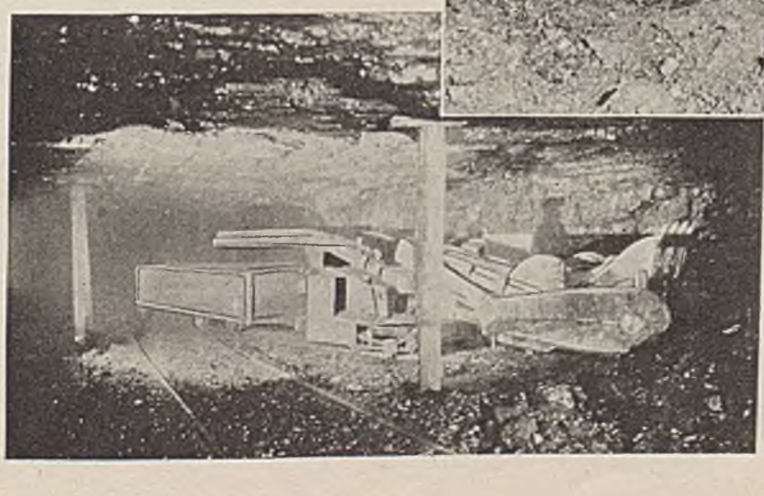
Loading the Second Cut of a Breakthrough With a Joy

Face of 16-Ft. Heading With Slate Raked Out After Having Been Cut and Shot. Note Three Shotholes in Upper Bench of Coal

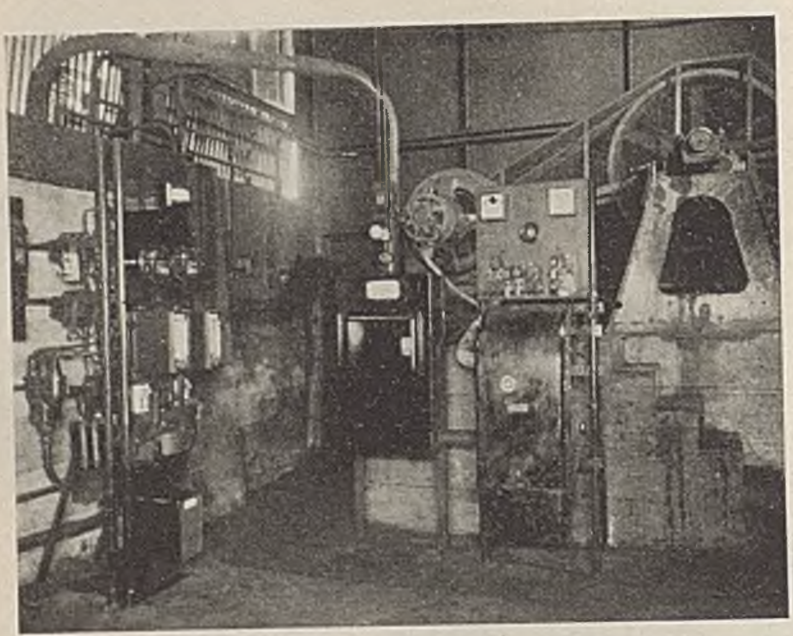
Face Fully Prepared and Swept of Impurities Ready for Shooting the Coal



This Goodman Power Shovel Works in 30-Ft. Rooms



Myers-Whaley Loading Out the Third Cut of an Entry Breakthrough



At Left, Incoming Panel; at Right, Synchronous Motor and Controls of Primary Fan

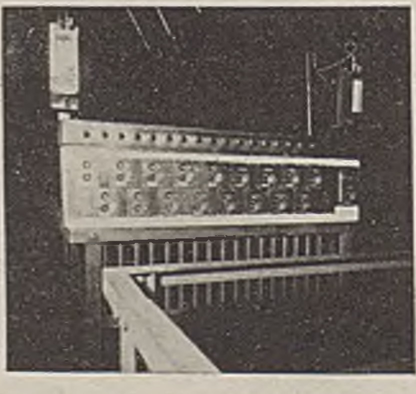
four inches of top coal is left and there is a 2-ft. band of very hard slate about 3 ft. from the bottom. This band is removed and the working place is swept clean before the coal is shot down. Coal is cut with track-mounted slabbing machines just over or just below the parting, and after the slate is shot the latter is raked out by the same machine. At one visit the loading machine loads the slate and at the next visit it loads the coal. Coal cuttings are loaded by hand.

At present four loading units are operating in the mine. Two Myers-Whaley loaders and one Joy loader are driving 16-ft. headings and a Goodman hydraulic shovel is driving rooms in experimental blocks. The Myers-Whaley and Joy units are being double-shifted. It is the expectation to drive rooms 30 ft. wide and 200 ft. deep on 40-ft. centers, gobbing as much of the slate as possible along one rib and taking a slabbing cut along the other, leaving a 3-ft. pillar. Because the coal is very soft, sloughing of the ribs will soon cause a 3-ft. pillar to weaken and allow roof caving. It is recognized that natural conditions or limitations of equipment may call for a change to some other method of working the rooms.

The main entry consists of four parallel headings and runs approximately through the center of the body of coal assigned to the mine. Four-heading cross-entries are turned to the right and left at right angles and have all breakthroughs driven at approximately 45 deg. to facilitate speed in transportation. The plan for these breakthroughs is projected for some weeks ahead, in order to bring about speed of entry driving and secure the desired haulage layout. Triple-heading butt entries, off which the rooms are driven, are turned to right and left 90 deg. off the cross entries, thus making them parallel to the main entry.

Inside equipment in addition to the loading machines now consists of four General Electric 8-ton cable-reel locomotives with contactor control and open equipment, one Jeffrey 15-ton main-haulage locomotive, one General Electric 15-ton locomotive with Timken journal bearings and contactor control arranged for dynamic breaking, four Goodman slabbing machines for center cutting, one Sullivan self-propelling coal drill, and three Chicago Pneumatic portable electric coal drills. It is the intention to use track-mounted drills in rooms and the others in headings. The cost of a mechanical loading unit consisting of a loading machine, locomotive, mining machine and drill is in the neighborhood of $25,000.

Main Control Panel on Gallery Between Primary and Re-treatment Tables



On the main haulway, which is about two miles in length, 60- and 75-lb. steel is used and the 6x6-in. x6-ft. ties have been impregnated with Wolman salts at the coal company's treating plant (*Coal Age*, Vol. 35, p. 343). Posts, headers, and cap pieces used on this haulway also are of treated timber.

Joints of both rails are double-bonded, in order to take full advantage of the track as a conductor. The bond on the inside of the joint is a 2/0 long bond and that on the outside is a 4/0 U-shaped bond. Both are electric welded. Every fifth rail is cross-bonded. The trolley wire, consisting of "No. 9" section, is paralleled by a 500,000-circ.mil feeder. Lights with angle reflectors to prevent glare in the eyes of the motormen are installed opposite each manhole.

Mine-car equipment consists of 300 composite, solid-body cars of 152-cu.ft. capacity made by the Kanawha Manufacturing Co. They are equipped with Timken bearings, four-wheel brakes, and spring drawbar in one end.

The plant and all equipment indicate a progressive attitude on the part of a management which has been in charge of the company's affairs for many years. The president, C. A. Cabell, was one of the founders of the company. L. N. Thomas is vice-president in charge of operation and W. G. Magee, vice-president in charge of sales. K. D. Quarrier is general superintendent and C. A. Pearse is superintendent in charge of the No. 9 mine.

SPOTLIGHTING

+ Variables and Constants In Coal Production Costs

By ERNEST L. BAILEY

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THE broad use of the word "economics," as applied to a particular industry, covers such a wide range that it may make for clarity if it is explained at the beginning that, as used in this article, its meaning is restricted to denote the science which investigates the means by which an industry or enterprise obtains the profits necessary or desirable for improvements, expansion, and dividends. Application of this science involves an examination of the structure and organization of the business or industry with reference to the factors which influence its earning ability.

Each industry and individual enterprise has its own distinct economic characteristics. In most industries, and in many private corporations, these have been studied, formulated, and analyzed in either public or private reports, and are periodically brought up to date. In the coal industry several such studies, more or less comprehensive, have been privately made by individual companies, but there has been little exchange of information as to methods used or results obtained which would guide others in devising a sound procedure for the development of essential economic facts or in making accurate deductions from developed facts.

To the extent that these facts are known and properly used by the mine management in determining the course of a company, errors of judgment are automatically eliminated. The number of failures which, year after year, mark the history of the coal industry, however, would appear to indicate a need for a better understanding of the economic principles underlying the production and marketing of coal on the part of those who have direction of this work.

It is true that, during the disturbed economic conditions which existed during and immediately after the war, many mines were opened which had no real chance to survive, because of some fundamental economic weakness; and these have contributed in important measure both to the present depressed condition of the industry and to the morgue of defunct mines. The circumstances under which many of these mines were developed were such that no criticism is justified, as they were brought into existence to meet wartime needs.

It is likewise true that since those days, in the face of a known developed productive capacity far in excess of the normal peak requirements of the market, a number of new mines have been opened and the capacity of many already existing mines has been greatly increased.

With large industrial consumers definitely committed to the slim waste line in their fuel diet, alert coal-mine management is becoming more keenly conscious of the fact that financial success for the operator lies in the subordination of planning for production to planning for profit. The major problem is not how much volume can be pushed up but what can be done to sell at a profit the tonnage for which there is a ready and a logical market. Mr. Bailey here outlines an approach to the solution of this problem in the abstract. The direct application of the principles of profit engineering to a concrete case in the coal-mining industry will be shown in another article to be published in an early issue of *Coal Age*.

Cumulative forces will be directed toward the stabilization of the coal mining industry as a whole in the degree that the essential economic factors of each individual mine are developed and applied to the conduct of its business. At the root of any economic investigation lies the conception of a standard of earnings on invested capital commensurate with the risk involved.

From the amount of money lost yearly in poorly conceived or badly managed coal mines, one might readily be led to infer that the investors in this industry do not demand or expect the same evidence of stability and earning power that is demanded by investors in other industries. Such inference, of course, is erroneous, as the expectation of a sound profit is the sole basis for any investment. The coal industry differs only in that the bases for expected profit are not ordinarily subjected to the same searching analysis necessarily applied where public investment participation is expected.

Most coal-mine investments made in recent years fall into two classes:

1. Investments made for the purpose of increasing productive capacity, based on the theory that increased production, giving rise to lower unit costs, would result in increased profits.

2. Investments for plant and mine rehabilitation and modernization, from which lower unit costs could be expected to result.

The first class of investment has

been peculiarly enticing to many coal producers. The usual line of reasoning is the company now has an investment in plant and equipment of, for example, $3 per ton of annual productive capacity; many of the major units are capable of substantially increasing performance; the limiting factor to production probably is a few items of equipment, the provision of which would equip the mine to produce 25 or 50 per cent more coal, and the additional tonnage could be realized with an investment of only $1 per ton of added annual capacity, leading to decreased costs, and increased profits.

If production were the only factor to consider the reasoning would be entirely sound, as an improved load factor on fixed charges and lower operating costs would result. Earnings, however, depend upon the ability to sell the product at a profit, and plant expansion is justified only when a profitable outlet is reasonably assured.

COAL differs from most basic commodities in that the price, within reasonable limits, exercises little or no influence on consumption. The important growth of substitute fuels in recent years has, in practically no important instance, been based on the economy of the substitute. The present price of coal at the mine mouth could be doubled and, except in unimportant districts, it would still remain the country's least costly fuel.

Because of certain characteristics peculiar to the coal industry, the law of supply and demand does not operate as a price stabilizer to the same degree as in other basic industries.

The temporary closing of a developed mine ordinarily is an expensive measure, the contemplation of which too frequently leads to a decision to continue operation at a loss until prices improve. Seasonal fluctuations in consumption (amounting to approximately 35 per cent) also are an important factor. Productive capacity of the industry must be kept above the normal peak requirements of the country in order that an adequate supply of fuel at all times will be assured. An industry equipped for such peak requirements must necessarily operate at reduced speed during the periods of low consumption, which, under existing conditions, also are the periods of lowest prices.

To expect the industry as a whole to work out and apply any broad, constructive measures of improvement seems useless. Each individual producer must determine for himself the proper balance of all factors which enter into his particular costs of producing and selling coal and adjust these to the variations in demand and price.

From an economic viewpoint the determination of a proper selling price should be dependent not upon the market but upon the over-all cost of production and distribution. If, after all sound cost-reduction measures have been applied, a particular producer finds himself above the margin, because of an artificially depressed market or by reason of adverse natural conditions or an inferior product, only one logical step remains: that is to close down until a period of readjustment has brought about sufficient change in conditions to justify the resumption of operation.

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Ernest L. Bailey

There will be unavoidable periods, however, when the total number of mines required to meet peak consumption will not be able to operate at capacity because of fluctuating demand. Therefore, it becomes necessary to analyze carefully the nature of production costs under varying percentages of capacity operation, in order that an intelligent price may be quoted during the off-peak season. Even though the producer consider it good business to continue in operation and temporarily take a loss on his product, he should at least know in advance at what rate of operation an available price will result in the least loss.

An analysis of production costs will show that they fall into three general classes:

1. *Constant Total and Variable Unit Costs*—Certain items of cost are fixed as to amount, regardless of the tonnage produced. These are constant total costs and give rise to variable unit costs dependent upon the production over which they are spread. They include such items as taxes, insurance, depreciation, interest, minimum royalty (if in excess of earned royalty), rents for sales offices, and expenses of like character. Salaries also fall in this class, but differ in that they are subject to adjustment. Let us assume that these fixed charges amount to $10,000 per month for a mine having a monthly capacity of 50,000 tons. If the mine were operating at capacity the unit cost of fixed charges would be 20c. per ton. If, however, the mine is operating at only 50 per cent capacity, the unit cost is 40c. per ton, or if at 25 per cent capacity it becomes 80c. per ton.

2. *Constant Unit and Variable Total Costs*—Certain operating costs (and sales costs if on a commission basis) vary as to totals, but are constant as to units. These include such items of labor as are paid for on a contract or piece work basis, the cost of which remains relatively constant regardless of the amount of coal produced.

3. *Variable Unit and Total Costs*—Certain other operating costs vary with respect to both unit and total values, and are influenced by the tonnage produced. This class includes day labor, power, materials and supplies, etc. A close examination of this class of costs will reveal that they partake somewhat of the character of both the other classes. That is to say, while the mine is operating at all there will be a certain minimum part of each item that will remain relatively constant, regardless of the volume of production, such as tipples expense, power, haulage, drainage, ventilation, etc. When production attains or passes the figure for which this minimum is adequate, a more nearly constant unit cost results.

To estimate the unit cost which may properly be expected to result from varying percentages of operation, each item of total cost must be studied and its variations with respect to output determined for each individual mine. From such an analysis a minimum selling price for a given tonnage may be intelligently determined.

COAL PREPARATION PLANT

+ The Structure That Houses It

By ANDREWS ALLEN

Allen & Garcia Co.
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EVERY structure bears a relation to its surroundings, to its companion structures, and to its contents. Each of these relationships must be considered by the designer if he is anything more than a mere draftsman, and though the utilitarian viewpoint must always, in the last analysis control the design, there are great differences in the way a thing is done and in the spirit with which the problem is approached.

A structure should have in itself a sort of beauty. We are likely to consider only the mechanical requirements of the structure, but it is also possible to keep in mind the need for a certain symmetry of proportion and outline which will make the structure pleasing to the eye and in harmony with its surroundings, converting a structure that is merely useful into one that is also beautiful. There is no reason why we should cover our country with architectural monstrosities. Why cannot the engineer absorb a little of the spirit of the architect, to whom a structure is a work of art as well as a machine? The lines of symmetry are based largely on the inner functions of the structure. All nature moves on the lines of least resistance. A structure designed to carry loads and stresses most economically and with minimum deflections will generally be pleasing in proportion and outline. Much of our predisposition to "dog houses" and "lean-tos" is due to sheer carelessness or to a failure to visualize the industrial functions for which provision must be made.

In its general design a structure should fit its surroundings. It should be harmonious in line and color with the neighboring units of the plant. It should use materials that offer harmony or a pleasing contrast with the environment and should express, without ostentation or excessive adornment, something of the serious purpose for which it is built. Materials should always be local where possible, thus giving a structure a definite local character. Foreign materials often make a building look like a pompous and unwelcome stranger in unfamiliar surroundings.

The design of the framework should be based on the equipment it contains. Here again is the old question of the egg or the hen. Shall we build a structure and put the machinery into it, or shall we design the machinery and build the structure with an intimate and essential relation to each part of it? Both methods have their place. Many preparation structures contain equipment which consists of many relatively small and self-contained units. When arranged in groups they naturally favor a structure having definite floors or stories where these units can be set and made tributary to the general arrangement for handling material to and from them.

Andrews Allen

There are many mechanical units in a mining plant, however, which must be definitely provided for and wrought into the structure. Provision for proper flow of material at suitable speeds and without breakage fixes their vertical and horizontal relation. The accessibility of parts which require attention determines the location of walkways, platforms, and stairways. These do not usually lend themselves to predetermined floor levels and a prearranged spacing of columns. On the other hand, no system of coal handling or preparation can be regarded as a finality. The art is moving forward rapidly; the requirements of the market change from year to year, and sometimes from month to month. If the machinery is too closely tied in with the structure, the arrangement is too inelastic and changes are too difficult to make.

Here is where the experience of the designer comes in. How can the structure and mechanical requirements be properly harmonized and at the same time sufficient latitude be provided for future changes? This requires much study and a thorough consideration of the changes which may be required to suit future conditions. Ample clearances between units will often prove a life-saver when changes are necessary. It is also important to allow ample space and facilities for moving and handling any unit into or out of the plant, and to consider the location of possible future conveyor lines by which portions of material may be transferred to some new or experimental equipment. When a structure has been amply designed, as far as space is concerned, there usually will be little trouble in making changes to fit new equipment. When changes are necessary, the modern cutting torch and welding outfit will make it possible to do a neat and substantial revamping job in half the time and for half the money it formerly cost.

Often the limitations as to cost are so stringent that it seems necessary to crowd and skimp in planning an arrangement. It usually happens, however, that, where such a program is undertaken, the saving in cost is more apparent than real. A better program generally will be to space the machinery as it should be and use cheaper materials, such as timber in place of steel, or to use steel only where it is necessary to keep the structure from distortion or warping.

In general, shaker screens and their drives, centrifugal dryers or crushers, and similar heavy vibrating machinery should have their supporting structures specially designed for them. A shaker screen, even if balanced, produces severe horizontal alternating stresses. These must be resisted by well-proportioned members designed to take care of all stresses, both in the members themselves and in their joints. The following formula for horizontal stresses from screens is in rational form, but the constants have been determined or modified by experience, with the idea of developing a formula which can be followed in designing a structure for operating conditions:

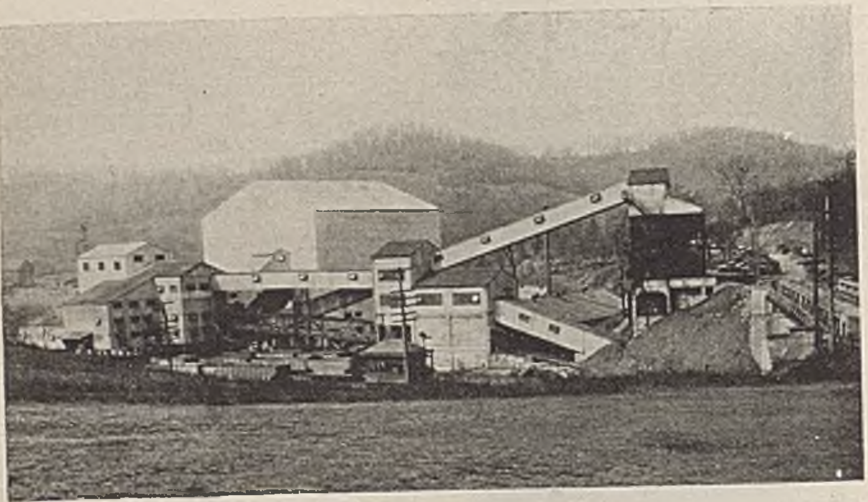
$F = W \times R^2 \times S \div 60{,}000$ where F = horizontal force in pounds; W = weight of screen in pounds plus about half the loading (that proportion of the load which acts as if anchored on the screen); R = revolutions per minute; S = length of stroke in inches.

Thus, a screen running 100 r.p.m., with a 6-in. stroke will produce a horizontal force equal to 100 per cent of the weight of the screen itself plus the weight of that proportion of the coal (usually one-half) which can be regarded as being anchored to it.

When this force has been determined, it should be taken down into the foundations and enough weight provided to prevent upward reactions at any column. Structural steel members should be proportioned to resist an impact equal to at least 300 per cent of the load. This, however, depends on the length of the bracing members. Lower unit stresses (that is to say, higher impact values) should be used where the distance from screen drive to foundation is more than 30 or 40 ft., unless the load can be absorbed by bins or heavy floors between the screen and the foundation.

The unit stresses or impacts adopted in a structure carrying heavy vibrating machinery should be chosen for deflection rather than actual strength, and for this reason it is *not* necessary to carry the same impact into the calculation of rivets, in which case 100 per cent impact generally should be sufficient. Care need be taken only to see that the joints are central and symmetrical, and that the metal is heavy enough to hold the rivets. A little spring in a connection angle that is too thin can throw quite a whip into a structure which otherwise would be strong enough.

Whether foundations or structures shall be provided independent of the main building is largely determined by relative cost and convenience. There is no such word as "impossible" in structural engineering. A structure can be designed of sufficient strength and stiffness to take any loads or stresses that may come upon it, but it does not always pay to do so. Good engineering demands that the fullest consideration be given to economy of material and labor. Independent piers for heavy vibrating units are frequently used when the foundations are good and not too deep.



When such separate foundations and structures are constructed, light and high structures escape those cumulative vibrations which would otherwise require a heavier and much better braced building. If horizontally oscillating screens are set even at a reasonable height above ground and rest on separate foundations and structures, much concrete must usually be added in order to provide the weight necessary to hold them down, whereas if the screens are supported on the main structure, the floors and other construction usually have sufficient weight for this purpose.

WHERE screens are placed above bins, the weight of the structure helps greatly to produce stability and stiffness, but where screens are below the bins, the effect is precisely opposite. A little motion in the screen or drive supports may start cumulative vibrations to an alarming degree. Of course, it would be useful to know the vibration period of a structure as a whole or in part, but in practice it is almost impossible to determine this essential factor in advance within the time available for making a design. We may discover it afterward in a disagreeable way if it happens to coincide with the vibration period of our machinery. When synchronous vibrations are encountered, it is usually possible to counteract them either by deliberately changing the vibration period of the structure or the speed of the vibrating member, or by providing additional bracing designed to exert force duly calculated to resist the vibration of a known weight with period and amplitude determined by observation.

A structure always should be so designed that it will take care of accidental stresses, such, for instance, as the over-straining of a belt, rope, or chain to the breaking point. In other words, the structure should never be the weak link. As above stated, a mining structure should be designed for stiffness and not primarily for strength. Beams should be proportioned in ratio of depth to length to give the required stiffness, unless the requirement of strength should be greater.

The result should be a structure that does not sway perceptibly in any part and where the only impression to our senses is a sort of "healthy" milling vibration somewhere "between a shake and a sound." With a structure of this kind maintenance of equipment is less troublesome, for parts do not shake loose as they so often do in flimsy structures. The operator can well afford to build a substantial structure to house fine expensive machinery, but often the structure is the last consideration left to the machinery designer and the cost is limited to whatever money may be left over.

Few structural engineers are capable or experienced in designing structures for supporting heavy vibrating machinery, and every year structure after structure has to be braced and strengthened because of inadequate strength or stiffness and lack of skill on the part of the designer. This is often true even where there is ample or even excessive metal in the structure.

Much may be said of the form and type of construction in steel and concrete. A structure should be composed of relatively large members with wide spacing. This is done to minimize the number of joints, to facilitate bracing, and frequently to save metal. Where panels are not fixed by the requirements of machinery or other positive conditions, it may be possible to determine the economical panel spacing by a preliminary calculation balancing the weight of columns against the floors and working for a spacing which will give a minimum cost per square foot. In steel the bracing should be diagonal, either single or double, and carried to the ground in continuous lines so as to take care of any combination of vibratory stresses.

Special care should be used to avoid the possibility of rotary vibration. In one case in my experience, a high structure on the top of which was a fast-running shaker screen vibrated seriously. On analyzing the situation I discovered that the vibration was rotary and a pair of vertical X braces at right angles to the axis of the screen and symmetrically disposed to it cured the trouble completely. It does not follow, therefore, that the bracing to control vibration need necessarily be placed in the direction of the forces which cause the movement. Wherever vibration is encountered in a structure it is my practice to study the situation carefully by measuring or sensing the direction and amplitude of the deflection at each point, then carefully studying and combining the results, and deciding accordingly.

Bracing members should be capable of taking both compression and tension. They should generally be double and symmetrical to the column section. Rod bracing or single-angle bracing can be used in roof work or light structures which do not have to resist vibration, but they have no place in a structure carrying vibratory load.

A pair of angles with battens or lacing makes a good brace and one can occasionally use an I-beam or H-beam, or even a channel connected by the flanges. Columns usually are composed of C-beams or H-beams, which in recent years have come to such a variety of uses. There are places in some structures, however, where a pair of laced channels is still preferable. This is especially true when there are two sets of bracing at right angles to each other attached to the same column.

The strength and simplicity of the connections in such cases compensate for the additional cost of the column shafts. Where laced channels are used it is generally possible to use "two-rivet" lacing bars, so that there are no pockets for water or coal dust. By spacing the lacing bars at a wide enough angle, it is always possible to obtain plenty of room for painting and cleaning the inside of the columns.

Concrete has contributed enormously to the strength and stability of mining structures. It can be used almost anywhere except where minimum depths and close clearances or attachments of machinery are necessary. Even concrete headframes are a complete success and provide rigidity and sufficient strength at low cost. Steel members subject to deterioration can be incased in concrete to preserve and stiffen them. Concrete floors are practically standard in the better class of mining structures, and there is practically no limit to the extent to which concrete can be used, except where it involves expensive form work.

In steel, the use of electric welding has already made great progress, and it will not be long before we shall have completely welded mining structures. This is a new art of fabrication and will require a new technique. So far its use has been largely auxiliary. All bridge trees for screens and heavy machinery should be welded, even if also riveted.

Conveyor bridges and such members as are expensive to fabricate by the old methods can be welded as a matter of economy. Bins can be welded in the field with only enough bolts to hold them together properly for welding. Tight bins are thus pro-

vided at no additional cost. Last, but not least, much shop detailing can be eliminated by welding such light members as stairways, girts, railings, conveyor bridges, etc., the design of which congests and slows up a drafting room, sometimes delaying the drawings of main members for a few unimportant connections.

As to covering, we have not yet attained the Continental standard of brick-filler walls in steel structures. Perhaps our structures vibrate so much that we are afraid that brick or tile will not stand up. If this is the reason, it is nothing to be proud of. Of course, the weight of the structure is increased by brick or tile, but this is by no means a disadvantage, as our structures generally are too light. In many cases in which I have made a comparison, the cost of brick or tile curtain walls is not at all out of line.

Our standard covering is corrugated steel, usually galvanized. The best grades are relatively cheap and are fairly tight, though, of course, they do not hold the heat. Roofs may be of the same material or of concrete tile, which is better and much more sightly. Transite and asbestos-protected metal are excellent materials either for roofing or siding.

It usually is desirable to provide tight skylights for lighting purposes only, and for ventilation it is better to use metal ventilators and windows than to attempt to use operating skylights or saw-tooth construction, which so frequently leaks.

There is no reason today for not using steel windows and doors. Steel sash are cheaper and much better than wood, and steel doors give more class to a structure than any other equal expenditure.

Outside platforms and stairways should be made of subway grating, which is safe, strong, and reasonable in cost. This practice should be followed also for interior platforms or stairways in dusty structures; otherwise, the best stairway construction consists of treads of inverted channels filled with concrete, and platforms of concrete on steel. Wood stairs and platforms are excellent in many ways, easy on the feet, and inexpensive, but frequently are objectionable because of the fire hazard and lack of permanence.

In designing a structure, it must be borne in mind that the mere fact that steel and concrete are used does not necessarily make the building fireproof. It is possible to experience a very hot fire in a structure that has little wood about it; even only a few girts, floors, or stairways. If these are well soaked in oil and covered with coal dust, they will produce a fire capable of warping or seriously damaging almost any steel or concrete structure. Some of the fire hazard is eliminated by using steel. The entire hazard can be removed only by proper protective coatings, such as are approved by the boards of fire underwriters or by the use of automatic sprinklers.

Last and least we have timber construction to consider. It has carried us over a period of rapidly developing industries. It has served us when no other materials were available, and now must be satisfied to remain as an auxiliary material and for use in temporary or hastily built structures.

Even the design of a timber structure is largely for the carpenter and not the engineer. Very few structural engineers know anything about timber construction, as was clearly indicated by the results of many years of engineering license examination in a certain state. There was always one problem in timber construction, and the answers would have made a good bedtime story. Timber, however, is a wonderful material. It has unique possibilities in many directions and when properly used should still fill an important place in engineering construction. Few engineers know how to make a joint in timber—well, let them learn.

Timber warps, shrinks, cracks, and decays. A knowledge of its failings should regulate its use. A certain quantity of steel should generally be used in a timber structure to keep it tight and in line. Timber, if of good quality, will last a long time when properly protected or impregnated with a preservative. It should be used in engineering structures having a short projected life or where radical changes may be made that cannot be readily foreseen. Heavy, "slow-burning" construction is far preferable to flimsy steel, and is much less costly also. There is an art of timber construction, and when rightly used timber is still one of our most useful materials.

The design of foundations is as important, perhaps, as any part of the design. It is necessary not only to go down to a stratum which will carry the desired load but possibly to brace the foundations to each other and stiffen them by buttresses, or otherwise, so as to resist any horizontal forces that may come upon them.

RECOVERED "LAST TON"

+ While Maintaining High Daily Production At Fordson Mine

ACTIVE TO THE VERY LAST

Some mines seem to waste away of old age. When development ceases, tonnage drops and all the advantages of no entry driving and little upkeep are lost in the expense of operating tipples, roads, and planes for meager output. At Kentenia mine, the coal was attacked at several points intensively, and as a result tonnage stood about 50 per cent of normal to the closing day.

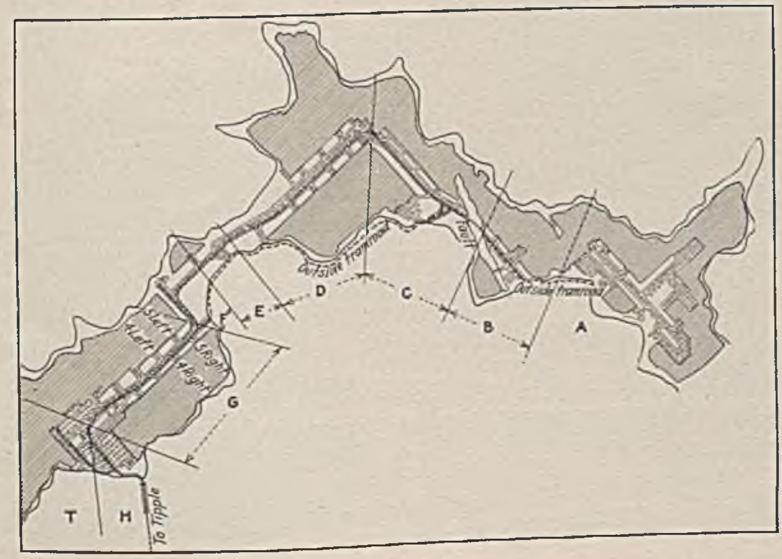
RECOVERING over 90 per cent of the total recoverable coal, maintaining practically full production to within seven months of plant abandonment, and loading 44 per cent of normal capacity on the very last day of operation, is the record of the Fordson Coal Co. at the Kentenia mine in Harlan County, Ky., which was shut down Sept. 13, 1930. Within a month and a half all but fifteen men of those willing to move had been placed at other mines of the company.

Beginning with a date about 12 months before shutdown nothing but main haulway chain and barrier pillars, the latter of 70- to 150-ft. widths, were left to mine. Instead of allowing the recovery of these to drag over several years, thereby suffering the low production penalty of minimum royalties, fixed overhead, and necessary day labor to operate the incline, tipple, and so on, it was decided there would be an economic gain in building a considerable length of outside tramroad, affording several points of attack to the barrier pillars, and in double or triple shifting near the end as the available working places decreased.

The mine is in half of a narrow and irregular area of the Wallins seam, bounded by outcrop, lying practically horizontal and close to the top of the ridge. Below the 72 in. of clean coal there is a 10-in. stratum of fireclay which during recovery caused some trouble by flowing out and heaving the bottom. In different locations the roof condition varied from a difficut drawslate to an excellent slate top up to 48 in. thick and overlaid with a sandstone approximately 20 ft. thick. The cover varies up to several hundred feet.

Kentenia was purchased in 1920 by the Ford Motor Co. interests from the Banner Fork Coal Corporation. Half of the available 650-acre area, known as Mine No. 1, was worked out in 1927. A map as of May 1, 1929, here reproduced, covers the other half, known as No. 2 mine. Normal single-shift capacity was 1,950 tons per day. Excepting the operation of one Joy type 5BU machine, continued to about the last month, the output was hand-loaded. The coal was lowered down a long incline to the tipple in four-car trips operated in balance. Hand loaded, the cars average 6,000 lb.; and machine loaded 5,000 lb.

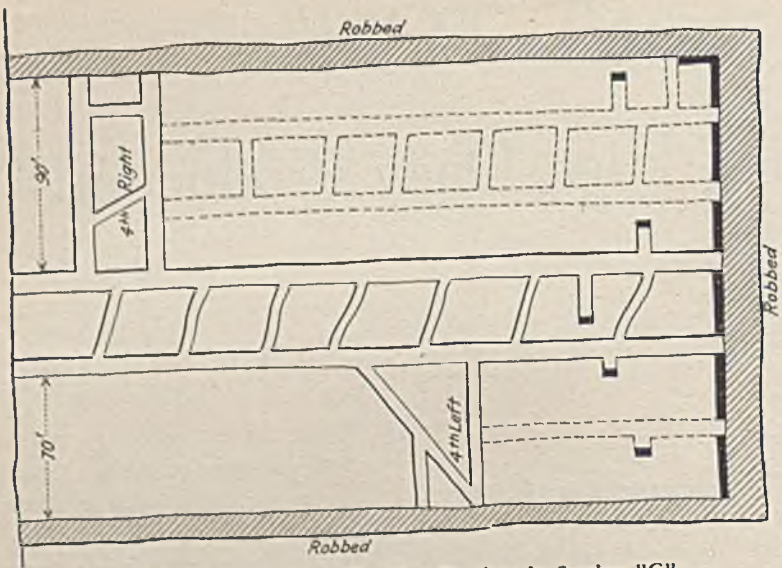
The Mine Was Divided Into Sections and Barrier Pillars Were Attacked at Several Points



Section *A*, shown on the map, was finished on March 20, 1930. Here there was a drawslate 3 in. to 36 in. thick and containing slips, but above it was a strong blue slate. Fairly close posting and quite a number of crossbars were necessary to hold the drawslate.

Sections *B* and *C* had a bad roof which consisted of 12 to 48 in. of drawslate that could be held with props and crossbars only when over 18 in. thick. In section *B*, 12-ft. rooms on 50-ft. centers were driven off from and at right angles to the main line and aircourse. After cutting through, the pillar was brought back as fast as possible. Two shifts were employed and two men worked per place. Very little of this section could be robbed open-ended.

In section *C*, the rooms were driven 12 ft. wide on 60-ft. centers. For the most part the pillars were then mined open-ended, placing two to four cars



Indicating Method of Working Barriers in Section "G"

at a time and using four men. Where pocketing was necessary, two men would drive through, while the other two worked on the stump. Although this necessitated laying a switch for each pocket, it was considered to be the cheaper method, because of the saving in haulage by serving four loaders at each trip of the gathering locomotive. Pillars were taken in section *C* working toward section *B*. Near the finish some trouble was encountered, so the work was changed from single shift to double shift, and at the last a third shift was employed. In the last 24 hours, 170 mine cars were loaded from the section.

Section *D* had some drawslate from the rear end outby for about 800 ft. From this point on through sections *E*, *F*, *G*, *H*, and *I*, the top was an excellent blue slate.

About 400 ft. of section *D* was worked double shift. Then the bottom heaved and in places raised the track almost to the roof. A third shift was put on, and for several days nothing but bottom was loaded. Access was gained to the stumps, and when these were removed, the bottom stopped heaving. Headings were then driven 10 ft. wide off the old cross-entries, and breaks driven 10 ft. wide on 75-ft. centers. The two headings off the old cross-entries provided, with two headings of the triple entry, four haulage roads to the robbing line. The center heading of the triple entry was used as a return airway.

Most of section *F* was robbed with the loading machine, the average production being about 225 tons during two eight-hour shifts. Sections *D*, *E*, and *F*, were finished at about the same time. From these three the coal was brought out through a drift near the center of section *E*, and thence over the outside tramroad laid with 40- and 60-lb. recovered rail and built especially for the job of barrier-pillar recovery.

The last large block, section *G*, was started about June 1, at which time it was the only coal left, with the exception of the small sections, *H* and *I*, near the main portal. On the smaller drawing, which shows the method of working, broken lines indicate the headings driven to split the pillars, and the extra wide black lines indicate working places. This section was worked on three eight-hour shifts, with three loaders per car. For the most part, the

Tonnage Loaded in Closing Months

1930	Tons Shipped	Days Worked	Tons per Day
January	39,137	23	1,701
February	31,495	16	1,968
March	29,308	17	1,700
April	27,350	21	1,301
May	30,697	21	1,461
June	33,930	25	1,357
July	30,501	24	1,273
August	28,609	26	1,101
September	9,937	10	994
September 8	.....	..	899
September 9	.....	..	927
September 10	.....	..	931
September 11	.....	..	872
September 12	.....	..	799
September 13	.....	..	840

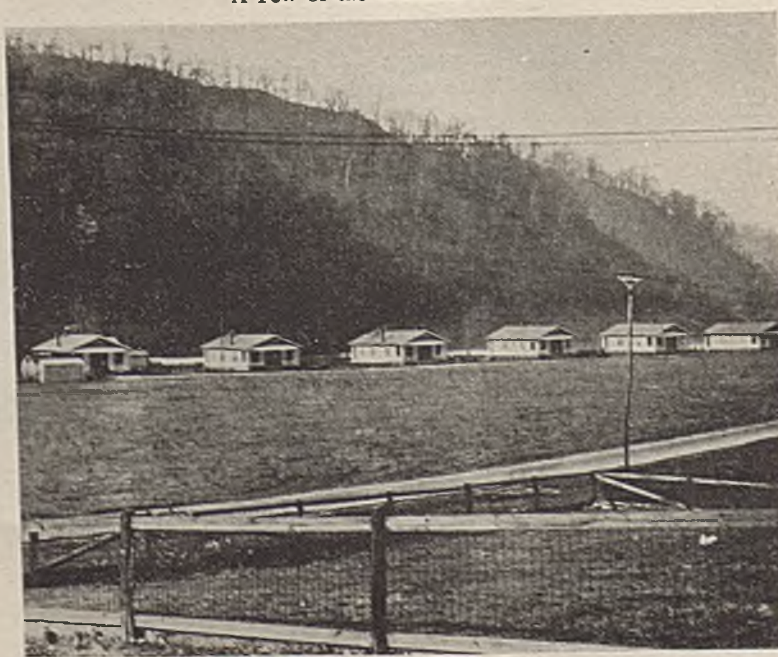
blocks were worked open-ended and two or more cars were placed at one time. In one eight-hour shift fifteen men working on the back end of one block loaded 270 tons.

As had been the practice before, the men were paid per car, but they took turns placing their checks on the cars. The tipple was operated only eight hours each day. During the last week the payroll averaged 168 men. On the inside were 64 coal loaders, 10 machine men, and 57 men on haulage, track, and miscellaneous jobs. The final sections, *H* and *I*, were finished on the same day, and on that day the loading was 840 tons. A table shows the performance for the final nine months and for the final six days.

Transfer of men to the company mines at Stone, Ky., and Twin Branch, W. Va., began about three months before the mine was closed. Men so transferred were not required to go through the usual 60-day probation period, but those going to work inside, although experienced on such work at the other mine, were re-

(Turn to page 137)

A Few of the Kentenia Houses



AMERICAN INSTITUTE

+ Assembles Year's Technical Thought

A PROGRAM of wide interest embracing valuation, education, economics, gas competition, stripping, safety in mechanization, blasting, subsidence, ventilation, and outbursts was presented at the annual meeting of the American Institute of Mining & Metallurgical Engineers, held in New York City, Feb. 16-19. Coal classification, cleaning, electrification, and mechanization, however, were omitted at this session.

Value of coal lands was discussed at a meeting on Monday under the leadership of John B. Dilworth, consulting mining engineer, Edward V. d'Invilliers Engineering Corporation, Philadelphia, Pa., who had prepared a comprehensive schedule regarding the methods of evaluating coal lands and properties. In discussing whether the basis of coal valuation should be sales prices of similar coal, the royalty received for similar coal, or the estimated earnings from operation, S. A. Taylor, consulting engineer, Pittsburgh, Pa., said that valuations must vary from time to time. Today near Pittsburgh, lands held under royalties of 30 to 33c. per ton have been returned to the lessor and cannot be leased for one-half that royalty. No safe valuation can be made on the basis of either royalty or selling price, but only on potential earnings.

G. H. Ashley, State Geologist, Harrisburg, Pa., remarked that the value of the property was to be determined just like that of any other investment—by the profit which could be attained in the operation of the property. A. W. Hesse, chief engineer, Buckeye Coal Co., Nemacolin, Pa., said that everything had to be considered, especially the freight rates, which often absolutely determined the value of a coal field. D. B. Reger, consulting geologist, Morgantown, W. Va., said that he had declared a moratorium on valuations. All the engineer could do just now was to present the general economic situation and leave the client to make his own deductions as to the value he would put on a property of that kind, but it was objected that the client was not looking for any service so incomplete and non-committal.

Mr. Taylor declared that consideration should be given to the protective character of the rights which the deeds of the various properties conferred. It was formerly considered that an operating company was fully protected if the owner of the fee in selling the coal rights gave release for all damage to the surface due to mining the coal on the property conveyed, but recently a company which owned the coal rights with such a provision on the property of both A and B mined within 5 ft. of the property line common to these lands, and when it drew the coal pillars of property A, without entering the coal under B, a line of fracture appeared 150 ft. over the line on the latter property. This fracture was 4 to 13 ft. wide and evidently was caused by the excavations on the property of A. There was also a line of fracture 2 to 4 ft. wide paralleling the first line of fracture 100 ft. further on the property of B.

R. E. Tally
Newly Elected President A.I.M.E.

It was evident that B had been injured in a way that was not provided for in the contract with him, and when Mr. Taylor was called in by the coal company he was obliged to recommend the settlement of the case by the payment of damages. The operator who held his lands on such contracts would do well to arrange his work so as to undermine both A and B at the same time, so that the work under A could not be held to be the cause of damage to the property of B. T. H. Clagett, chief engineer, Pocahontas Coal & Coke Co., Bluefield, W. Va., declared that in the Pocahontas region leases were drawn so as to give protection to the operator in mining the subjacent coal on another property against damages to the surface on the first property.

At the luncheon of the Coal Division, C. E. Bockus, president, National Coal Association, said that coal would do well to hold its own in the next ten years. He did not look to increased exports to rectify the situation. In 1926, with the British mines idle, such of our exports as replaced British coal represented perhaps 16,000,000 gross tons, far less than our own annual variation in three of the last four years. The public and the coal industry should not be greatly perturbed about the great number of coal companies to be amalgamated. Nine-tenths of the coal produced probably came from the mines owned by only about 600 companies, if companies and their affiliations were regarded as only one corporation. This 600 included many captive companies, so that the task of reducing the list to a manageable few was not so hopeless as some thought. Three hundred of the larger companies could, if they adopted a co-operative instead of a fighting spirit, bring stabilization to the coal industry.

At the afternoon session, Ralph E.

Davis introduced, and H. K. Ihrig presented, a paper on "The Economics of Natural Gas Utilization." Messrs. Davis and Ihrig are consulting engineers, Pittsburgh, Pa. The latter declared that with gas only about 5 per cent of excessive air was needed, because the molecules of gas were infinitesimal and the mixing of air and gas was almost perfect, especially as compared with coal dust and air, which required a 40-per cent excess of the latter. He added, "Natural gas contains no appreciable quantity of ash, sulphur or moisture. In addition, it requires less excess air than any other fuel. Though its hydrogen content is high, which lowers the effective heat content, this is more than compensated by the absence of impurities such as those just listed."

He stated that in a coal-fired kiln the furnace atmosphere might vary from oxidizing to reducing in a relatively short time, but with natural gas the character of the atmosphere might be regulated, which is especially important in the pottery, brick, and tile industry, where the color and quality of the product depends on these factors. In metallurgical furnaces an oxidizing atmosphere will cause scaling, and with some fuels the scaling loss may be greater than the entire cost of the fuel.

When burned by surface combustion, as by the Bonecourt system, which feeds an inflammable mixture of air and gas to an incandescent surface, much as with a Welsbach burner, an efficiency of 92.7 per cent can be obtained even after five months' burning and as much as 700,000 B.t.u. per cubic foot of combustion space per hour has been obtained, as against 24,000 B.t.u. for coal dust.

IN COMPARING fuels Mr. Ihrig would consider the heat lost in the sensible heat of the ash, if any; the heat lost in the evaporation of the inherent moisture and in driving off the moisture formed by the combustion of hydrogen; the waste due to having to heat an excessive quantity of air; and the heat lost in the escaping gases. According to Mr. Ihrig, one cannot overlook these losses if a real comparison of the thermal values is to be made. The British thermal units obtainable from divers natural gases are as in Table I and obtainable from coal as in Table II.

Illinois coal at $6 a ton Mr. Ihrig equated to natural gas at 31.8c. per M. cu.ft. and West Virginia coal at that price to natural gas at 21.8c., the comparison being based on net available heat values. He quoted Bulletin No. 276 of the U. S. Bureau of Mines as showing that with 500 tests made under carefully controlled conditions, coal in domestic furnaces gave an efficiency of about 58 per cent. "On the other hand," he said, "efficiencies of 75 per cent with gas-fired house-heating furnaces are common, and a new boiler placed on the market recently has shown 93.9 per cent efficiency."

Table I—Heating Value of 1,000 Cu.Ft. of Natural Gas

	Gross Heating Value B.t.u.	Net Available Heating Value B.t.u.
Ashland, Ky.	1,197	964
Columbus, Ohio	1,147	911
Amarillo, Tex.	1,086	873
Hugoton, Kan.	1,018	818
Munroe, La.	1,019	816

Eugene McAuliffe's paper, entitled "Comparison of Accident Hazards in Hand and Mechanical Loading of Coal," covered only twelve mines operated by the Union Pacific Coal Co. during one year, 1929, but mechanical loading showed a margin of safety over hand loading of 38.3 per cent as regards fatal accidents and a margin of 44.6 per cent over hand loading when computed on an exposure basis. The shortness of the period and its limited range, however, did not, Mr. McAuliffe said, amount to positive proof of the superior safety of machine loading. The figures are based on the number of shifts and not on tonnage produced, but would have been 89.3 per cent per compensable accident had the latter consideration been taken. No consideration was paid to accidents involving less than seven days of disability, but care was taken to include as part of the accidental or fatality record the accidents incidental, however remotely, to hand or machine loading, respectively.

Fred S. McConnell, vice-president, Enos Coal Mining Co., Cleveland, Ohio, read his article on "Mining Coal by the Stripping Method." He stated that the tendency was to increase the diameter of the drillholes so as to avoid the necessity for chambering or springing the hole several times before loading it with explosive. "With the use of liquid oxygen as an explosive and with the later explosives developed by the powder manufacturers, the tendency is to get away from the cost and danger of springing holes and to place the charge in the hole without springing."

Table II—Heating Value of Pound of Coal

	Gross Heating Value as Received B.t.u.	Net Available Heating Value B.t.u.
West Virginia Coal	13,761	11,217
Eastern Kentucky Coal	13,654	11,157
Pennsylvania Coal	13,076	10,576
Western Kentucky Coal	11,926	9,602
Indiana Coal	10,202	8,070
Illinois Coal	9,844	7,697

Mr. McConnell said that the shovel should be so placed alongside the bank to be dug that the available bail pull will produce the greatest digging effect and also so that the material can be spoiled with least aggregate motion of the machine.

K. A. Spencer, chief engineer, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan., in his paper, "Strip Coal Mining in the Southwest," said that the thickest seam of coal now being mined is 34 to 36 in. thick and about half the strip-mine coal of Kansas is being produced from a seam of coal averaging only 20 in. in thickness. It is practicable to mine this seam even where the overburden is 40 ft. thick.

"A new mine," he added, "opened on 4,200 acres of this thin seam in southeastern Kansas, after a year's operation has been able to produce 16.4 tons per 8-hour man-day, or 2.05 tons per man-hour. At this mine it has been necessary to remove 17.6 cu.yd. of overburden for each ton of coal mined."

IN REPLY to F. G. Tryon, Coal Division, U. S. Bureau of Mines, Mr. McConnell said that the price of strip-pit coal was about the same as that of the deep-mine product. Mr. Spencer declared there were less fines in strip coal because the deep-mine coal with which it competed in Kansas was shot out of the solid. Mr. Taylor remarked that the stripped coal from the Pittsburgh, or No. 8, seam was sold for 10 per cent less than deep-mine coal, but tests made by the railroads had shown it 10.5 per cent more efficient. The quantity of fines is substantially the same in strip and deep-mine coal. Mr. Spencer said the railroads had found that the strip-mined coal of Kansas was 7.8 per cent more efficient than deep-mine product.

Charles W. Wagner, special engineer, Glen Alden Coal Co., Scranton, Pa., read a paper on "Premature and Hangfire Explosions in Anthracite Mines," in which he urged that detonators of different manufacturers should not be purchased at any one colliery lest in any one shot detonators of different voltage characteristics should be used.

It was announced that H. N.

Eavenson, consulting engineer, Eavenson, Alford & Hicks, Pittsburgh, Pa., was elected chairman of the Coal Division by 377 votes, and E. H. Suender, general manager, Madeira, Hill & Co., Frackville, Pa., vice chairman by 372 votes. It was stated also that L. C. Harrington, professor of mining and metallurgy, University of North Dakota, Grand Forks, N. D.; Otto Herres, Jr., assistant manager, United States Fuel Co., Salt Lake City, Utah; and Howard J. Thomas, consulting engineer, Birmingham, Ala., were elected to the committee for three years.

At the annual business meeting, Feb. 17, the admissions committee reported a membership of 9,168, of which number 6,632 were members, 1,031 associates, 15 honorary members, and the rest junior members, junior associates, Rocky Mountain members, and student associates. The treasurer reported a gross income of $194,636.50 and expenditures of $193,739.72, with assets of $1,054,-244.36. It was announced by the tellers that the president-elect was R. E. Tally, vice-president, United Verde Copper Co., New York City, and the vice-presidents were H. N. Eavenson and H. A. Guess, managing director, American Smelting & Refining Co., New York City.

In the afternoon, the mine ventilation committee met and proposed several changes in the already outlined code. Though the attendance was large, the committee members present did not constitute a quorum, but suggestions were made, with everyone voting, and the committee will consider these later.

On Wednesday morning, Feb. 18, at the mining geology session, George S. Rice, chief mining engineer, U. S. Bureau of Mines, presented briefly a paper on the "Origin of Instantaneous Outbursts of Gas" and one on "Instantaneous Outbursts of Carbon Dioxide in Coal Mines in Lower Silesia," by P. A. C. Wilson. Mr. Rice stated that he knew of no instances in the United States in which outbursts had occurred.

He was not of the opinion that outbursts could be associated with bumps. In several severe bumps resulting in heavy damage there had been no outbursts of gas, and in several outbursts of gas he had yet to find evidence of bumps, though sometimes the outburst coal would dislodge timbers and let down roof. This essential disconnection of bumps and outbursts, Mr. Rice said, was not accepted generally in Europe. Many scientists believed there was a real connection between the two.

Quoting H. P. Greenwald, physicist, U. S. Bureau of Mines, Mr. Rice declared that when gas containing ethane was passed through coal dust so highly compressed in a steel tube that the specific gravity of the column of dust was 1.26, about that of solid coal, the ethane was at first entirely adsorbed. After 6 hours a little ethane passed, but after 19 hours the ethane in the gas after passing through the coal was only 30 per cent as much as in the gas before it entered the coal. Mr. Rice said he believed that the ethane displaced the methane and that, because of this quality, ethane and other paraffin hydrocarbons which are usually found when coal is crushed are generally absent in the mine atmosphere.

H. N. Eavenson

Mr. Wilson's paper described the geology of the Lower Silesian coal field. It appears that both in the early Tertiary period and in the diluvian glacial age there was volcanic activity. Mr. Wilson also discussed the recent accident at the Curt shaft of the Wenceslaus mine, in which 151 miners were instantly killed. Outbursts had not been common in this mine. Prior to 1915 no emissions of carbon dioxide has been noted in this field.

The disaster occurred in a longwall face about 627 ft. long at a depth of 855 to 1,155 ft. There were 55 men at the face. The blasting had been done behind safety doors, the new crew entering the mine about 45 minutes later. It was not till they had been underground for more than 2 hours that the outburst occurred. The gas that escaped entered another part of the mine and killed many of the men there. Those in the section of the mine where the outburst occurred were all killed. A great block of coal 53 ft. long by 26 ft. deep was thrown, without being crushed, a distance of 6 to 10 ft. An immense quantity of fine dust also was thrown out. It completely filled the working place in front of the longwall face for a length of 429 ft. About 4,000 cu.yd. of coal and rock was blown out and about a million cubic feet of carbon dioxide issued into the workings.

At the Ground Movement and Subsidence Meeting, in the afternoon of Feb. 18, R. Laird Auchmuty, mining engineer, Eavenson, Alford & Hicks, Pittsburgh, Pa., presented a paper entitled "Subsidence and Ground Movement in a Limestone Mine Caused by Longwall Mining in a Coal Bed Below." It narrated what happened to a limestone mine of the Marquette Cement Manufacturing Co. and to the surface above it when the Oglesby Coal Co. mined by longwall the coal beneath the limestone mine. Data showed that there was a rise over the pillar as the longwall work approached, but this rise was always small, 0.057 ft. (about ⅝ in.) being the largest lift observed, and even that was preceded by descents. In one period of six months one of the marking plugs rose 0.046 ft.

Marked lateral and longitudinal movements also were noted. Thus the paper shows lateral movements of 8⅝ in. and longitudinal movements of as much as 3¼ in. H. I. Smith, U. S. Bureau of Mines, showed slides illustrating the limestone rock and the alleged effects of the undermining.

W. O. Hotchkiss, president, Michigan College of Mines, Houghton, Mich., questioned the facts presented, as he had criticized them when the case between the limestone and the coal companies was in court. Mr. Auchmuty had briefed satisfactorily, he said, the testimony of the Marquette Cement Manufacturing Co.'s witnesses, but the lateral movements probably were the result of a rocking of the base line, which at one end lay over undermined ground which might not have completely settled.

George S. Rice then briefed the paper of Wallace Thorneycroft, Whimple, Devon, England. Mr. Thorneycroft gave data regarding the removal of coal below Plean House. First in 1907 and 1908 a 5-ft. seam at a depth of 580 ft. was extracted by longwall. He found the maximum lifting of the ground from mining such a seam was 2 in. and occurred over the pillar. To study the movement he hung plumb lines from the four corners of the building. Later, a 2-ft. seam, 90 ft. above the first, was mined by longwall. In this case the lift over the pillar was greater than before.

THREE points in a line at right angles to the longwall face were raised at one and the same time—between June 14, 1920, and July 24 of the same year—0.69, 0.70, 0.70 ft. respectively. On Sept. 20, when the next level was taken, these points were on their way down, being below the original level. Yet on Sept. 28 they were higher than on Sept. 20 and all three were higher than on June 14. On Oct. 14 they were at about the same level as on June 14—that is, one was 0.08 ft. lower, another 0.01 lower, and the third 0.01 higher—but they were still below the high level of June 28. As late as Dec. 10 all three were higher than on June 14. Nothing is said as to leveling methods, the character of the monuments, the nature of the ground, or of the weather. Mr. Thorneycroft says, "Some of the anomalies may be due to mistakes of the surveyor."

Observations made on leveling points located on two strong concrete water towers at Garthamlock Colliery were given. These towers must have had foundations deep enough to protect them against frost action. The coal, which was mined by longwall, was 408 ft. deep and 2 ft. thick. Observations were not made perhaps early enough, though the author says nothing as to this. However, on June 16, 1913, the tanks were higher at all points than on May 16, but only 0.05 ft. on an average. On July 24 the tanks were down 0.14 ft. below their May 16 level and on Aug. 12 they were 0.06 ft. above that level. Again the oscillation! (The figure for June 16 has been doctored in calculating these averages, for the author makes one point on the tower rise 1.06 ft., which obviously is incorrect and has been reduced to 0.06 ft., that it may accord more closely with the others.)

P. B. Bucky, assistant professor of engineering, School of Mines, Columbia University, New York City, described his studies of the strength of strata, using in the construction of his models, not bricks, like M. Fayol, but monolithic concrete and obtaining the necessary breaking stress by rapid revolution of the block. The new method, for according to Mr. Rice it is new, obtained its results according to Professor Bucky, without violation of the principle of dynamic similarity. He showed several typical breaks; some of them of the dome type.

L. C. Graton, professor of mining geology, Harvard University, Cambridge, Mass., hailed it as a first serious attempt to bring the experimental method into the field of mining engineering and thought the laboratory method should be fruitful.

At the Ventilation Committee meeting, Thursday, Feb. 19, Dan Harrington, chief safety engineer, U. S. Bureau of Mines, presented his paper on the "Progress of Metal-Mine Ventilation in 1930." He mentioned the gas in the Hetch-Hetchy tunnel and the decisions of the conference held by the members of the staff of the Engineer's Office of the city of San Francisco, the U. S. Bureau of Mines, and the Industrial Accident Commission. The conference ordered "an exhaust system of ventilation in all workings and auxiliary blowers to force fresh air from the fresh-air supply to the face of the workings." Fresh-air jets or baffles for removing standing gas from the roof of the tunnel also were ordered.

A. C. Callen, dean of mining, University of Illinois, Urbana, Ill., briefed the paper of J. H. Fletcher and S. M. Cassidy, Allen & Garcia Co., consulting engineers, Chicago, on "Air Cooling to Prevent Falls of Roof." At the Saxton Coal Mining Co.'s mine near Terre Haute, Ind., working the No. 4 seam, the roof kept constantly falling in summer, the roof, ribs, rail, and trolley being always dripping wet. Sets would not hold the rock without close lagging.

It was not thought that moisture caused the rock to fall, because a

place sprayed with water steadily for over a year remained in perfect shape, and fresh falls showed no water on bedding planes. The roof on the return also, where the temperature was uniform, was less affected than roof on the intake, which was subjected to temperature changes.

It was decided to cool the air in the summer before admitting it to the mine. Four water sprays were used to bring the air to a temperature of 61 to 63 deg. F., the mine temperature being about 58 deg. F. This even coolness could be maintained on the hottest and most humid days without the use of an excessive quantity of water. Water at 56 deg. F. is obtained from the deep wells that supply the mine plant. The mine receives about 40,000 cu.ft. of air per minute and seldom uses over 250 gal. of water in the same unit time, though as much as 500 gal. sometimes is needed. The quantity of water is automatically regulated in accordance with the temperature.

INCLUDING labor, material and freight the cost of the installation was $4,804. It costs $2,380 per annum to run including labor, repairs, and amortization, and the savings for timbermen and slate cleaners is at least $4,000 annually. There are a number of other advantages the exact value of which cannot be determined.

Mr. Rice thought guniting would be better than conditioning. At the experimental mine it has proved its value in keeping up a bad roof. After all, the variable temperature would extend only about 4,000 ft., and guniting would not be excessively expensive, and once done would be good forever if the spots where the work was not well done were promptly repaired.

Mr. Harrington said that one should not generalize as to the cause of roof deterioration. Sometimes the cause was temperature, sometimes moisture. In Colorado, New Mexico, and Utah there were shale roofs which had a wide range of temperature; sometimes 100 deg. F. or more in a single day. The winters were extremely cold. There was no sweating and no humidity in summer, and the roof stood well. This roof was much disposed to decrepitate if exposed to moisture. Mr. McAuliffe said that his headings when used as intakes had no falls, but the roof in returns which contained the moist mine air frequently fell and closed the airway. When the air was reversed, conditions were reversed also.

HORSE IN HORSEPOWER

+ Not the Only Measure of Mine Locomotive Performance

By C. A. ATWELL

Design Engineer, Westinghouse Electric & Mfg. Co.

Electric mine-locomotive motors are something like the English dray horse, which James Watt studied in arriving at the mechanical unit of measurement, horsepower. To the dray horse, the sustained loading of 1 hp. would mean exhaustion. By the same token the locomotive motor should not be expected to develop its nominal one-hour horsepower rating throughout the day. The result of continuous overloading of the motor would mean overheating and possible roasting of the insulation on the windings. In yet another respect the traction motor and the horsepower are alike. For a short period of time, both are able to develop power considerably in excess of their respective ratings. The motor can develop, roughly, twice its one-hour horsepower momentarily.

IN THE earlier days, when animal haulage was customary, the practical man judged the power of a horse or mule to pull cars largely by size and general build. To this day the eye continues to be relied upon by some practical men to gage the power of the "mechanical mule," the mine locomotive. "That locomotive is big enough to handle at least ten more cars," they will say.

To them, the mechanical unit of measurement, "horsepower," is *the* unit for gaging performance. True, to compare one motor with another, it is desirable to know the horsepower of each. But other units equally as useful in measuring motor performance are torque, tractive effort, speed, and efficiency. The object of this article is to point out the meaning and relation of these various units in the performance of motors in electric mine locomotives.

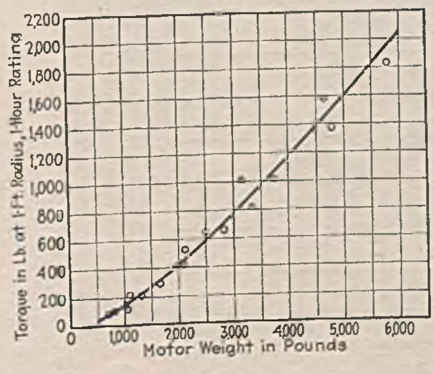
About 150 years ago, James Watt, inventor of the steam engine, wanting to adopt a definite unit for measuring mechanical power, made some experiments to determine the power that strong English dray horses could develop. He found that the average horse could develop power enough to raise 550 lb. 1 ft. in 1 second. He realized that this amount of power was in excess of what could be exerted by the average horse over a full day. As a result of these experiments the unit of mechanical horsepower was established. It was later found by experiment that this unit of mechanical horsepower was equal to 746 watts, the unit of electrical power.

Electric mine-locomotive motors are given horsepower ratings in conformity with the standards of the National Electric Manufacturers' Association. The nominal rating is defined as the horsepower at the armature shaft which the motor will develop for 1 hour under conditions rated as normal, without exceeding a temperature rise of 75 deg. C. (167 deg. F.) by thermometer, or without an increase in resistance of windings of more than 40 per cent. This determination is made in a stand test with covers removed and with natural ventilation. An exception to the above temperature rise limit is made for the commutator, which is allowed a rise of 90 deg. C. (194 deg. F.).

Although the N.E.M.A. standards do not define a continuous or all-day rating for the mine locomotive motor, it is desirable to determine such a rating to aid in the proper application of locomotives to different service conditions. A rating of this kind is defined as is the one-hour rating, except that temperature rises are measured at the end of a test run, the duration of which is long enough for the winding temperatures to become constant. The continuous horsepower rating, therefore, is dependent on the ability of the motor to dissipate heat at a rate that will keep the temperature rise of its windings down to a specified limit. Obviously, to increase the continuous rating, it is necessary to take away the generated heat at a faster rate.

Fig. 1—Relation of Motor Torque and Weight

The points on this diagram show the relation between the one-hour rated torque and complete motor weight for a number of existing mine-locomotive motors of different manufacture.



Sometimes the external surface of the frame is ribbed to enlarge its radiating area. An internal fan on the motor shaft for drawing air through the winding is little used, because it would suck in coal dust, water, etc., which in turn would damage the windings, commutators, and brushes. Another factor which discourages the use of the self-ventilating fan is the relatively slow speed of most mine-motor armatures. An effective means of increasing continuous ratings, frequently used on the larger locomotives, is the utilization of a separate blower. In this case the air intake is so arranged that only clean air is taken into the motors.

In actual operation of a locomotive, appreciable heat is conducted away from the motor to the locomotive axle and framework. Passage of air over the external surface of the motor, due to the motion of the locomotive, removes additional heat by convection. These last two factors in heat dissipation are not considered in the factory stand tests to determine the continuous rating. The means taken to increase the continuous rating have little effect on the one-hour rating. Most of the heat developed in the active copper and iron parts in one hour's time is absorbed and has no chance to be dissipated.

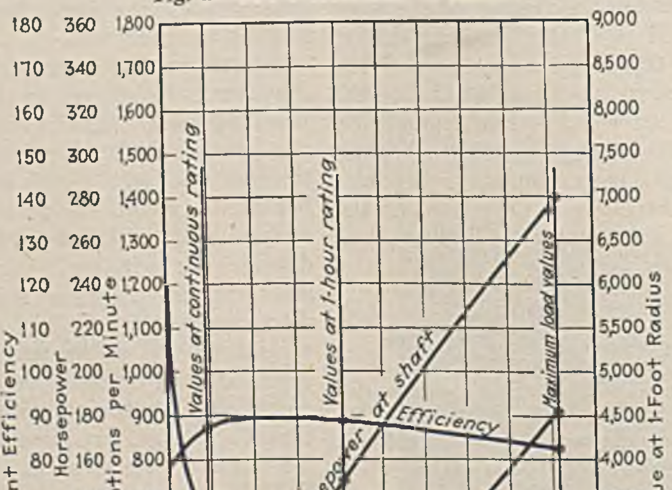
An obvious way of increasing both the one-hour and continuous ratings of a motor is to increase the allowable temperature rise of the windings and commutator. The temperature rise of 75 deg. C. (167 deg. F.) for windings given in the N.E.M.A. standards is based on the use of combustible insulating materials, such as cotton, linen, silk, and paper. Insulation by non-combustible materials, such as asbestos and mica, makes higher operating temperatures entirely feasible (105 deg. C., or 221 deg. F.) and thus steps up the actual horsepower of the motor without increasing the quantity of material used in the construction of the motor.

The speed of a mine locomotive motor is expressed in r.p.m. (revolutions per minute) of the armature. Thus the one-hour rated speed is the r.p.m. of the armature at the one-hour horsepower, and the continuous rated speed is the r.p.m. at the continuous horsepower. The torque at any rating is the pounds of force exerted at a radius of 1 ft. from the center of the armature shaft. Speed and torque are both so closely related to horsepower that it may be said speed and torque combine to produce horsepower. If either one is increased or diminished, the horsepower is raised or lowered accordingly. This is the reason why one cannot judge the size or weight of a motor of a certain horsepower without also knowing the speed.

The analogy between the horse and the motor may again be drawn upon. The small, light-weight race horse may actually develop more horsepower than the large, heavy dray horse. A race horse is a "high-speed low-torque" animal, while a dray horse has a "low speed high-torque" characteristic. Horsepower is proportional to speed times torque.

While rated horsepower alone is no measure of the size or weight of a motor, the rated torque is such a measure. Actually, the torque is a measure of the electrically active copper and iron; but for similar designs it may be used as a measure of the complete motor weight. This is indicated in Fig. 1, in which torques at one-hour rated horsepowers have been plotted against motor weights for a number of mine-locomotive motors made by several different manufacturers. Each small circle in this figure represents the complete weight and the torque at the one-hour rating for a certain motor. The curve drawn through the average of these points indicates the approximate one-hour torque for a motor of any complete weight between 500 and 6,000 lb.

Fig. 2—Test Performance of Motor



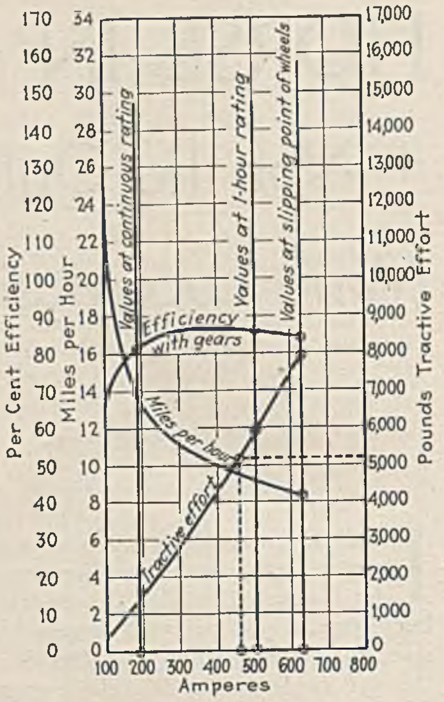


Fig. 3—Performance Curve of Motor on the Locomotive

This shows the performance of the motor as of Fig. 2, when changed to represent its operation on a 20-ton, two-motor locomotive with a gear ratio of 15 to 76, and a wheel diameter of 36 in.

Fig. 2 shows a set of test-performance curves of a 250-volt, 150-hp. mine-locomotive motor. The values of efficiency, r.p.m., torque, and horsepower are plotted against amperes as a base. Since all four curves are plotted against the same ampere values, a vertical line drawn through any point on the horsepower curve indicates the corresponding operating values of r.p.m., torque, and efficiency, and also indicates the corresponding amperes on the horizontal scale. The curve labeled "efficiency" shows the per cent of electrical horsepower supplied to the motor terminals that is developed as mechanical horsepower at the shaft. These performance curves are typical of the direct-current series motors.

Motor test curves, as plotted in Fig. 2, are not in the most convenient form for indicating locomotive performance. They show the speed, torque, and horsepower developed at the motor shaft, but when the motor is applied to a locomotive, the principal values desired are the corresponding tractive efforts and miles per hour. These values indicate the pulling force at the locomotive wheels and the speed in miles per hour at which this pulling force operates.

Fig. 3 is such a performance curve. Tractive effort, miles per hour, and efficiency with gears are plotted with amperes as a common base. The efficiency here is lower than in Fig. 2, due to the inclusion of losses in the reduction gearing between the motor shaft and the locomotive axle. Referring to Fig. 3, at the one-hour rated amperes of 505, the tractive effort is 5,950 lb. and the miles per hour, 9.2. At the continuous rated amperes of 190, the values of tractive effort and miles per hour are 1,400 lb. and 13.8 respectively. Since the values shown are for one motor, the total locomotive tractive effort will be these values times two—the number of motors used per locomotive.

It will be noted that the maximum values are derived from a lower current value than in Fig. 2. The reason for this is that the slipping point of the wheel for a 20-ton two-motor locomotive has been reached at 8,000 lb. tractive effort per motor. In Fig. 2 the maximum values of torque and amperes were limited only by the ability of the motor to withstand the resulting heating of its windings. If the motor represented in Fig. 2 were used on a locomotive heavier than 20 tons, then the curves in Fig. 3 could be extended further to the right. To increase the locomotive weight would allow greater tractive effort to be exerted before the wheels would slip.

The performance curves shown in Fig. 3 are as true a representation of the manufacturer's tests of the motor as those in Fig. 2. They have been changed to represent other terms only for greater convenience in considering the motor as a part of a specified locomotive. With this type of curve available for several motors that might be used on any given locomotive, a number of interesting comparisons can be made. The values of tractive effort and miles per hour at the one-hour continuous ratings can be compared, or the values of amperes and miles per hour at any given tractive effort may be found as shown by the dotted lines. This curve is in the form most convenient for determining whether the locomotive is suitable for a particular service.

Knowing how much tractive effort is required for each loaded car pulled, the miles per hour can be found for a trip of any number of cars. The current at this tractive effort and miles per hour can be determined, and its percentage of the one-hour and continuous rated current values will be important items in determining whether the locomotive can safely haul the given number of cars. It is not the purpose here to go into rules and methods for applying motors or locomotives to various kinds of service, as this has already been done elsewhere (see "Applications of Motors to Mine Locomotives," by W. A. Clark, *Journal of American Institute of Electrical Engineers*, April, 1925). The objective is merely to point out that a set of motor curves of the form shown in Fig. 3 is a necessity in making calculations for motor applications.

At the beginning, it was pointed out that horsepower is an important unit of motor performance. Yet horsepower is by no means the most important measure of the ability of the locomotive to haul coal. Much more important are the questions, What is the tractive effort? and What is the speed in miles per hour at the amperes of the motor rating? It is always desirable to have a high tractive effort, but it is necessary frequently to limit the miles per hour of mine locomotives, because track conditions and safety will not always permit high speeds. This is especially true of locomotives used in gathering service.

By reason of limited locomotive speed, the horsepower obtained from a given motor-frame size also is limited. Nearly all single-reduction mine-locomotive motors could be designed for greater horsepower if the locomotive speed could be increased. The true measure of motor performance on mine locomotives is the answer to the question, How much load will it pull, and at what speed?

▼ ▼

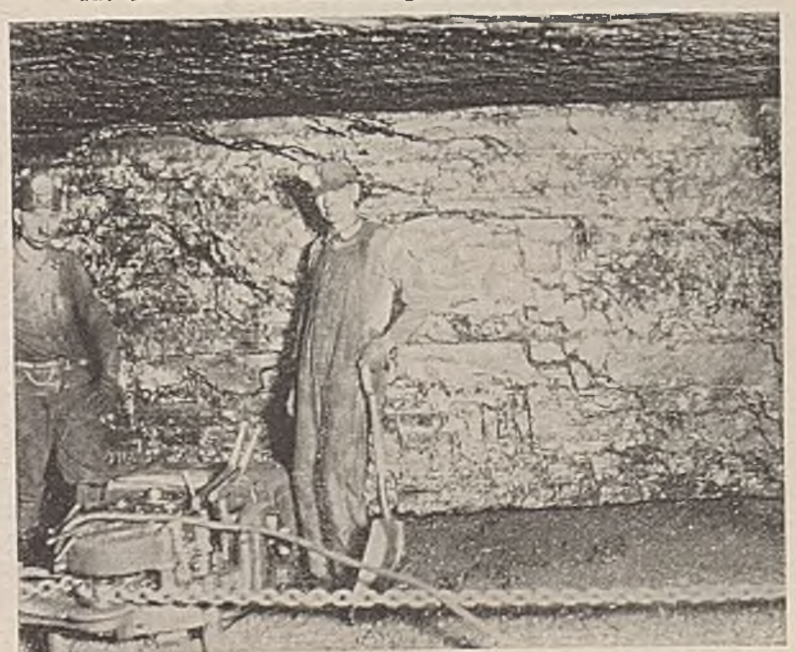
RECOVERED "LAST TON" While Maintaining High Daily Output

(*Continued from page 130*)

quired to spend some days on the special training section in order to become acquainted with the new conditions.

Final calculations indicate that the actual recovery for the whole mine was between 91 and 93 per cent of the total recoverable coal; i.e., of the coal acreage minus outcrop and faulted areas. Company officials admit that the results of the rapid extraction of the barrier pillars by multiple shifting and working two or more loaders per car were an object lesson in the possibilities of concentrated mining.

The Coal Was Clean and Averaged About 6 Ft. in Thickness



Coal Age

Sydney A. Hale, *Editor*

New York, March, 1931

Broadened service

DECISION of the Committee of Ten of the Coal and Heating Equipment Industries to establish national headquarters at Chicago in charge of a full-time staff headed by Oliver J. Grimes as managing director is convincing evidence of the strength which this much-needed co-operative movement has gained in the few short months of its existence. The step taken justifies the vision of the founders of the committee and gives promise of continuing growth and expansion of co-ordinated activity in meeting the new competition facing solid fuel and its allies.

The opening of the Chicago office also marks a broadening program in still another direction, since that office will serve as Western headquarters for the National Coal Association, with Mr. Grimes as resident manager. It is several years since the bituminous operators' organization had direct staff representation outside of Washington; the re-establishment of a Chicago office is both an augur of intensification in the service the National can offer its membership and proof of the soundness of the progress of the association through the trying years since 1920.

How far the excellent beginnings thus made can be carried must depend, of course, on the degree of moral and financial support which the interests that will be the chief beneficiaries of the program give. There is no question as to the need for the program initiated by the committee; the coal association, too, has demonstrated thoroughly its usefulness to the industry. The new competition means not only local problems which will tax the skill and resources of local committees and local associations but the over-all co-ordination and support which only nationally organized bodies can effect.

Timely—and welcome

SHARP NOTICE of the necessity for extra safety precautions, with particular emphasis on the increased danger of roof falls during periods of irregular operation, has been issued by R. M. Lambie, chief of the Department of Mines of the State of West Virginia. The menace of intermittent pillar extraction also is pointed out and the fact is stressed that rapid robbing, when coupled with competent supervision and adequate timbering, reduces the accident hazard. To this general admonition, Mr. Lambie adds:

> Due to low prices and irregular operation, the officials and operators are warned not to lessen the number of supervisors and to keep the mines properly and continuously ventilated, rock-dusted, and patrolled during the next three months. The situation at this time, due to the aforementioned facts and the extremely dry condition of most mines, has brought about the worst condition we have ever had to contend with, and only by the closest attention and complete enforcement of the mining law will we be able to go through this period without trouble.

The warning is both timely and welcome—timely because of the operating conditions outlined and welcome because it is in such refreshing contrast to past admonitions in some quarters which palliated, if not excused, neglect of safety measures in times of financial depression. While safety laws vest considerable discretion in state mine inspection departments, *Coal Age* knows of no statute which authorizes or permits the state to waive strict enforcement of sane safety rules because an offender may be hard put financially to comply with reasonable regulations for the safeguarding of human life.

Any suggestion, either expressed or implied, that such power exists or that such departure from the underlying spirit of these laws is deadly—if not criminal. The direct repudiation of such a suggestion in the paragraph quoted from Mr. Lambie's warning ought to stiffen the backbones of any and all inspectors who might be inclined to let misplaced sympathy with the financial plight of an individual operator soften sober judgment. If the operator can't or won't take the required safety precautions, the duty of the state is clear: Close down the mine.

Heavy sills and caps save American jacks

ONE feature in American methods that has made the recovery of jacks high has been the use of heavy sills that spread the load and so prevent creep around the base of the prop and keep it from sinking into the floor. The Safety Research Board of Great Britain in its report on "Steel Pit Props," notes in discussing the merits and defects of the steel-tube prop with timber filling, as used at Aitken Nos. 1 and 2 collieries in Fifeshire, Scotland: "Some difficulty has been experienced in withdrawing the props, owing to the large amount of roof coal and stone which falls from the goaf edge around the back row of props and to the fact that the props sink from 12 to 18 in. into the soft floor."

This difficulty, however, is by no means a specific fault of this kind of prop, though its small diameter and circular cross-section make its penetration into the floor somewhat easier than with props having an enlarged foot. The quotation calls attention also to the need for adequate caps, which also have been usual in America when using jacks. The same authority says that in Great Britain the losses in posts may rise to 300 per cent per annum, yet even where the loss is thus large "a saving in cost of material is effected." The report cited instances an advance of 400 yd. per year. Such rapid movement makes timber more expensive than steel, despite the heavy percentage losses.

But what a saving surely could be effected if the props, instead of resting on soft clay, were based on solid timber footings and the roof were kept in place by massive caps until time came to move sills, caps, and jacks forward. The American method of using jacks, which was suggested by R. Y. Williams, has received little commendatory notice, not because of its lack of merit but because it was introduced at the beginning of steel-jack-supported conveyor-longwall faces in this country before the difficulties found in Great Britain had developed here. The ease with which the jacks are freed for removal and the fact that they can be freed from a distance, are other factors favoring recovery.

Triumph or tragedy of the status quo

NO truer than the aphorism, "The King is dead. Long live the King," is the statement that coal mines go into bankruptcy only to open up with more zest than ever, for bankruptcy sweeps away most of the overhead that made operation difficult. The youthful successor is more difficult to deal with than the doddering old company it displaces.

And that will be true of natural gas companies also. A pipe line, so long as it does not rust, will always be a menace to the coal industry. The stockholders who expended the money to lay it down may regret their indiscretion, but one cannot well remove a buried pipe line from one place to another any more than a post hole. It is there to transport gas. It may never pay interest, depreciation, or obsolescence, but so long as it will pay the price of the gas at the well, pay for maintenance, pumping, and executive and technical forces, it will continue to carry gas, and it may remain in operation even after it has ceased to earn enough to pay for those items.

So likewise with heating by oil and gas. When the furnace is equipped for burning a special fuel, to go back to coal involves throwing away equipment which cost real money whether it is valuable or not. There is a natural impulse not to do any such thing but to continue a method of operation involving a minimum change. This, to say nothing of the injured pride that goes with acknowledging defeat after boasting of superior wisdom.

All, therefore, that prevents the introduction of oil and gas even temporarily is of value. The low price of coal, its better preparation, the new sales methods, the trend to fine sizes, the development of the stoker furnace, even the present poverty or parsimony of the consumer, will aid in preventing the "first step that counts." Nothing ever is as it was. The minds of men are now helped, now victimized by the status quo. The industry should arrange always, if possible, to have this force working on its side.

Monolithic heterogenes

ONCE again the integrity, or monolithism, of the mine roof has been assailed, and with the usual unanimity; this time during the discussion of Prof. P. B. Bucky's address on the strength of strata, in the course of the February meeting of the Coal Division of the American Institute of Mining & Metallurgical Engineers in New York City.

Unbroken roofs which stretch over acres and acres of territory give no opportunity for the flow of extrudable clays or shales. Consequently when stress falls on strata containing such beds they retain their space-maintaining qualities as they did before mining, and the harder beds above and below are bent in the manner of parts of a monolith; that is, with a maximum stretch at the bottom of the beam grading down to zero at the neutral axis and a maximum compression at the top of the beam.

In this action the clay serves much as does the thin web on a girder, where almost all the stress is carried by the upper and lower flanges. It always has been difficult for the tyro to understand how the web of the girder withstands the bending strains, if indeed he troubles himself at all about the matter; but really it has little strain to bear and its principal and only essential function is as a strut to keep the two flanges at the required distance. That is the function of the clay band, a duty it will perform only as long as it cannot slip away and avoid it.

Nature does not work on the principle of the survival of the fittest. When three posts sustain a structure, the failure of one merely lays the burden on the other two. The middle one, for instance, may sag, and it will then receive a burden proportional only to its resistance. So also in the shear at the cross-section of a roof, the stronger layers take care of the weaker, because the former give way less under shear. And, in bending, the stress falls in the main on such of the uppermost and lowermost strata as are competent to meet the stress. If the lowermost is not equal to the occasion, it ceases to be part of the monolith and becomes a drawrock.

Quite obviously, when the roof has been broken, there are spaces into which clay can be extruded; and the loads on the strata are in places so relieved that, despite the roughnesses between the layers, horizontal movement between them is made easy. Monolithism, therefore, is destroyed. But with such broken roofs Professor Bucky did not deal.

NOTES

. . . from Across the Sea

VENTILATION seems to be getting its meed of attention abroad, and well it may, because of the high pressures necessary to drive the air through the workings with the needed distribution. Earlier engineers failed to provide shafts and roadways numerous enough or large enough to permit low-pressure ventilation; the shafts were deep and their construction far more costly than ours per cubic yard of excavation, so there was every disposition toward economy in cross-section.

Moreover, where several seams are worked one above the other, there is leakage from seam to seam. It is a fact that in some small mines in this country, reliance has been placed on the escape of air under pressure to the surface or to seams above for the ventilation of a lower seam. Such leakage must be quite a difficult problem where several seams are excavated one above the other and dependence is placed on the tightness of the roof to keep the air in its course throughout any one seam.

According to *Glückauf*, shafts Nos. 3, 4, and 9 of the Consolidation pit in Germany, the last of which is the intake and is of 23.8-ft. diameter, are provided with 635,000 cu.ft. of air per minute at a pressure of 14.2 in. water-gage, probably at least double that in use in this country.

A fan planned to have a bigger capacity than any to be found in this country is or will be installed at No. 3 mine of the Durban Navigation Collieries, Ltd., in Natal. It was described by F. A. Steart, general manager, Northfield Collieries, Natal, South Africa, at the Third Empire Mining & Metallurgical Congress, held in South Africa, May 2 of last year. It is a double-inlet Sirocco fan of 12 ft. 10 in. diameter, and Mr. Steart described it as "at the present time the largest colliery fan yet made." He should have said the fan with the largest capacity.

This Durban Navigation fan is designed for a duty of 700,000 cu.ft. per minute at 7-in. water gage, being driven by a direct-acting triple-expansion engine of 1,020 brake horsepower. The capacity is not much in excess of that of the fan at Caretta mine of the Consolidation Coal Co., in the Pocahontas region, which actually delivers over 500,000 cu.ft. per minute at a water gage slightly in excess of 5 in. One of the two fans at this mine is of 14 ft. diameter.

There are fans of the Sirocco type of larger diameter than any of these in the United States. Some have a diameter of 20 ft. If they were run at 7-in. water gage and at a speed sufficient to produce this pressure, they also would deliver 700,000 cu.ft. per minute, but these large fans were originally designed for direct-connection to an engine and the speed of the fan was limited to the safe and economical speed of that unit. In these days of electrically driven equipment, of course, no speed restrictions are imposed.

One of the most practical of the researches made at the behest and on behalf of the Safety in Mines Research Board of Great Britain has been one on the strength of those steel-rib arches of which so much use has recently been made in Europe. Prof. S. M. Dixon made these tests in the laboratory of the City and Guilds (Engineering) College. His report shows clearly that the fishplates at the top of the arch that connect the right leg of the arch rib to the left leg should be of ample strength, that the horseshoe arch is not as strong as the straight-leg arch, and that an arch rib is quite likely to fail sidewise (that is, longitudinally along the arched roadway) if the space between the arched ribs is not filled. He found that the 4x2-in. horseshoe arch failed at 22.5 tons, the same size straight-side arch at 27.1 tons, and the latter arch brickfilled at 67.1 tons. Thus brick filling added 147 per cent to the strength of the arch. The 4x1$\frac{5}{8}$-in. arch failed at 13.8 tons and the 5x4$\frac{1}{2}$-in. at 56.2 tons.

Fishplated Steel-Rib Arches With Struts Between

Brick-filled arches of 4x2$\frac{1}{4}$-in. section weighing 11.15 lb. per foot, 8 ft. wide and 8 ft. high restrained from side movement deflected considerably at the crown but carried 67 tons per arch before failure commenced by tearing the fishplates at the crown. Had the fishplates been stronger and stiffer, a heavier load probably would have been carried.

Some concrete arches of the Schaefer type have been introduced into South Wales and stilted steel arches are being used in many fields.

Stripping in Germany seems likely to undergo a further modification, after which it will be conducted in a manner a trifle more like that in operation in American bituminous strippings. The overburden will be dredged with land dredges, just as ever, but instead of being loaded into railroad cars, hauled to the spoil bank, dumped and placed by conveyors, it will now be carried by belt conveyors along a steel conveyor bridge, 1,214 ft. (almost $\frac{1}{4}$ mile) long, and weighing 3,740 tons, which weight excludes the weight of the dredger and electrical equipment. According to *Colliery Engineering* the capacity of the bridge at the Golpa-Zschosnewitz mine, in the Bitterfeld district of Prussian Saxony, will be 97,475 cu.ft. per hour. The method should work well where the material to be loaded is devoid of stickiness, and therefore will not adhere to the belt.

The same publication in two issues describes two new bathhouses with up-to-date equipment, such as cannot be duplicated in this country perhaps anywhere. These bathhouses de luxe are to be found at the Barnborough Main Colliery, Wath-on-Dearne, Rotherham, Yorkshire, England, and at the Kingshill Colliery, Shotts, Lanarkshire, Scotland. Apparently, there is still some uncertainty in Great Britain, as here, as to whether clothes should be hung up from the roof of the bathhouses or placed in lockers. The former colliery uses clothes hoists (*habits montants*) and the other colliery uses lockers.

At Barnborough Main Colliery the cubicles in which the men take their showers are built of white glaze brick, and for privacy's sake each is equipped with half doors suspended some inches above the floor. Each cubicle has a stand or duckboard. At the bathhouse of the Kingshill Mine, which is owned by the Coltness Iron Co., Ltd., the locker system was adopted because sweating on the walls and the offensive odor of dirty clothes could be avoided. Air is sucked in by a fan, is warmed by steam pipes, and then circulated under pressure through pipes. Thus it reaches the walls and travels down and within them by ducts to orifices near the floor. The heated air entering the room rises and finds its way to roof ventilators.

Each group of lockers is arranged in two parallel rows set back to back with a 3-in. space between. This space is closed at the top and at the ends so as to be airtight. It is further divided longitudinally into four sections, to each of which is led a branch from the 6-in. warm-air main which runs along the top. The air escapes the section by a grid at the foot and back of each locker. It rises through the locker and escapes by a grid at the top, the doors being kept closed except when in use. Every facility is provided in the locker, including a rack for the collier's pipe. On the door of every fifth locker is a mirror. A door is provided for flushing out the 3-in. space between lockers.

Each cubicle has a recess where a towel and shirt can be hung, so that they will escape being splashed by the spray. Each man is required to dry himself and don his shirt before leaving his locker. A feature in the building is a sort of shoestand, with eight small troughs of dubbin, with which the men anoint their shoes before going below. For the men as they leave, there is an electrically revolving shaft with six shoe brushes on which to clean their shoes before entering the bathroom proper.

Another innovation is a dining room for seating 72 persons, with canteen providing for their wants.

One big improvement is the use of a four-leaved revolving door to keep out cold draughts and to save air. It is difficult to understand how bathhouses continue to be built with leaky hinged doors. The coal operator ought to be, and often is, an expert on ventilation, but somehow he has never appreciated the value of the door with revolving leaves, either above or below ground, the Consolidation Coal Co., I believe, being the only exception.

R. Dawson Hall

meet government requirements. So some of it was by no means "the finest of the wheat." Furthermore, coal is better cleaned now than ever before, resulting in lower ash yields. Here, however, are the figures:

Average Percentage of Ash in Car Samples From Published Reports of the U. S. Bureau of Mines

	Ash Per Cent
Middle Appalachian (southern West Virginia, Virginia, western Kentucky)	7.2
Northern Appalachian (Pennsylvania, Ohio, Maryland, northern West Virginia	10.2
Oklahoma-Arkansas	11.7
Eastern Interior (Illinois, Indiana, western Kentucky)	11.9
Western Interior (Iowa, Missouri, Kansas)	15.2

The great need for better cleaning plants for industrial coal in the western interior province is obvious.

On the ENGINEER'S BOOK SHELF

Sources of Coal and Types of Stokers and Burners Used by Electric Public Utility Power Plants. By W. H. Young, Institute of Economics, in co-operation with the U. S. Geological Survey. The Brookings Institute, Washington, D. C. 79 pp., 6x9 in.; paper. Price 50c.

"It is a commonplace that the distribution of goods remains the least known of the primary economic functions," says W. H. Young in introducing his subject. This publication does not attempt to answer so large a problem in regard to coal; it merely essays to solve the problem with regard to the electric public utility power plants and to give the information by mining regions. Some of the regions from which the coal comes, unfortunately, in some cases have been made in this report too large and extensive, especially that which is designated the central Pennsylvania field, which contains coal areas where the coal is of a high quality and areas where the coal is inferior. It seems an anomaly to divide the bituminous coal field of Pennsylvania into only five districts and to divide West Virginia into no less than seven—the Panhandle, northern West Virginia, Kanawha, Logan, Kenova-Thacker, Pocahontas (including Tug River), and New River (including Winding Gulf). It would be no more difficult to draw dividing lines through central Pennsylvania than it has been to draw them through the State of West Virginia. Exception may be, and indeed has been, taken to some of these latter lines, as there would be to any lines drawn in central Pennsylvania, but they are recognized, nevertheless.

Strange to say, it happens that the Somerset-Meyersdale field sends coal to the same areas as the central Pennsylvania field, and that when it arrives it is used in quite similar proportion for pulverized coal, underfeed stokers, overfeed stokers, chain-grate stokers, and hand-fired boilers. That, however, proves little, for the poorer types of coal in central Pennsylvania have a more limited territory than the higher types for public utility purposes and do not modify in any way the figures for the whole district. The whole question of coal areas needs consideration. They should be based on coal characteristics rather than on union lines, as in the case of central Pennsylvania. Surely also Illinois needs partition as much as eastern Kentucky, which is split into three parts.

The figures unfortunately run back to 1928, so perhaps it is not worth while to quote that 17 per cent of the coal, or 7,112,739 tons, used by electric public utility power plants was pulverized before burning, that 2.3 per cent of the coal used by these plants, or 973,068 tons, was burned under hand-fired boilers; or that electric public utility coal plants burned 53.8 per cent of their Texas and North Dakota coal, 43.1 per cent of their Virginia and Alabama coal, and 40.3 per cent of their western Pennsylvania coal in the pulverized form. The Somerset-Meyersdale and Cumberland-Piedmont fields, with only 5.2 per cent burned as pulverized coal, and the central Pennsylvania field with only 6.2 per cent so burned are in the tail end of the atomized-fuel procession.

A table is given showing the average percentage of ash in car samples from reports of U. S. Bureau of Mines, but these perhaps are misleading, for the reports of the Bureau are for coals purchased by the highly discriminating U. S. government. Relative to each other the figures may be of value, for the U. S. government buys the best of each region. However, some of the analyses were obtained by the government to find out where to buy and when the seller was not quite clear how nearly he could

The Fuel Problem of Canada, by Martin Nordegg. The Macmillan Co. of Canada, Ltd., Toronto, Canada. 155 pp. 5x7½ in.

Canada has labored for years under the handicap that it has no fuel where its principal manufacturing industries are located. Coal is a cheaply produced article which transportation costs raise to quite an expensive commodity. When the costs of selling and delivery are added, the burden on the consumer is heavy. But these facts, however unpleasant, must be faced by all coal consumers where coal mines and markets are widely separated. Hence consumers are quite likely to insist on buying from mines whence transportation is cheap.

Mr. Nordegg claims that the United States producers are selling coal in Canada at less than cost. That probably is true. They are doing the same in the United States. It is quite the general rule also to sell "distress" coal and other superfluous articles for anything that can be obtained for them. Particularly is that true of coal for which no ready market is found at the point of delivery. It must be sold promptly because storage, unloading, and loading costs are quite high and soon eat up, not only the costs of production but any other costs that may have been added thereto. Probably Canadian operators are occasionally faced with a similar dire necessity.

The author declares on page 38 that Nova Scotia bituminous coal has only 3 per cent of ash. In "Investigations of Fuel and Fuel Testing," of the Canadian Department of Mines, the lowest ash given for Nova Scotia fields is 7.5 per cent; the highest—if it be just to mention it—is 17.9 per cent. The ash of peat fuel, presumably Canadian, is said to be 3 per cent, but the authority just cited in ten samples puts the low figure at 3.6 and the high figure at 11.1 per cent. The other figures have not been checked. No intent to mislead should be alleged, for Mr. Nordegg might well have mentioned the Coal Creek coal of British Columbia, in which the ash runs from 2.2 to 4.2 per cent. R. DAWSON HALL.

THE BOSSES TALK IT OVER

Day Work—
How Can It Be Controlled?

"THE Old Man was right," began Jim, the super, as he and Mac settled down to one of their daily talk-it-overs. "Our day labor costs have been out of our control."

"Not so fast, Jim," chimed in the foreman. "First, tell me how you figure that out. Day work gets more supervision than any other job below ground. My assistants and I check up on those jobs every time we pass them, and that is more than once, twice, or three times a day."

"It's not a question of how much supervision, Mac, but how intelligent. Dad and I have decided to apply specialized supervision to day work. One man—two or three, if necessary—will look after day work only, and report direct to you. Your section foremen will concentrate on face activities."

"What's the big idea?" grumbled Mac.

"Simply this," smiled Jim: "We've all had a rude awakening. All of us were given a chance to estimate the time required to lay a room switch. We gave our figures, each in a separate envelope. Then we had time studies made. Last night Dad and I compared the results. Believe it or not, Mac, not one of us came within 20 per cent of average actual time; and the guesses of even your section foremen varied as much as 100 per cent. No two estimates were nearly alike. There's been too much guessing and not enough knowing."

WHAT DO YOU THINK?

1. What has been your experience in the control of day work?

2. Can day labor jobs be standardized as to time required?

3. Analyze the proposed plan and give your reactions.

4. What will be the effect on face efficiency?

All superintendents, foremen, electrical and mechanical men are urged to discuss the questions on page 142. Acceptable letters will be paid for ▸▸▸▸

Is it ever advisable to shift tonnage men to day work? Mac and Jim had words over this question in February. How the readers of *Coal Age* would handle the problem is told in the letters following.

As a Business Proposition

IN coal mining, the greatest item of cost is labor and the greatest waste is time. How wisely we are able to handle these items of expense determines largely our success or failure. The final analysis of management is to increase the quality and quantity of every man's work. In this, the usual procedure is to find means of increasing the production of the miner without increasing the number of company man-hours.

Evidently Mac, Jim, and the Old Man have discussed this question, and Mac is being held responsible. Mac's statement to Jim is evidence that he would rather put the miner at day work than have him go outside to be questioned by the Old Man. Mac is fooling no one, but is playing ostrich. The Old Man can get the facts from the cost sheet. It certainly looks like an insult to a foreman's intelligence to be questioned on a matter like this. It all seems to me as if Mac and the Old Man have their signals crossed and had better go into conference.

The test of a foreman is his ability to get things done. To do it yourself is good advice if you have only a few jobs ahead; but the foreman's work is so extensive that he must depend on a large number of men to execute orders. As we find the foremen, we find the men; and the men make the mine.

A leading coal corporation with a name for making coal-mine officials of the highest order follows this plan. This concern is careful whom it employs as an official. It holds regular monthly meetings of officials and other representative employees, in no way perfunctory but carefully planned from beginning to end. Fifteen days before each meeting a mimeographed copy of questions to be discussed at the coming meeting is sent to every man expected to be there, the object being to give each man a little time to think over the questions, so that he can be amply prepared to talk or listen with intelligence. With these questions comes a complete mimeograph of the proceedings of the last meeting.

Another plan this company follows is to keep all key men informed by frequent circular letters. These circulars cover every phase of mining and in some years three hundred such letters are received by each man on the list. All this material is filed by each man for future reference.

Through this plan more than through anything else, the foremen are raised to a higher standard. When they see that an assistant foreman shows slowness of improvement they put him at work where he takes orders instead of gives them. Mining is a business proposition and should extend right up to the working face. G. E. DAUGHERTY.

Paintsville, Ky.

John Didn't Earn His Pay

JIM was right in telling Mac he should not have put the entry man to work. Such practice encourages loaders to leave their working places at any semblance of an excuse, with the knowledge that they will be given a job elsewhere and earn at least as much money with less work. To keep all men in the mine contented, Mac must treat all men alike. This is impossible under the circumstances shown to exist at the mine where Mac is foreman.

Another reason the superintendent opposed Mac's decision involves the time necessary for the entry man to gather the necessary tools and get to the entry requiring cleaning. So much time would be lost that the actual work accomplished would not justify payment of wages for the entire day.

Curwensville, Pa. PETER ROSS.

Make Up Lost Time by Turns

IF the mine is unionized, there is not the slightest doubt that John would see the committee and put in a claim for lost time. As it is admitted that the reason John had to go home was that the machine had broken down and failed to cut his place I don't see where Mac could put up much of a fight. He evidently realized that he would have to pay lost time anyway so he might just as well have John work for it.

At an operation isolated from towns, where the men live from five to sixteen miles away and have to rise at 4:30 or 5 and drive or take a train to work, it is only right that where the worker is unable to work through a fault of management, the company should give the man day work. I see no reason for Jim's protest, as in 25 years of mining experience I have never seen the time where an extra worker on hoist days could not be economically employed.

In my district this particular instance could not happen. If a machine breaks down and men are left without coal it is the rule that the machinemen work over and the company shoots the place after it has been cut. It is also in our contract that where the place is cut and the shotfirer through negligence fails to shoot the place, leaving the loader without coal, the loader shall be given day work or be paid for lost time. These things are only fair, and should be practiced in union and non-union mines. Should a whole section be closed down by the examiners on account of the top breaking and an accompanying release of gas, we arrange to notify the workers and save them the trip to the mine. The time or cars lost by these men are made up by "turns" when they return to work. I see no reason why, if Jim protests employing John on day work, Mac could not use this system successfully. THOMAS JAMES.

Vincennes, Ind.

To Keep Men Satisfied

MAC probably had several good reasons for telling John to clean track. He may have been showing John that he had some interest in him. If this was the case, Mac showed commendable judgment, for he will be repaid by having a satisfied workman, a workman who will do more and better work in the future. A little psychology helps a great deal any time.

I don't think Jim was justified in protesting Mac's decision, because Mac, being in charge of the inside workings, knows more about the conditions than does Jim. He is going around every day and sees these things. Our "super" doesn't want to see his men going home under any circumstances, he wants to feel that his men are satisfied.

Ernest, Pa. ROBERT SAMSON.

Supervision Found Wanting

NO MATTER what the reason for his decision, Mac should not have shifted the entry man to another job when he found the entry uncut. Mac's duty should be to employ every man in the mine profitably. For this reason Jim was justified in protesting Mac's decision. A policy of this sort will spoil the good worker, causing him to become careless, because he knows that a job will be made for him in case he runs out of work even through carelessness on his own part.

It is certainly a reflection on Mac that he does not know what is going on in the mine. Only one deduction can be drawn from this case, and that is that supervision and reporting have been lax; otherwise, the foreman would have known first thing in the morning that John's place had not been cut during the night. The management should keep a record covering such matters, and if no improvement is shown the underground boss should be let go, even if his name is Mac.

FREDERICK NEUMAN.

Scranton, Pa.

Mac Made a Big Mistake

OUTSIDE of salving his own conscience, a quality which most foremen can scarcely afford to develop in these perilous times, there is little or no justification for Mac employing John at cleaning track. In the first place, that is not John's regular line of work, and to employ him on this job is merely to deprive another of a job to which he is much more justly entitled. Again, it is poor mine economics.

In most progressive operations it is customary to figure ahead and, as most machinery is prone to develop weaknesses at the wrong time, to anticipate such troubles. Extra rooms should be held in readiness for such an emergency, unless there still exists an Arcady where the cost sheet disturbs not the dreams of those responsible for its business solvency. Where lack of development precludes this desirable provision, a quick substitution of the machinery will fill the breach. In any case, the practice of employing loaders outside their own province is not a good one.

It is my conviction that the only salvation for any operation lies through planned production. There isn't now, and there never has been, the slightest taint of magic in running a coal mine, and about all that ever emerges from the sleeve of the average mine superintendent is much sweat and a well-thumbed cost sheet.

Among the several reasons readily apparent against the practice of shifting jobs is the attitude of the workman toward his job. The loader, as a rule, is paid a higher rate than the maintenance man and feels that he isn't required to give the best that's in him so long as he puts in the shift. Even if this weren't true, so haphazard a method of cleaning road is scarcely complimentary to intelligent men.

Road cleaning can be accomplished more economically and thoroughly by employing as large a force of company men as haulage facilities will permit, under the direct supervision of the mine manager or one of his assistants. Usually the haulage force is best for this purpose and, as it is a vital part of any mine personnel, the extra time granted these men on idle days helps to lessen the disparity in the respective earnings of loader and company man, besides accomplishing a necessary function in a sensible manner.

Consideration

No close observer of coal mining can fail to feel the heart warmth of the average owner and management of mines for the worker. Dad or Jim will say, "We are doing the best we can for our people; nothing would please us better than to be in a position to do more." The industry has the desire, but not the power, to do for its workers. If wastes are eliminated by sounder management practices, much more could be accomplished toward satisfying the worker. Human considerations come first, of course, but without continuous improvement of operation those considerations cannot be advanced. This problem in its many phases is the center of these pages. Co-operate in its solution; send in your letter today.

I have always felt that there is too great a disparity between loader and company man in the remuneration each receives. Loaders are seldom proficient or sufficiently interested in any work outside their own, which calls for no unusual talents, unless husky physique comes under this caption. On the other hand, the hazards and unusual conditions which are likely to confront both haulage and maintenance men call for alertness and a measure of ingenuity entirely out of harmony with the disposition of the average loader.

From the standpoint of harmony and practical procedure, shifting jobs is never justifiable. Efficiency and control rest upon the exercise of correct judgment in the distribution of the upkeep expense of the operation, and a high-grade, thoroughly competent haulage and maintenance force can always be depended on to respond in generous measure directly according to the treatment given them.

ALEXANDER BENNETT.

Panama, Ill.

Conciliation Board Ruled

A MAN who enters the mine with the intention of working the shift should be paid for the day if something has occurred during the night to prevent him from carrying out his job. Some time ago a case similar to John's arose in one of the anthracite mines. A miner entered his working place, sat down for a few minutes, and then decided to go home. This decision automatically robbed his helper of a day's work.

The conciliation board ruled that the miner was compelled in this case to pay his helper for the shift, since the latter was willing but did not get the opportunity to work. My interpretation of Mac's problem as applied to anthracite mining is that the company should adopt a system whereby a man without a job for one shift should be assigned to a miner who has plenty of work to be done.

JOHN J. CHIRE.

Hasleton, Pa.

Beware of Favoritism

I AM confident that Mac was justified in putting John to work; that he understood the particular circumstances in the case. But as to whether Jim was justified in protesting Mac's decision, I am unable to say; that depends upon the management set-up. There are two facts to the case: It is possible that the overhead expense at this mine might be so high that the added expense could not be justified. On the other hand, John might be a good worker with a large family to support, in which case he deserves payment for the day.

My rule is to do exactly as Mac did, provided I have a job at hand which must be done. But if the man who has been favored fails me the first time he will not have the opportunity of repeating. In every case, I attempt to be sure of my ground, so that men loading coal will not plan their work so as to force me into giving them occasional turns at day work with the ulterior intention of taking things easy for a day.

SAMUEL A. JONES.

Johnstown, Pa.

Mac Made No Mistake

MAC used good judgment when he offered a shift at cleaning track to the loader he met on his way home. It seems this was not the first time John's place had not been cut, due to the machine being broken. As he was in no way responsible, why not give him a chance to make a day's wage? Mac did just what any foreman interested in his men would or should have done.

Jim showed his narrowness by protesting Mac's action. He is of the type found in many of our mines today: the type that does not realize that a man's a man regardless of whether he be loader or general manager. The super was a loader at one time; if not, he should have been. He should picture himself once again in the loader's place, working by the day, car, or tonnage—not by the month. Reporting for work, going back home, not having made a dollar, through no fault of his own, to a wife and family perhaps in need of his earnings.

Jim should get away from the feeling that the man is just a loader and summarily let him go home. The miner is the most important man around any mine. Without the loader, how long

would the company employ Jim and Mac? All companies should have a rule that in case a man reports but is unable to work, through no fault of his own, an effort be made by those in charge to find him work, exactly as Mac did. JAMES T. REYNOLDS.
Moundsville, W. Va.

Privilege the Good Worker

MAC'S reason for putting John to work was that John is a good entry man and the foreman did not want to see him idle for even a day. To a good man, lost time is a discouragement and should be avoided at all costs, for one good man on the job is worth four or five of the indifferent type. You can depend on a good, honest man to carry out your plans and suggestions; furthermore, the better the man, the less supervision he requires, an advantage which should not be overlooked.

Even though a machine breaks down, there remains no excuse for an entry not being cut. In such events we operate one of the other machines overtime and shift it to the territory requiring cutting. It appears as if Mac was not on the job in this respect. However, he used good judgment in putting John to work at some other job, for the reason that no excuse could be found for sending him home. Perhaps the night boss was involved. He should be required to make out a report on all cutting, so that any place let down during the night will come to the attention of the day foreman, who can give the neglected worker some other job before he goes into the mine. F. J. HALL.
Stickney, W. Va.

Mac Alone Was Responsible

IT WOULD appear that Mac was putting John to work simply because he was a good buyer in the store, or possibly that the track in Section A really required cleaning. Notwithstanding, the fact remains that John did not produce any tonnage for the day and the company was required to pay him just the same.

Jim apparently has allowed the control of his men to slip away from him. Instead of protesting this small incident, he would do better to go back to his office and give careful study to the whole operating scheme. It is necessary that every man know his place in the organization and that every boss know his responsibility. If the allowances are fair there should be no necessity for shifting men except in case of absenteeism.

Under no consideration do I believe in making the tonnage worker the goat. Mac alone is responsible for John's not having any work to do in his entry. A little investigation by the superintendent might have shown up other defects in operation which should be nailed on the spot. The trouble might have rested with the machine runner or even with the repair man. It was the self-evident duty of the superintendent to place the responsibility then and there.

No company should be without a strict policy governing the scheduling and responsibility for mine operation. It is surprising how near management can come to getting a definite tonnage from each man when attention is given to systematic supervision.
Mogg, Ky. OSTEL BULLOCK.

In the Light of Experience

IN THE light of circumstances, the "super" was not justified in protesting Mac's decision. Every company should have a policy covering matters of this kind, for then the men will respect their superiors and be contented in their job.

To illustrate this point I went into a man's place in a mine to which I had just been assigned, and found the roof exceptionally well timbered. I asked the miner his name and he told me it was Bill. Then I said, "Well, Bill, you certainly know your stuff." His face lightened; and he replied, taking my hand, "Boss, you are the first man who ever talked to me like this." As much can be gained toward the improvement of efficiency by the intelligent handling of men as by intelligent guiding.
Oliphant, Pa. JOHN BOHN.

Efficiency vs. Sympathy

EVIDENTLY Mac put John to work cleaning track in order to allow him to make a day's wages regardless of efficiency. The fireboss was at fault for not reporting the trouble to the foreman, who in turn could have relayed the information to the loader and instruct him to double up with some other loader.

I do not consider it good practice to clean roads during the day shift. Not only is it dangerous but it involves handling refuse twice instead of loading it directly into mine cars. No doubt Jim had this in mind when he "called" Mac for instructing John to handle this job. Shifting of loaders to day work is bad as a general practice. There is one exception that might be taken, however, and that is to allow the loader to fill in on a job of track-laying or timbering in case one of the regular day workers failed to appear for work. That all depends upon the loader, of course. Only if he is a good man will he earn his wages for the day at work of this kind. It is dangerous for a mine boss to become too sympathetic toward the miner, for such feelings encourage the latter to take a day off without excuse. The thing to remember is that all men are not the same and that each must be considered more or less an individual case.
Smithfield, Pa. F. O. NICHOLS.

Square Dealing Is Rewarded

WHETHER the mine foreman did right in giving the entry man a day job depends on particular circumstances. The fact that the worker responded so readily to Mac's suggestion proved that he really wanted to work and was thankful for the opportunity. It is in this spirit that the foreman and his workers should co-operate. In practice, however, I find such actions too often based on unmerited favoritism, fraternal ties, or relationships, a situation which causes discontent among the other workers.

There was something to be commended in the action of each of the three men involved. John cheerfully responded; Mac wanted to give John a square deal; finally, Jim, though doubtful as to the advisability of the action of his foreman declined to make an issue of it, knowing that Mac knew John as an individual, while he himself knew John only as an employee. If action and reaction are equal, the best way to get a square deal is to give a square deal. W. H. LUXTON.
Linton, Ind.

Why Didn't Jim Investigate?

JUDGING from what John said, Tom's machine must have been breaking down frequently, which made Mac peeved. That is a poor way for a foreman to act under the circumstances, even though it knocks men out of work and prevents the foreman from meeting his tonnage quota for the day. How many times in your experience have you had equipment neglected? Then, on the last of the month, the big boss called you in and stormed over the cost. When you said anything about the other fellow letting you down, merely patching up the equipment and charging a good deal of overtime for a hurried job, he probably said you were passing the buck and that you were not trying.

Jim should have stopped making his rounds and gone to the machine at once to make a careful inspection and find the cause of the breakdown. Then he should have called the chief electrician and told him to make the repair, so that the machine would cut coal not for a day but for a long time; that otherwise a new man would be given his job.

Mac should be careful in placing loaders on day work. That practice encourages poor clean-ups. Only if the man out of coal is a hard worker and loyal to his employer, will he show his appreciation of Mac's generosity by doing as much as, or more than, the average day man in eight hours. I have men of this type and naturally give them special consideration. They are an unusual lot. If they find a fall of slate on the haulway early in the morning, they will clean it up without instructions and have the road open before the foreman gets to the scene of the fall. In so doing they save many times the cost of moving the slate and trust the foreman to pay them for their time. They are the men to favor.

Glo, Ky. WALTER HORNSBY.

Better to Send John Home And Pay Him for the Day

JOHN was put to work to cover Mac's neglect. Jim was fully justified in protesting Mac's decision; he was entitled to know just why this action was taken. Under similar circumstances I would severely censure Mac, but allow him one more opportunity to make good, provided this was his first offense. A company should get a new super if Jim tolerates such practice.

It must be assumed that John is an average man employed on a tonnage basis, that he got up at the proper time, donned his mining togs, had his good wife pack his pail, and arrived in time at the mine. He boarded the man trip, rode a couple of miles underground, and walked another mile to his place of work. Finding the entry uncut and having no work, he started on his long trek to the outside. Fortunately for John, he met up with the super under conditions that were embarrassing to Mac, so John was told to clean track in a certain heading. Mac would have done the right thing had he told John to go home and paid him for the day. It probably amounted to the same thing, as far as the company was concerned.

A company with a policy that makes such occurrences possible is traveling rapidly toward the inevitable end which has already placed the property of many concerns in the hands of creditors, or totally eliminated them as an integral part of the coal mining industry.

CHARLES M. MEANS.
Pittsburgh, Pa.

Look for Unsafe Practices And You Will Find Them

HAVING served for a number of years as inspector, foreman, and superintendent, I speak from experience. First, I might say I cannot agree with anyone who feels that employing a safety inspector at a mine is poor management. As a matter of fact, I feel that it shows good judgment on the part of any company to do so. One writer, I noted, states that the salary paid a safety inspector is money foolishly spent. As to this, I feel that at any mine employing upward of 300 men, a safety inspector will save many times the salary paid him in the way of accident prevention.

Some may ask the question, Why does a safety inspector see conditions which men on the job day in and out do not see? This brings back to my mind a conversation I one time had with the vice-president and general manager of one of the largest coal companies in the Pittsburgh district. After completing my inspection of several of his large mines for insurance rating purposes, I discussed with him a number of the sub-standard conditions I had found. Many of these would cost very little or nothing to correct. He realized at once what it meant to his company in dollars and cents aside from the safety. Of a sudden, he struck his fist on his desk and remarked, "Reynolds, I know those conditions you have found out there exist or you would not report them. Many of them would cost little or nothing to avoid. What I can't understand is that our men who are at the mines seven days a week are blind to them and don't realize what compliance means to our company." My answer was that I went to the mine looking for them and found them.

I recall another instance: I went to a mine where the men had gotten into the habit of traveling the hoisting slope during work hours, it being a short cut to the outside. I drew the foreman's attention to this hazardous practice, and while I was not in position to make any recommendation, I was there to report conditions as I found them. Being personally acquainted with the man in charge, I told him what steps I would take to break up this hazardous practice, and he thought the suggestion a good one. I completed my inspection and left, thinking he would carry out the suggestion I had made. He apparently did not, however, for the following day two miners were killed by a runaway car on this very hoisting slope. This happened a number of years ago, and I suppose the widows and children of those two victims are still drawing compensation. If the company had employed a safety inspector, no doubt these two men would have been living today.

As to the authority of a safety inspector, I feel he should be given full authority over every man on the job from trapper to superintendent. So long as he is working in the interest of the company and safety, he should report, I feel, to the general manager direct, and a copy of his report should be sent to those in charge at the mine.

JAS. T. REYNOLDS.
Moundsville, W. Va.

Organized Credit Extension Will Curb Overdraft Evils

PAYROLL overdrafts are a source of trouble at every mine where credit is loosely extended to miners. It makes additional work for the clerical force and leaves a feeling among the employees who resort to such overdrafts that they are privileged characters and stand closer to the company than the honest, faithful employees who are conservative and try to meet their obligations. The overdrafted employee in most cases is an inefficient worker. He usually works when he feels like doing so, and has no interest centered in his job except to get by. He believes, and it is true, that so long as he stays indebted to the company it will retain him and that in very rare cases will he be discharged.

I personally know of miners who make it a practice to keep in debt with the company they work for, especially during times when work is slack, for no other reason than to be sure they will have a job and something to eat. Any company that builds up its organization with men of this kind will lose efficiency in production to the extent that it will more than offset any possible profit from the store. Of course, there are exceptions to this rule, and the deserving worker should be given consideration.

One of the best systems covering overdrafts I have seen was to keep the payroll posted daily and to allow no employee to overdraw his account. In cases where a man was sick or had sickness in his family, and could not meet his obligations on this account, the company would not charge him for his rent or for medical attention, fuel, and light during the period in question. In addition, the store manager would extend sufficient credit to see the employee through. At the expiration of the trouble, the employee would be charged with his deficit in the store and be offered the privilege of working extra time to meet it.

A system similar to this can be set up to take care of efficient workers during slack times. If the system is carefully organized, the men will know that they must work faithfully in order to keep themselves in the good graces of the company. This system not only keeps the employees feeling kindly toward the management but it builds up an organization which leaves little to be desired.

C. T. GRIMM.
Kirksville, Mo.

Trade Literature

Dump Cars. Western Wheeled Scraper Co., Aurora, Ill.—Catalog No. 80: 144 pp., illustrated. Describes the grading tools and machines made by this company, including dump cars of drop door and lift door types.

Paints. "Master Specifications" is the title of a booklet on paints issued by the Joseph Dixon Crucible Co., Jersey City, N. J. This 8-pp. illustrated bulletin in addition to its data on industrial paints includes information on flake-graphite paint.

Rubber Lining. Wilkinson Process Rubber Sales Corporation, Chicago—Among the uses for Linatex, mentioned in this 23-pp. booklet, is for mine-skip lining and for coal-handling plants.

Couplings. Parker Appliance Co., Cleveland, Ohio—Bulletin No. 23; folder illustrating and describing the advantages and uses of triple-tube couplings.

First-Aid. Contest Outfits and First-Aid Kits are illustrated and described in bulletins Nos. 43 and 45 issued by the Mine Safety Appliances Co., Pittsburgh, Pa.

Rock Drills. Type "L-8" Rotators, Bulletin No. 87-C, 12 pp., illustrated, and Self-Rotating Water Stoper, Bulletin No. 87-E, 4 pp., are two publications recently issued by the Sullivan Machinery Co., Chicago.

Arc Welding. Automatic Arc Welding by the Electronic Tornado Process. Lincoln Electric Co., Cleveland, Ohio—Pp. 40, illustrated.

OPERATING IDEAS

From PRODUCTION, ELECTRICAL And MECHANICAL MEN

A Convenient Range for Adjusting Surveying Instruments

SURVEYING instruments probably receive more rough usage in mine service than in any other kind of work. In low seams they get many a bump from closely placed timbers and obstructions, such as gob walls and ventilating curtains. Furthermore, the continual collection of dust and moisture upon them, both inside and out, makes frequent cleanings necessary.

Consequently, mining transits and levels get out of adjustment quite frequently, but, owing to the necessity of returning them to the office and of establishing the necessary points upon which to sight while they are being readjusted, many engineers are sometimes prone to allow their instruments to remain out of exact adjustment for long periods. The disadvantages resulting from such laxness are too apparent to require elaboration.

While doing mine surveying in the southeastern Kentucky coal fields in 1927, Daniel D. Jenkins, of Rolla, Mo., was shown an adjusting range which was designed to obviate these disadvantages. It provided a convenient place for testing and adjusting instruments with accuracy and speed.

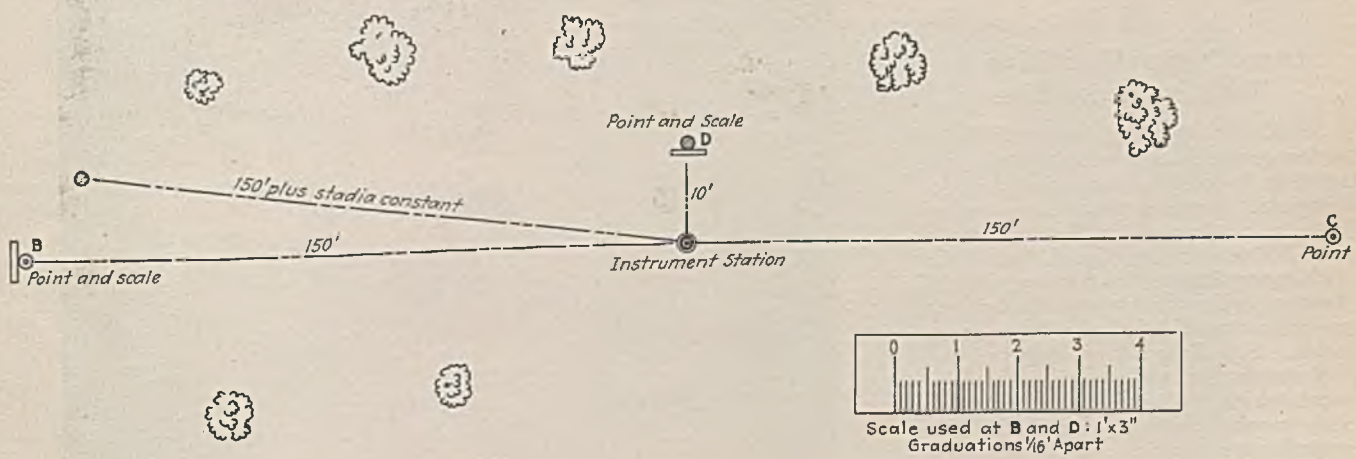
Along a nearly level bench on the mountainside, near the main portal of the mine, the undergrowth and young timber had been cleared away to form an open space about 300 ft. long and 15 ft. wide. In the center of this clearing a piece of drill steel was driven into the ground to form a permanent station. At distances of 150 ft. on each side of it, lengths of steel were driven in to mark the prolongations of a straight line through the permanent station. Back of one of the points and directly in line with them was erected a post, 6 ft. high, which carried, about 5 ft. above the ground, a scale divided as shown in the accompanying sketch. This scale and the three stations were used in adjusting the line of collimation of the instrument.

At right angles to the permanent station and about 10 ft. from it, a tall pole was firmly set up, and a point was marked upon it by means of a tack set as high as could be conveniently seen with a transit. Vertically under the tack, and as low as possible, a second scale, divided like the first scale, was fastened. This was used to adjust the horizontal axis of the transit.

Set off at a small angle to the line *BC* (see sketch) was a second pole. The side of this pole which faced the permanent station was planed flat and graduated as is a leveling rod. These graduations did not extend for the whole height of the rod, but, beginning at a point exactly 4 ft. above the top of the permanent station, they were carried up to the 6-ft. mark. The exact distance from the permanent station to this pole was 150 ft. plus the stadia constant of the instrument. In adjusting the stadia wires it was necessary only to move them until they included a certain known distance on the pole—they were then in exact adjustment.

Such an adjusting range is easy to lay out, costs little or nothing, and is highly convenient for making adjustments following any one of the numerous mishaps met with in underground surveying which throw an instrument out of adjustment.

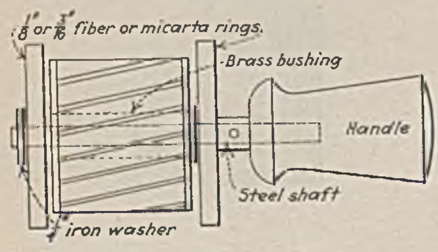
Layout of Adjusting Range; Scale for Adjusting Line of Collimation and Horizontal Axis



Tester for Stator Windings

Whether the windings of a stator have been correctly connected can be determined by the use of a testing device, the design of which is described in the January, 1931, issue of *The Electrical Journal,* published by the Westinghouse Electric & Mfg. Co. The device is built from the rotor of a 60-cycle fan motor and a few odd parts. It will indicate instantly whether either a single coil or a group of coils have been accidentally connected in a reverse manner.

In the construction of this tester, the shaft is pressed out from the fan rotor and a small brass bushing inserted.



Assembly of Testing Device

This bushing is then drilled to a loose fit on a 1/4-in. steel rod. As shown in the accompanying sketch, two fiber or Micarta disks, 1/8 to 3/16 in. in thickness, are cut so as to exceed slightly the diameter of the rotor. Iron washers are used to keep the assembly in position on the shaft, the outer washer being soldered into position or held by a cotterpin. The handle from a 30-amp. knife switch completes the device.

In testing a stator about one-half voltage should be applied to the stator winding and the device held against the stator iron and slowly moved around the periphery. If the winding is correct, the fan rotor will continue to rotate in one direction. If, however, a single coil or group of coils has been reversed, the rotor of the tester will turn in the opposite direction when it passes over the affected section of the stator. It is easy to determine the direction of rotation of the testing rotor by holding the finger lightly against its surface.

Many find "Operating Ideas" one of the most interesting parts of the paper, because it helps them at their daily job. Doubtless you have some unusual way of doing something, have devised a new tool for meeting one of the problems of your work, or have hooked up your electrical equipment in some new way. *"Coal Age"* would be glad to learn of this development. A photograph may aid in telling the story, and a sketch—however rough so it tells the tale—will be welcome with the description. Our draftsmen can redraw the sketch and the editors can clear up the manuscript, if such processing is needed. All of which may save you labor and time. All we want are facts and ideas to put in shape for publication.

Large Station Uses Priming Tank in Suction Line

Relatively speaking, the quantity of water pumped per ton of production is small in the coal fields of southern West Virginia. For this reason a new pumping station located in No. 6 mine of the Elkhorn Piney Coal Mining Co. (a Koppers interest), Stanaford, Raleigh County, and containing two 100-hp. units ranks in that district as a large installation. Simplicity of priming and control equipments, and a spacious arrangement which will encourage cleanliness and careful inspection and facilitate maintenance are features of the station.

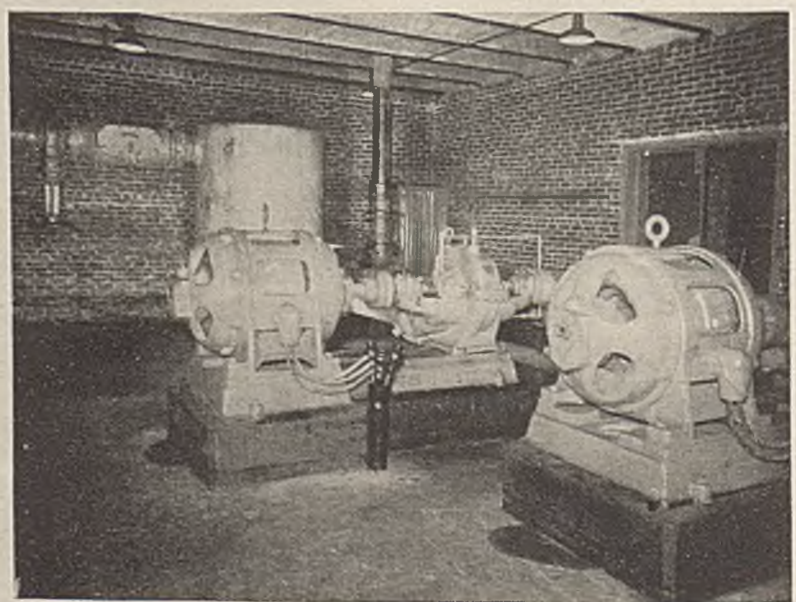
The suction line consists of 210 ft. of 10-in. flanged steel pipe and the water level in the sump is approximately 10 ft. below the pumps. Connected in series with the suction line and located in the room with the pumps is a 4½x6-ft. 700-gal. priming tank. This eliminates any necessity for a foot valve in the sump on the suction line. The strainer is located in the pumproom adjacent to the tank, and thus there is no occasion for the unpleasant and difficult job of getting at the end of the suction line in the sump.

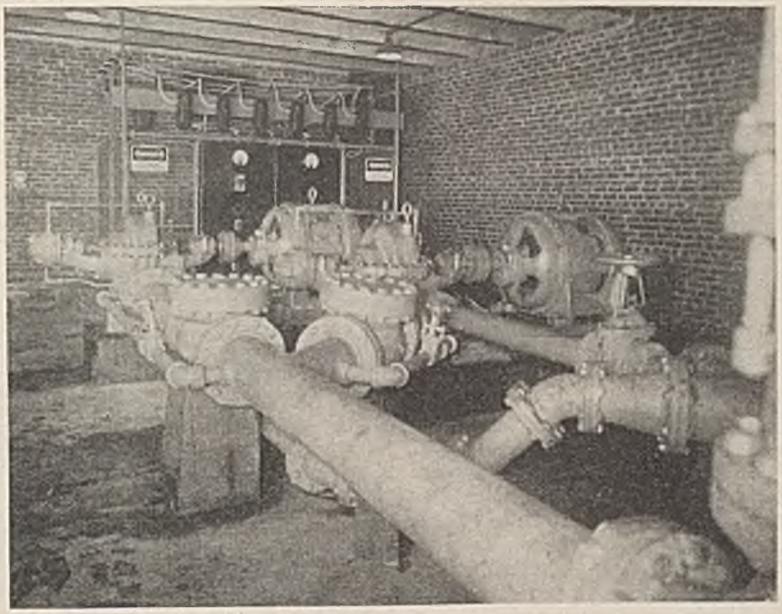
Both pumps are Worthington Class SD two-stage bronze-fitted 4-in. centrifugals rated 750 g.p.m., 309 ft. head, 1,750 r.p.m., and equipped with water-balance thrust bearings. They are driven by Westinghouse Type CS 2,300/4,000-volt squirrel-cage induction motors having sealed sleeve bearings. Starting is by means of Westinghouse manually operated compensators. The 2,300-volt power feeder is contained in a spiral wire-armored cable which enters through a borehole.

The pumping station discharge consists of an 8-in. pipe extending to the surface through a 300-ft. borehole. The piping arrangement includes a check valve in the discharge connection from each pump, a gate valve in each suction line and another in the main suction close to the priming tank but on the sump side of the Hazleton strainer. Around each of the two discharge checks there is a 2-in. bypass with gate valve.

Connection leading to the sump is at the top of the priming tank and that leading to the pumps is at the bottom. While pumping is going on the water level in the tank stands about 3 ft. from the bottom. Each time before starting the equipment a bypass is opened and water allowed to flow back from the discharge column into the priming tank. A petcock located 10 in. below the top of the tank is kept open during this time to allow escape of air and to indicate when the water level has risen close to the top of the tank. Starting a pump causes lowering of the water level in the tank, thereby producing sufficient vacuum to lift the water and start a flow from the sump into the tank.

Water Enters the Priming Tank Through a Strainer in a Connection Near the Top





Discharge Checks in Center Foreground; Suction Lines at Right Hand

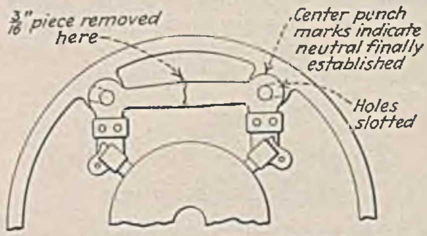
Inside dimensions of the pumproom are 20x36 ft., and the ceiling height is 10 ft. 4 in. A uniform and pleasing distribution of light is obtained by use of six ceiling mounted porcelain enameled reflectors equipped with 100-watt lamps. Power connections from the ends of conduit cables to motors consist of disconnecting potheads and short lengths of flexible varnished cambric wires.

During construction there arose the problem of getting the priming tank into the mine. Measurements indicated that in certain places the heading height was not sufficient to allow hauling the tank on an ordinary mine car. Instead of building a special car the tank was cut in two at the center, thus allowing easy transport into the mine. In the pumping station it was reassembled by bolting a 1x4-in. ring on the inside over the joint and then electric-welding the seam on the outside. The tank is equipped with a manhole, which feature made it possible for a man to get inside to assemble the bolts holding the ring.

Changes in Original Design Should Be Recorded

Whenever a major change is made in some feature of original design during the repair of equipment, it should be described and a record attached to the unit. That this precaution will save much time and effort is proved by an experience of Grady H. Emerson, of Birmingham, Ala., in overhauling a 5-ton gathering locomotive.

It was found that the armature, which had been rewound, would run in only one direction and then not without considerable arcing at the brushes. These brushholders were mounted on a crossbar of cast iron and insulated therefrom with mica washers and tubes. They were not arranged for shifting, but an alteration made it possible to shift them temporarily. The sketch shows the type of brushholder found on this particular series motor, and how the holes of the mounting bolts were slotted so that the brushes could be shifted over a small arc.



Alterations to Brushholder

This provision was made because, from all appearances, the armature winding was off neutral a bar or so, as was deduced from the fact that the motor would run satisfactorily in one direction, but would flash over and arc in the other. After the slotting operation was completed, the brushholders were replaced; and after much experimenting it was found that an absolute neutral point could not be located. If one was located during idle running, the arcing would show up in one direction or the other when the motor was loaded.

This went on until a maintenance man came along and offered the information that the brush bar had been cut and a piece welded into it. A weld had been previously noted, but it was considered a repair to a break. It was evident that in the past someone had had some similar trouble and probably had corrected it by lengthening the bar. About $\frac{3}{16}$ in. had to be cut out and the bar brazed together again, this measurement being roughly the equivalent of the thickness of one bar and one mica. With the completion of this job, a neutral point was found.

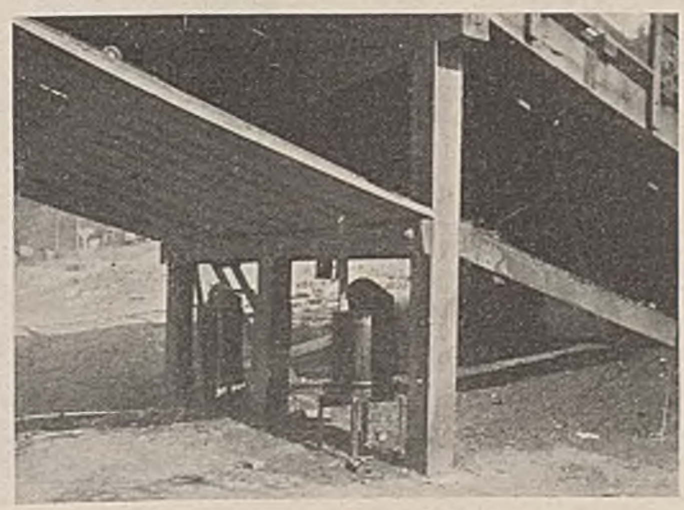
Tanks and Drip Pans Save Oil

To prevent waste of oil used in lubricating the chain car haul to the tipple at Mine No. 154 of the Consolidation Coal Co., Van Lear, Ky., two tanks and drip pans have been installed, as shown in the accompanying illustration. The car haul is 500 ft. long and handles about 1,250 cars of coal and rock per shift of 10½ hours. Average daily coal production is about 1,600 tons.

One tank is placed under the loaded car haul and the other under the return side. Each tank has a capacity of 30 gal. and is of the type ordinarily used in the retail sale of kerosene or oil. The drip pans, which extend under the lower strands of the loaded and empty car hauls, are about 20 ft. long. They are made by splitting ordinary galvanized spouting, such as is used in leading rainfall from the roofs of buildings to the ground, and forming it into a rectangular trough of the proper width. The discharge consists of an extension of the drip pan which is not split.

The equipment serves the double pur-

On the Job Saving Oil

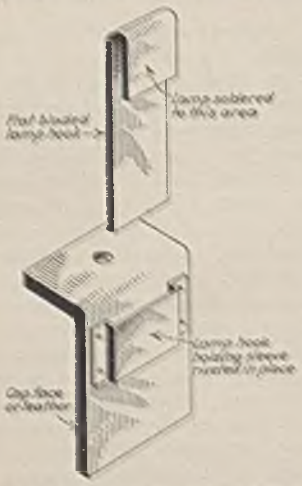


pose of conserving oil and eliminating drippage. Both sides of the car haul are oiled once a day with blackstrap. Four gallons commonly is required for a complete oiling. Of this quantity, two gallons is recovered in the tanks. Oil caught in the tanks is filtered before being used again.

Flat-Bladed Lamp Hook Protects Wearer

More than once the dangers of round-section hooks on open-flame lamps for attachment to a miner's cap have been pointed out. The point of this hook located so close to the forehead can cause injury should the wearer collide with an obstruction; for example, a crossbar. Another disadvantage of this type of hook is that it does not hold the lamp securely in place when the holding prongs are loose or missing altogether.

As a remedy for these disadvantages

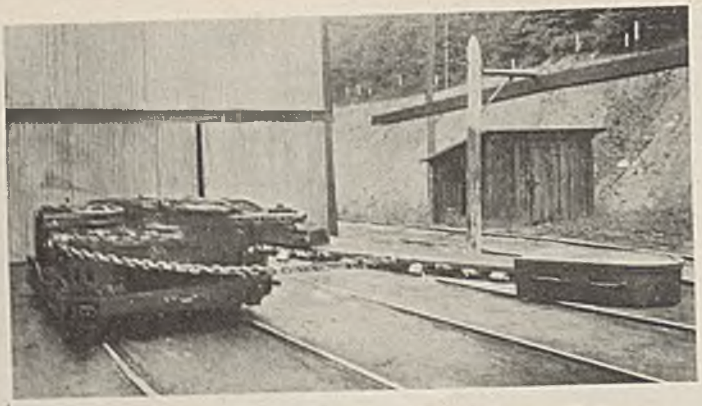


Details of Flat Hook on Miner's Open-Flame Lamp

in the anchoring of the open-flame lamp to a miner's cap, Charles Watkins, of Kingston, Pa., describes a hook design similar to that used on the electric cap lamp. The round-section hook with which the open-flame lamp is originally equipped is removed and in its place is soldered a flat-bladed hook made of fairly heavy sheet metal. Also, on the leather lamp support of the cap is riveted a metal sleeve or socket.

Chain Added to Cutter Does Sluing and Locking

Safe sluing of the cutter bars of 29C arcwall mining machines used in the Elkhorn division of the Consolidation Coal Co. has been provided for by adding a chain which at one end is permanently fastened to a stationary part of the machine frame. When the cutter bar is to be slued back to the right, the end link of the chain is hooked over the end of a bit in the cutter chain and the latter inched along by manipulation of the machine controls. This puts tension on the pulling chain and causes the cutter bar to swing around.


Chain Hooked Over a Cutter Bit for Power Sluing

The illustration, at Mine 214, McRoberts, Ky., shows the chain in sluing position. This same chain is used as a cutter-chain lock when tramming the machine. At that time the cutter bar is locked in the center position and cannot swing. If the cutter chain is started accidently, it can move only the inch or two which will tighten the sluing chain.

Near the center of the sluing chain there is a swivel link which is an important detail of the attachment. Before swivels were used, the chains frequently were broken. The swivel prevents pulling the chain in a twist—a condition which is destructive to any chain working near its capacity.

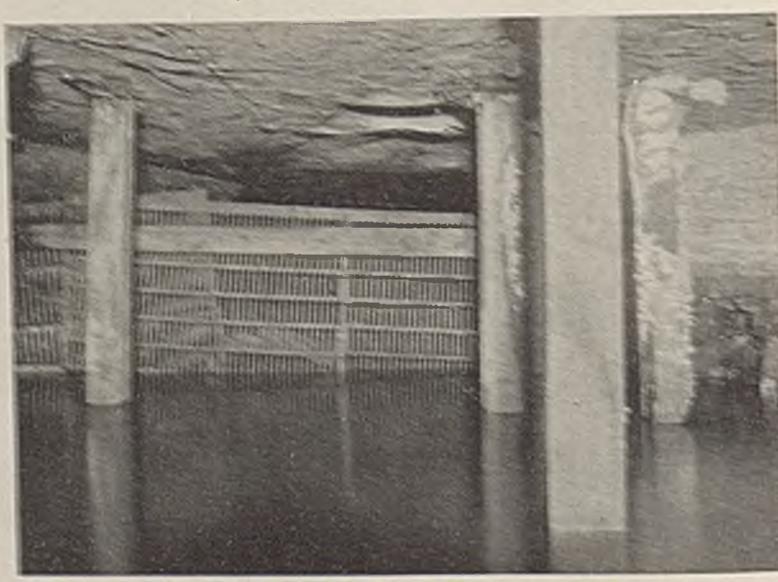
Tipple Screen Plates Used As Sump Strainers

After a difficult experience in cleaning a pump suction strainer submerged in a sump back of a dam, officials of the Auxier mine of the North East Coal Co., Auxier, Ky., cast about for a method which would prevent a repetition of the difficulty.

As an experiment the heading was fenced with screen plates discarded from a tipple shaker. The barrier was erected about 20 ft. from the dam and has been successful in stopping the passage of floating refuse into that portion of the sump where the pump suction is located. Efficiency of the screen is indicated by the fact that considerable débris has floated against it on the upper side.

Although the mine water is of such chemical characteristics that it destroyed the cast metal strainers in a comparatively short time, it appears to have but slow effect on the screen plates.

Keeps the Suction Pool Free of Débris



When Portable Ammeter Shunts Cause Trouble

Poor or damaged testing equipment may prove a handicap rather than an aid to the maintenance man. A recent experience of David Williams, Youngstown, Ohio, proved this point. On a trouble shooting job it was decided to take an ammeter test of a motor, using a portable d.c. ammeter of high grade which had a long record of reliable

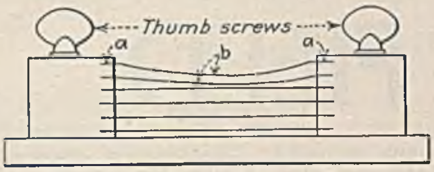


Fig. 1—Bending of Shunt Bars on Ammeter Causes Poor Connections at Points *A* and *B*

service back of it. This reading indicated a heavy overload on the motor at times, and in trying to locate the cause several hours was consumed in disconnecting the mechanical load, thoroughly testing the motor, control, etc. The cause for the high reading was finally found in the shunt of the ammeter itself. The bars of the ammeter shunt had been bent down, then straightened again, leaving poor connections at the end of the bars. See Fig. 1, as indicated by *A* and *B*.

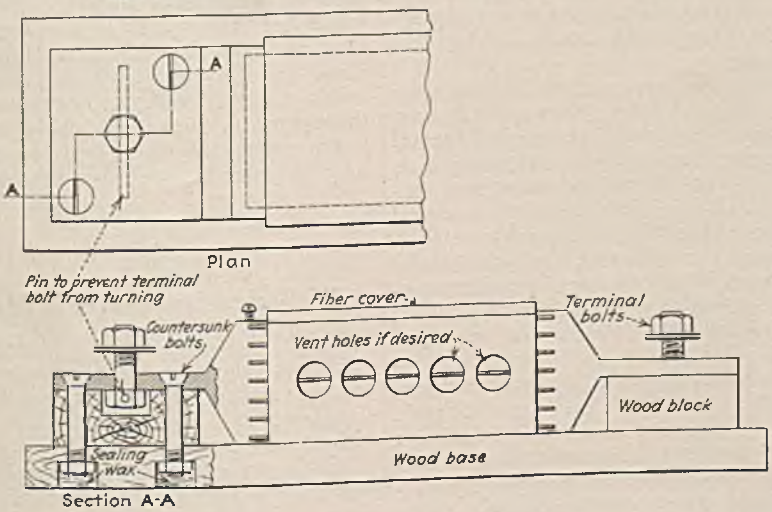
Usually, portable meters are given proper attention. But the ammeter shunt and calibrated leads are too often tumbled about in the rush of breakdown jobs, or are crowded into unsuitable places in the shop or are damaged by carrying them with the hand grasped across the middle section of the shunt. Another serious injury sometimes given shunts comes from attaching heavy motor leads to the terminal bolts and from the use of wrenches on the nuts to make sufficient contact.

Many electricians in mines and small plants, where their employers, through false economy, will not provide regular portable meters for maintenance work, are obliged to use meters from switchboards or other stationary mounting types. Such meters cannot be expected to give the accuracy, flexibility, or convenience in portable service that regular portable instruments would give, and their use should be discouraged for such work. However, many electricians get years of helpful service from such meters, for slight errors in accuracy may not seriously handicap the man who understands his machines and their normal characteristics.

If stationary type ammeters are to be used in portable service the meter itself should be inclosed and the shunt mounted on a substantial base, as is done with regular portable shunts. Fig. 2 shows such a mounting. The countersunk bolts attach the shunt to its base and provide against strains incident to using wrenches on the terminal nuts. A pin may be run through the head of the terminal bolt to prevent turning. A fiber case will further protect the middle section of the shunt. The rest should be self-explanatory.

After all, the ammeter is but a millivolt meter reading in thousandths of a volt the potential drop across the shunt, and any change in the original resistance of the shunt, or of the calibrated leads, immediately affects the reading of the meter. A loose connection on one bar results in an error of several hundred per cent, but a lesser error is more likely to be misleading and perhaps go a long time without detection.

Fig. 2—Mounting Stationary Shunt for Portable Service



Shaft Guides Are Oiled By Gravity Flow

Shaft guides should be lubricated regularly for best results. By so doing, the life of the guides is lengthened and the skips or cages perform more smoothly. A shaft guide oiling system adopted at the No. 6 mine of the Wheeling & Lake Erie Coal Mining Co., at Lafferty, Ohio, in which oil runs by gravity from a reservoir to the contact surfaces of the guides, is described by D. Stanchina, of Adena, Ohio.

The general arrangement is indicated in Fig. 1. A $\frac{3}{4}$-in. hole is drilled half way through the guide, from the back face and at a vertical angle of 45 deg., for the reception of a $\frac{3}{4}$-in. pipe. A $\frac{1}{2}$-in. hole is then drilled through the guide from side to side so as to intersect the bottom of the angular hole. Similarly, a hole started from the front face of the guide is drilled to meet the

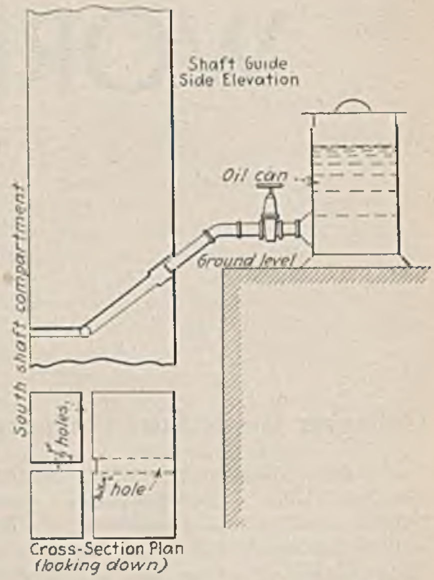


Fig. 1—How Oil Reaches Guides

intersection of the first two holes. These holes are connected with a pipe line from a 5-gal. reservoir can which is spotted at the ground level of the shaft.

In the pipe line is a valve which is opened only when lubrication is desired and the cages or skips are in operation. The cage or skip will pick up the oil and carry it downward and upward on the guide, so that in a few minutes the entire length of the guide is lubricated.

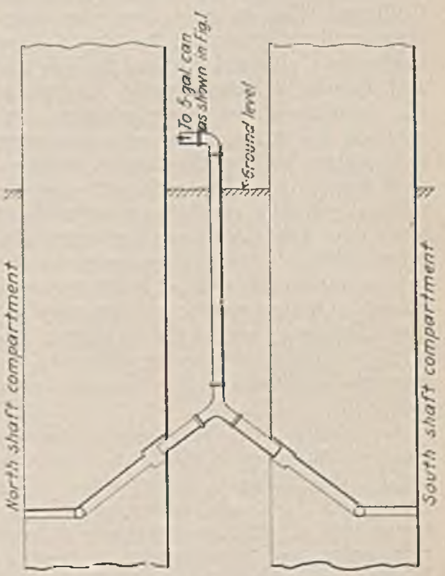


Fig. 2—Lubrication of Center Guides

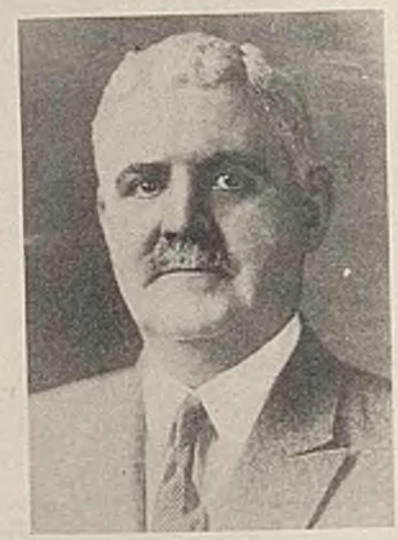
It will be found that this system will keep oil on the safety pins, links, shafts, and other moving parts on top of the cage. Equalization of flow from all holes can be obtained by partially plugging the holes which emit oil too freely.

Some slight variation of the general arrangement must be made in the lubrication of the two guides in the center of the shaft. These variations are indicated in Fig. 2.

WORD from the FIELD

Gallagher Heads Sales Company

Michael Gallagher, president of the Pittston Co., Scranton, Pa., was elected chairman of the board of the United States Distributing Corporation, New York City, at a meeting of the board of directors held Feb. 27. Mr. Gallagher succeeds Harry N. Taylor, elected chairman of the United Electric Coal Cos. Wm. G. Bernet, New York, was chosen president of the distributing company. On the same day, Mr. Gallagher also was elected chairman of the board and president of the Sheridan-Wyoming Coal Co., operating in Wyoming.



Michael Gallagher

Penn Anthracite Co. Formed

Formation of the Penn Anthracite Collieries Co., to take over the properties and equipment of the South Penn Collieries Co., Elk Hill Coal & Iron Co., and Southern Pennsylvania Anthracite Co., was completed at Philadelphia, Pa., early in February. The new company, it is stated, will be the largest independent company in the anthracite region, with a potential productive capacity of more than 2,000,000 gross tons annually. Nine collieries will be included in the new combination when it is consummated. Of this number, eight, employing 3,500 men, are in the Scranton district, and one, employing 500 men, is located in Schuylkill County, near Pottsville.

The mines will be operated by the Penn Anthracite Mining Co., the collieries organization acting as holding company. The same executive personnel will direct the operations of both companies, and is composed of the following: president, R. H. Buchanan, Scranton, Pa., formerly receiver for the South Penn company; secretary-treasurer, William M. Burrus, Scranton; assistant treasurer, William F. Brandamore, Scranton; assistant secretary, Frederick H. Schroeder, New York City. The board of directors will be composed of the following: Robert K. Cassatt, Cassatt & Co., Philadelphia; Frank C. Wright and James J. Lee, Lee, Higginson & Co., New York City; Charles Dorrance, consulting mining engineer, Scranton; and Mr. Buchanan.

The holding company acquired the South Penn properties at a receiver's sale on Jan. 30 for $900,100. Elk Hill properties were secured by an exchange of stock. Financing of the new concern has been accomplished by the issuance of $1,000,000 in first mortgage bonds. Common stock of no par value to the amount of 100,000 shares is authorized under the charter, as is 22,561 shares of preferred stock of no par value. Holders of $1,000 South Penn first mortgage bonds will have the option of exchanging each of them for six shares of preferred stock and four shares of common in the new company. Lee, Higginson & Co. have underwritten the issue.

Operating personnel of the new company is as follows: general manager, Thomas F. Steele, formerly general superintendent of the South Penn Collieries Co., Scranton; electrical engineer, H. M. James, formerly electrical engineer for the Hudson Coal Co., Scranton; combustion and mechanical engineer, W. H. Lesser, formerly mechanical engineer, Madeira, Hill & Co., Frackville, Pa.; sales manager, A. C. Peterson; superintendent, Randolph colliery, W. H. Tavenner; superintendent, Von Storch, Legitts Creek, and Capouse collieries, John Harvey; superintendent, Johnson colliery, Earl Lamb; superintendent, Raymond, Riverside, and Ontario collieries, John Marshall.

New Plant Construction

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

Central Pocahontas Coal Co., Anawalt, W. Va., contract closed with the American Coal Cleaning Corporation for pneumatic coal-cleaning plant consisting of two Type R separators with a capacity of 100 tons of 2½ in.x0 coal per hour and 80 tons of ½ in.x0 coal (re-treatment) per hour. A dust-collecting system is included, and the probable date of completion of the plant is April 1.

Montevallo Coal Mining Co., Aldrich, Ala.; installation of a Norton jig at the Aldrich mine now under way; capacity of the completed installation will be 90 tons per hour.

Westmoreland Mining Co., Blairsville, Pa.; contract closed with Roberts & Schaefer Co. for a complete steel tipple to be erected at Hillside, Pa. Capacity of the plant will be 500 tons per hour and it will prepare and load three sizes.

To Study Anti-Trust Laws

For the purpose of considering the present-day operations of the anti-trust laws and possible changes, or at least a clarification of many of their provisions to remove generally recognized handicaps to progressive industry, the National Association of Manufacturers will meet in New York City on March 18. Close to one hundred men, executive heads of representative organizations throughout the country, will be invited to the conference, which will be presided over by John E. Edgerton, president of the association.

Peabody Buys Majestic Mine

The Peabody Coal Co., Chicago, has taken over the Majestic shaft mine and the Gale strip mine of the Crerar Clinch Coal Co., at Duquoin, Ill. The consideration was not made public. Majestic employs about 600 men and has an available coal acreage of 2,000. The Gale strip mine has been under development for a number of years.

Varied Program Being Prepared for Coal Men At Cincinnati Convention

SCIENTIFIC organization and management of mines, safer operating practices, developments in mining systems, mechanical mining processes, and research in fuel utilization will feature papers to be delivered by leading coal mining officials at the eighth annual convention of practical operating men and national exposition of coal-mining equipment to be held at Cincinnati, Ohio, May 11-15, under the auspices of the Manufacturers' Division of the American Mining Congress. Officials in active charge of the convention and exposition are Ralph E. Taggart, Stonega Coke & Coal Co., Philadelphia, Pa., chairman of the program committee; F. J. Maple, John A. Roebling's Sons Co., Trenton, N. J., chairman, manufacturers' division; L. W. Shugg, General Electric Co., Schenectady, N. Y., director of exhibits; J. F. Callbreath, secretary of the congress; and E. R. Coombes, secretary of program committee and manufacturers' division.

The program for the convention represents the consensus of opinion of leading mine operators as expressed at field divisional meetings held recently at Chicago; Pittsburgh and Scranton, Pa.; Huntington, W. Va.; Birmingham, Ala.; and Washington, D. C.; and by questionnaires received from operators in the Far West and the Oklahoma-Kansas district. It embraces subjects of interest to anthracite and bituminous producers and consumers. The following coal operating officials have been invited to serve as chairmen of the twice daily sessions: George W. Reed, vice-president in charge of sales, Peabody Coal Co., Chicago; P. M. Snyder, president, C. C. B. Smokeless Coal Co., Mt. Hope, W. Va.; D. D. Muir, Jr., vice-president and general manager, U. S. Fuel Co., Salt Lake City, Utah; T. T. Brewster, president, Mt. Olive & Staunton Coal Co., St. Louis, Mo.; S. D. Warriner, chairman of the board, Lehigh Navigation Coal Co., Philadelphia, Pa.; Thomas W. Dawson, vice-president, H. C. Frick Coke Co., Pittsburgh, Pa.; H. L. Warner, Warner Collieries Co., Cleveland, Ohio; C. F. Richardson, president, West Kentucky Coal Co., Sturgis, Ky.; J. G. Bradley, president, Elk River Coal & Lumber Co., Dundon, W. Va.; and Erskine Ramsay, chairman of the board, Alabama By-Products Corporation, Birmingham, Ala.

Nearly thirty coal operating officials have already accepted invitations to deliver papers to the convention, and acceptances of tenders are expected from an additional number, before the convention gets under way. Papers definitely slated for presentation to the convention include the following: "Maintaining Discipline," Thomas G. Fear, Fairmont, W. Va., general manager, Consolidation Coal Co., with discussion by R. V. Clay, Wheeling & Lake Erie Coal Co., Cleveland, Ohio; Milton H. Fies, DeBardeleben Fuel Corporation, Birmingham, Ala.; and A. R. Pollock, Hudson Coal Co., Scranton, Pa.; "Safety Program of the American Rolling Mill Co.," C. W. Conner, Nellis, W. Va., general superintendent.

"Mining Systems in Central Pennsylvania," by M. D. Cooper, division general superintendent, Hillman Coal & Coke Co., Pittsburgh, Pa.; "Mining Systems in the Southern District," W. A. Hamilton, Tennessee Coal, Iron & R.R. Co., Pratt City, Ala.; "Loading Machines in Mechanical Mining in Thick Coal Seams," E. J. Christy, engineer, Wheeling Township Coal Mining Co., Adena, Ohio; "Gathering Systems With Mechanical Mining," C. J. Sandoe, vice-president, West Virginia Coal Co. of Missouri, St. Louis, Mo.

"Anthracite Research for Utilization," C. A. Connell, Anthracite Coal Service, Philadelphia, Pa.; "Roller Breaker Practice Suggested by New Market Trend," Paul Sterling, mechanical engineer, Lehigh Valley Coal Co., Wilkes-Barre, Pa.; "Rock Mucking by Machines," Russell L. Suender, Madeira, Hill & Co., Frackville, Pa.; "Mechanical Mining in Anthracite," John C. Haddock, president, Haddock Mining Co., Wilkes-Barre, Pa.

"Cost of Mine Accidents," R. M. Lambie, West Virginia Department of Mines, Charleston, W. Va.; "Safety at the Mine Working Face," F. B. Dunbar, general superintendent, Mather Collieries, Mather, Pa.; "Safety With Conveyors," Albert L. Hunt, general superintendent, Pennsylvania Coal & Coke Corporation, Cresson, Pa.; "Safety With Electrical Equipment," W. P. Vance, general superintendent, Butler Consolidated Coal Co., Butler, Pa.

"Mechanical Mining" at the mines of the Stonega Coke & Coal Co., J. D. Rogers, general manager, Big Stone Gap, Va.; "Budgeting Repair Work," B. H. McCracken, maintenance engineer, Consolidation Coal Co., Fairmont, W. Va.; "Main Line and Gathering Haulage," Newell G. Alford, Eavenson, Alford & Hicks, Pittsburgh, Pa.; "Haulage," D. D. Dodge, general superintendent, W. J. Rainey, Inc., Uniontown, Pa.; "Research on Coal for Utilization," John Roscoe Turner, president, West Virginia University, Morgantown, W. Va.; "Treating Machine Bits," H. H. Taylor, Jr., Franklin County Coal Co., Chicago; "Successful Handling of Refuse," F. S. Follansbee, chief engineer, Koppers Coal Co., Pittsburgh, Pa.

In addition to the above, the following papers by operating men are tentatively scheduled for presentation: "Scientific Organization," George W. Reed, vice-president in charge of sales, Peabody Coal Co., Chicago; "Scientific Management for Mine Operation," P. C. Thomas, vice-president, Koppers Coal Co., Pittsburgh, Pa.; "Mining Systems in Illinois and Indiana," George F. Campbell, vice-president and general manager, Old Ben Coal Corporation, Chicago; "Mining Systems in the Far West," George Schultz, general superintendent, Liberty Fuel Co., Latuda, Utah; "Strip Mining," K. A. Spencer, chief engineer, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan.

"Mechanical Mining," Earl Oliphant, treasurer and general manager, Standard Coal Co., Vincennes, Ind.; "Mechanized Mining," C. A. Cabell, vice-president, Carbon Fuel Co., Charleston, W. Va.; "Mechanical Loaders in Thick Seams," E. C. Mattox, general manager, Roundup Coal Mining Co., Roundup, Mont.; "Safety and Mechanical Mining," W. J. Jenkins, president, Consolidated Coal Co. of St. Louis, St. Louis, Mo.; "Conveyor and Scraper Mining in Thin Seams," T. F. McCarthy, Clearfield Bituminous Coal Corporation, Indiana, Pa.; "Thin Seam Mining in Arkansas," V. C. Robbins, McAlester Fuel Co., McAlester, Okla.; "Conveyor Slope Installation and Operation," David Ingle, president, Ingle Coal Co., Evansville, Ind.; "Developments in Coal Cleaning," Howard N. Eavenson, Eavenson, Alford & Hicks, Pittsburgh, Pa.; "Cutting, Drilling, and Blasting," G. C. McFadden, assistant vice-president, Peabody Coal Co., Chicago.

Business Still Slow

"Telescopes trained on foreign affairs yield more for the optimist this week than do economic microscopes examining domestic movements," says the March 4 business review of *The Business Week*. "Fumbling gestures toward closer European co-operation in politics, in agricultural problems, in finance, and a slight upturn in British prices may be significant straws. Abandonment of our embargo efforts may be counted among these constructive international indications. At home there is still no decisive evidence of business change. Our index is practically stationary at 78.2 per cent of normal, about the average level of the past two months.

"Steel activity shows no signs of marked increase in demand from the big consuming industries, and the spring automobile sales prospects are still uncertain. Strengthening of raw cotton prices, textile demand, and the residential building projects has begun to stir some enthusiasm, but spring fever probably is a sufficient explanation of the rise in stock market prices and activity, perfectly paralleling last year's. Expansion of bank investments is somewhat encouraging, but as yet indecisive of any definite change in credit policy. Liquidation of commercial loans and contraction of Reserve credit continue. After all, the most cheering business news of the week will be the rush order of caskets for the 71st Congress."

Mining Institute Will Meet In West Virginia

Mining engineers and coal operators throughout West Virginia and the East have been invited to attend the meeting of the newly formed coal division of the American Institute of Mining and Metallurgical Engineering at Fairmont, W. Va., March 26-27, the first ever held in West Virginia. The program is being arranged by a committee headed by Prof. C. E. Lawall, head of the School of Mines, West Virginia University, Morgantown, W. Va. Howard Eavenson, chairman of the division will be the principal speaker.

Technical papers on various phases of the coal mining industry will be read on March 26, and will be followed in the evening by a banquet at the Fairmont Hotel. March 27 will be given over to an inspection trip to the Carolina (W. Va.) mine of the Consolidation Coal Co. Armstrong Matthews, assistant general superintendent, Consolidation Coal Co., Fairmont, W. Va.; S. D. Brady, Jr., superintendent, Brady Coal Co., Morgantown; J. D. Sisler, West Virginia state geologist, Morgantown; Charles Hagenbuch, mining engineer, Consolidation Coal Co., Fairmont; and Lee Morris, assistant state geologist, Morgantown, will address the March 26 meeting.

Southern Appalachian Group Plans Safety Drive

Following the procedure outlined at the last meeting of the safety committee of the National Coal Association by a representative of the Portland Cement Association, the Southern Appalachian Efficiency Association is preparing plans for an intensive drive against coal-mining accidents. A no-accident month will be featured in the near future. The association is directing a request to the U. S. Bureau of Mines that it supply each miner in the field who has gone one year without a lost-time accident with a card. For five years' service without a lost-time accident, it is proposed that the miner be presented with a certificate, and for ten years, with a button.

Canada Bars Russian Anthracite

The Canadian government on Feb. 27, according to news dispatches, issued an order barring importations of coal, woodpulp, pulpwood, lumber of all kinds, asbestos, and furs from Soviet Russia. An official announcement which said that the government must refuse to support Communism by an interchange in trade, contained the following: "The government is convinced that political prisoners are exploited, that the standard of living is below any level conceived of in Canada, and that all employment is in control of the Communist government, which regulates all conditions of work and seeks to impose its will upon the whole world.

Harry N. Taylor

Resigns from presidency of United States Distributing Corporation, New York City, to become chairman of the board and general manager of the United Electric Coal Cos. Mr. Taylor, while retiring from the active management of the United States Distributing Corporation, will continue to serve it in an advisory capacity.

Stronger Trade-Practice Bureaus Favored at Meeting

Strengthening of trade practice bureaus and their establishment in all the coal-producing fields of the country was advocated at a meeting of representatives of seven Southern coal bureaus held in Cincinnati, Ohio, Feb. 12. The opinion of the conference was embodied in the following resolution:

Resolved, That it be the sense of this conference that the trade-practice movement should be established and strengthened in every producing field in the country, because of the vast beneficial effect of the elimination of the various unfair practices set forth in the several codes; that this conference recommends frequent bureau meetings in each field, to be attended by the chief executives of the producing companies; and further recommends the appointment by each bureau south of the Ohio River of a member and an alternate to serve on a general committee, representing the Southern bureaus, which committee shall hold monthly meetings at a convenient place, for the purpose of reviewing the situation in each field and charting a program.

The first meeting of the general committee, provided for in the resolution, will be held at the Sinton Hotel, Cincinnati, Ohio, March 16. All delegates to the February meeting voiced the opinion that it would be a calamity to the industry should the movement be discontinued, and pledged themselves to endeavor to make the bureau work a "living force" in the affairs of their respective districts. Numerous accomplishments of the bureau program were cited. D. A. Thomas, Birmingham, Ala., chairman of the trade-practice section of the Market Research Institute of the National Coal Association, and president, Montevallo Coal Mining Co., presided and C. C. Dickinson, Charleston, W. Va., president, Bailey-Sudduth Fuel Cos., acted as vice-chairman.

Midwest Coal Conference Set For May 21-22

The 1931 Midwest Bituminous Coal Conference to improve and extend the uses of Illinois and Indiana coals will be held at the University of Illinois, Urbana, Ill., May 21-22. The conference will bring together representatives of the coal, heating, heating and piping, warm-air heating, and power industries, as well as leaders in the field of smoke abatement, engineering, education, and general business for a discussion of the utilization of coal in power, industrial, and domestic fields.

At a preliminary meeting held in the offices of the Illinois Coal Bureau, Chicago, on Feb. 10, the following committeemen were appointed: program—B. R. Gebhart (chairman), Illinois Coal Bureau; Prof. A. C. Callen, University of Illinois; Dr. M. M. Leighton, Illinois State Geological Survey; V. G. Leach, Peabody Coal Co. and the Midwest Stoker Association; Prof. W. A. Knapp, Purdue University; F. H. Bird, Central Indiana Coal Co.; C. M. Oberling, National Association of Purchasing Agents; and N. Hettler, National Association of Power Engineers; publicity—Dr. Leighton (chairman), Mr. Waffle, Professor Knapp, and Mr. Gebhart; local arrangement—Professor Callen (chairman).

Retail Association Again Offers Summer Sales Campaign

The National Retail Coal Merchants' Association, after polling those who used the material offered in 1930, has again decided to prepare a summer sales campaign. This campaign will be similar to that developed last year, and will consist of folders, postcards, blotters, and newspaper advertisements. The material will be made available to retail merchants at a cost much less than would be possible if the dealers prepared and printed the material themselves.

Ohio Safety Men Elect

At a late meeting of the Eastern Ohio Council of the Joseph A. Holmes Safety Association, the following officers were elected: president, C. W. Jeffers, United States Coal Co.; vice-president, John Jenkins, Youghiogheny & Ohio Coal Co.; and secretary, B. L. Denahue, Rail & River Coal Co., all of Cleveland, Ohio.

Best Rock-Dusted Mine To Receive Award

Officials of the U. S. Bureau of Mines are making a study to determine the bituminous coal mine which is most thoroughly protected by rock dust. That mine will be recommended for an award by the Joseph A. Holmes Safety Association at the March meeting, to be held in Washington, D. C.

Coal, Oil, and Gas Utilization Stressed At A.S.M.E. Fuels Meeting

COAL, oil, and gas papers, covering the subjects of refinery waste fuels, utilization economics, coal drying, anthracite, conversion to gas firing, slag-tap furnaces, bituminous byproducts, boiler and furnace losses, boiler selection, Middle Western coals, pulverized fuel, future trends in steam generation, and smoke abatement were the features of the Fourth National Fuels meeting of the American Society of Mechanical Engineers, held simultaneously with the Fifth Mid-West Power Engineering Congress at the Stevens Hotel, Chicago, Feb. 10-13.

Under the title, "Economics of Fuel Utilization," Albert L. Brown, general service engineer, Consolidation Coal Co., New York City, on Feb. 11, presented a comparative study of coal, oil, and natural gas in the United States. Extension of pipe lines to new territories, Mr. Brown said, will subject natural gas to some burdens and difficulties formerly the share of oil and coal. These include high transportation costs, poor load factors, variable seasonal demands, and improvements in equipment for the utilization of competing fuels. It was his opinion that natural gas will make little progress in industries like the electric-steam utilities, where B.t.u. cost is a prime factor. The house-heating load also is less attractive than commonly thought, because of its seasonal character, leaving industrial uses as the largest market.

Coal holds first place as a source of energy, and while statistics show that it has lost tonnage to oil and gas, Mr. Brown contended that a gain of one fuel over another is only a temporary advantage, and "is the result of some new development pertaining to the production or use of the favored fuel, which is sooner or later offset by improved utilization of other fuels." Improvements in market research and in preparation, aided by the growth of automatic stokers and improved pulverizers and furnaces, place in the hands of the coal industry powerful competitive weapons.

T. A. Marsh, president, Modern Coal Burner Co., St. Louis, Mo., presented a "Symposium on Small Stokers," prepared by the Midwest Stoker Association. The paper severely criticized the engineering profession for its neglect of this field. Engineers in general in the past stated that stokers were not applicable to boilers under 200 boiler horsepower, "and it finally remained for the coal industry to force the development and the commercial possibilities of stokers in this field." Even today, the paper added, the coal companies sell 68 per cent of all stokers supplied for plants under 200 boiler horsepower. At the close of 1929, small stoker installations were 179 per cent greater than at the end of 1927. Sales in 1930 were 40 per cent greater than in 1929.

Small plant operation, it was pointed out, is the crux of the smoke problem, and no cure for smoke in soft-coal-burning districts can be found until mechanical stokers are used in all small plants, including those in the home. A nationwide survey, it was stated, shows that there are over 1,266,638 logical prospects in the commercial and semi-industrial field for stokers. This is exclusive of 4,949,800 prospects in the domestic group. It is estimated that all plants under 200 boiler horsepower consume 264,553,535 tons of coal annually, at a cost of $1,058,214,140.

Stoker sales in the commercial and semi-industrial fields must be predicated on fuel savings which will justify the investment. In the domestic field, convenience must be the ruling factor. In the design of small stokers, it was pointed out that the quality of coal varies in different localities. The cardinal point in design is a machine that will burn the cheapest fuels. Engineering must necessarily be devoted not to a consideration of a single installation but to the broader and more comprehensive commercial aspects of multiple installations.

In the discussion following the paper, J. F. Walter, Iron Fireman Manufacturing Co., said that figures collected from 634 industrial and 162 domestic installations showed that the combined number were paying 39.44 per cent on the investment as a result of savings in fuel. C. A. Reed, Pittsburgh Coal Co., said that his company was supplying fuel to 2,300 small stokers in Pittsburgh, Pa., and 1,500 in Greater New York. It was the practice of the company, he said, not to furnish the cheapest coal but one of a good grade, carefully sized, and otherwise prepared especially for this class of use. Frank Chambers, chief smoke inspector for Chicago, remarked that he considered the small stoker the most effective weapon in smoke abatement, and that he was moving to require their installation in all cases where there was 1,200 sq.ft. of steam radiation or 2,000 sq.ft. of water radiation.

An opposite view of the engineering contribution was taken by C. A. Connell, general manager, Anthracite Coal Service, Philadelphia, Pa., in a paper entitled "Engineering Service to Anthracite Consumers and Recent Developments in the Utilization of Anthracite." The anthracite industry, he remarked, is to a large extent dependent on engineering genius in developing combustion methods to the point where the public will prefer hard coal. Mr. Connell detailed the history and purposes of the Anthracite Coal Service and described the Anthracite Institute Laboratory at Primos, Pa.

"Conversion of Coal-Fired Boilers and Furnaces to Gas Firing" in Memphis, Tenn., was outlined by William D. Edwards, mechanical engineer, Memphis Power & Light Co. When a pipe line finally delivers gas to a community, "the necessity of building up a load becomes of paramount importance, to which end the installation of gas-burning equipment under existing boilers becomes an important factor." Where gas is used, there is a more direct relation between the quantity used and the outdoor temperature than with any other fuel.

The coal-gas ratio has been the football of opposing interests, Mr. Edwards remarked. On a strictly B.t.u. basis, he stated, 25,000 cu.ft. of 960-B.t.u. gas is equivalent to 1 ton of 12,000-B.t.u. coal. In practice, however, the average firing ratio seems to be 20,000 cu.ft. in the case of a good hand-fired coal plant. If the coal-burning plant is badly handled or in poor condition, the total will drop to 15,000 cu.ft., while good stoker plants will bring it up to the theoretical figure of 25,000 cu.ft. The ratio of gas to fuel oil ranges from 5,000 to 6,000 cu.ft. to one barrel of oil. The relation between coal and gas resolves itself into a question of the relative efficiencies of each. Mr. Edwards gave it as his opinion that for coal at 40 per cent efficiency, gas efficiency would be 50 to 60 per cent.

For a group of twelve Memphis office buildings, hotels, apartments, factories, and garages with steam heat converted from coal or fuel oil, the average consumption per square foot of radiation in one season was 605 cu.ft. of gas. A group of three buildings, made up of an office building, residence hotel, and medical clinic with hot-water heat converted from coal and oil had an average gas consumption of 400 cu.ft. per square foot of radiation. A survey of a group of buildings in Memphis showed an average of 3.3 tons of coal per season per 100 sq.ft. of radiation.

In the residence heating field, with 60c. gas, Mr. Edwards gave the following figures for heating plants converted from coal or fuel oil, and for plants using regular gas-fired equipment:

Converted From Gas or Fuel Oil

Form of Heating	Cost per Sq.Ft. of Radiation Cents	Cu.Ft. of Gas per Sq.Ft. of Radiation
Hot water........	25.9	432
Steam.............	35.0	583
Hot air (equivalent)	22.6	375
Vapor............	29.3	488
Regular Gas-Fired Equipment		
Hot water........	20.56	383
Steam.............	24.18	413
Hot air (equivalent)	17.80	530

A round-table discussion on smoke abatement under the leadership of Col. Elliott H. Whitlock, Stevens Institute of Technology, Hoboken, N. J., and Ely Hutchinson, editor, *Power*, New York City, featured the closing session on Feb. 13. H. N. Bubar, Dust Recovery, Inc., New York City, in a paper on "The Fly Ash Problem," reached the conclusion that the removal of particles retained on a 300-mesh screen and a major proportion of those passing such a screen would largely eliminate the dust nuisance in the average pulverized coal installation.

Mr. Hutchinson, in discussing the

present status of smoke abatement, said that the public would turn to the courts for relief from pollution, whether in the country or in the centers of industry. He urged greater publicity of research looking to the elimination of smoke and fly ash to forestall unadvised action by political or other interests. Lastly, Mr. Hutchinson expressed the opinion that the solution of the problem was a matter for engineers and not medical clinics. Colonel Whitlock gave a résumé of smoke ordinances, and recommended that the ideal ordinance be broad and free from rules and regulations, which could then be developed by an advisory board. Victor J. Azbe, St. Louis, Mo., expressed the opinion that most ordinances are too lenient, in that they permit a No. 1 or No. 2 smoke to be emitted continuously, a No. 3 smoke for short periods, and make no reference to smoke from domestic plants.

O. P. Hood, mechanical engineer, U. S. Bureau of Mines, Washington, D. C., stated that the interest in the movement could be measured by the number of calls for the model smoke ordinance. Five or six years was required to dispose of the first 300 copies printed, while in 1929 the 1,700 reprints made in that year were exhausted in nine months. The Hudson County (N. J.) and Massachusetts laws were discussed by W. G. Christy and David A. Chapman, respectively.

In a talk on "Improvements in Missouri-Kansas Coals, and Their Burning Equipment," E. L. McDonald, efficiency engineer, Kansas City Power & Light Co., Kansas City, Mo., said that sale of coal on the B.t.u. basis has furnished the incentive for improvements in mining methods, better mine drainage to reduce surface moisture, and better hand-picking to remove impurities. This, Mr. McDonald observed, has gradually resulted in not only a better but also a more uniform coal.

Gas Sales Drop in 1930

Sales of natural gas by companies representing more than 85 per cent of the public utility distribution exceeded 572 billion cubic feet in 1930, a decrease of 1.4 per cent from the 1929 figure, according to the American Gas Association. Sales for industrial purposes dropped nearly 8 per cent. The drop would have been still greater, it is reported, if the industry had not expanded into territories where the fuel was not previously available. Sales to public utilities, in spite of a decline of 1.8 per cent in the output of electricity, increased 6.7 per cent in 1930, the association says.

A national advertising campaign to combat natural gas and oil is urged by the Southern Appalachian Coal Operators' Association. In a resolution passed last month the organization urged such a campaign by a joint committee of operators, wholesalers, retailers, and railroads. It was further suggested "that the National Coal Association consider very seriously the question of a national campaign in the manner above outlined, making the necessary assessments against its members for their part of the expense."

The Memphis company mentioned above is said to have accepted franchises from several towns in western Tennessee, with the result that it plans to begin work within 60 days on a pipe line and distribution system to cost $3,000,000. Peoples Gas Light & Coke Co., Chicago, has started construction of a 24-in. line to supply Joliet and Will Counties, Illinois, with gas from Texas. Work on the 275-mile line of the Western Gas Co. from El Paso, Texas, to Douglas, Ariz., will be begun in March, and pipe is already being shipped. Northern Natural Gas Co., Chicago, has completed 900 miles of a 2,691-mile network which will eventually reach from Texas to Minneapolis and St. Paul, Minn. Capacity of the completed system will be 300,000,000 cu.ft. daily.

Preliminary surveys for the North Central Gas Co. line from Fremont County, Wyoming, to western Nebraska are now being made. The company is a subsidiary of the New York Oil Co., which expects ultimately to have in service 400 miles of line with an annual capacity of six billion cubic feet. Pipe and equipment for a 100-mile line to several Texas towns has been ordered by the Pecos Valley Gas Co. Construction of the Natural Gas Pipe Line Co. of America's line from the Texas Panhandle to Chicago is over half completed. Five hundred and eighty-five miles of 24-in. line out of a total of 950 miles has been completed.

Robison Heads Ohio Group

W. L. Robison, Cleveland, Ohio, vice-president of the Youghiogheny & Ohio Coal Co., was re-elected president of the Eastern Ohio Coal Operators' Association at the annual meeting held last month. The other officers of the association also were re-elected, as follows: vice-president, R. L. Ireland, vice-president, Hanna Coal Co.; treasurer, E. S. Willard, general manager, United States Coal Co.; and secretary, D. F. Hurd. All are residents of Cleveland.

Coming Meetings

Mine Inspectors' Institute of America; annual meeting, May 4-6, John Marshall Hotel, Richmond, Va.

American Mining Congress; annual convention, May 11-15, Cincinnati, Ohio.

Midwest Bituminous Coal Conference; May 21 and 22, at University of Illinois, Urbana, Ill.

Rocky Mountain Coal Mining Institute; annual meeting, June 3-5, Cosmopolitan Hotel, Denver, Colo.

National Retail Coal Merchants' Association; annual meeting, June 4-6, Hotel Lord Baltimore, Baltimore, Md.

National Association of Purchasing Agents; annual convention and "information show," June 8-11, Royal York Hotel, Toronto, Canada.

Colorado and New Mexico Coal Operators' Association; June 17, 513 Boston Bldg., Denver, Colo.

Industrial Coal Reserves Total 34 Days' Supply

Stocks of anthracite and bituminous coal in the hands of industrial consumers in the United States and Canada on Feb. 1 were 33,551,000 net tons, according to the monthly report of the National Association of Purchasing Agents, Inc. This figure is equal to 34 days' supply, based on the January consumption of 31,590,000 tons. Total stocks dropped about two million tons from the January figure. Of this total, Canada reported a decrease of 600,000 tons, and the remainder was fairly evenly divided among the various consumer classifications, with the exception of coal-gas plants, which showed a slight increase.

Days' Supply of Bituminous Coal In Various U. S. Industries

Byproduct coke...	36	Railroads........	24
Electric utilities...	47	Steel mills........	29
Coal gas plants...	64	Other industries..	31
Average total bituminous stocks throughout the United States........			32

Estimates of Output, Consumption and Stocks, in Net Tons

	United States Production	Industrial Consumption	On Hand in Industries
January, 1930..	56,816,000	38,512,000	39,007,000
February......	45,712,000	35,195,000	37,078,000
March........	40,324,000	37,083,000	36,554,000
April..........	40,766,000	36,230,000	31,535,000
May..........	41,901,000	34,685,000	30,700,000
June..........	38,897,000	31,613,000	30,824,000
July..........	40,373,000	30,496,000	31,500,000
August........	41,851,000	29,817,000	32,735,000
September.....	43,925,000	28,900,000	33,720,000
October.......	51,726,000	31,651,000	33,700,000
November.....	43,329,000	30,884,000	34,017,000
December.....	45,802,000	32,217,000	34,162,000
January, 1931..	44,699,000	31,590,000	35,497,000
Feb. 1.........	....	....	33,551,000

Commercial stocks of bituminous coal, used largely for industrial purposes, amounted to 37,200,000 tons on Jan. 1, 1931, according to the U. S. Bureau of Mines. In comparison with the amount on hand at the beginning of the previous quarter, this is an increase of 1,300,000 tons, but is 3,100,000 tons less than the quantity in storage on the same date last year. Exports during the last quarter of 1930 averaged 331,000 tons a week, as against 382,000 tons in the preceding quarter. The weekly rate of consumption within the United States during the fourth quarter of 1930 amounted to 8,987,000 tons, as compared with 7,370,000 tons in the previous quarter. In comparison with the average weekly rate of consumption during November and December, 1929, however, the rate of home consumption plus exports for the period under review shows a decrease of 16.6 per cent.

In addition to the stocks in the hands of consumers there was 8,940,000 tons of bituminous coal on hand on the docks of Lake Superior and Lake Michigan on Jan. 1, as compared with 9,804,000 tons on Oct. 1. Stocks of anthracite in retail yards on Jan. 1 declined from the Oct. 1 total, and also are a little less than on the corresponding dates of other recent years. In terms of days' supply the present stocks of anthracite are equivalent to 43 days' requirements.

Washington Opposes Reductions in Wage Scales; Decision Hits Both Union Factions

VARIOUS departments of the United States Government, it was disclosed last month, have come out against wage reductions. In letters to certain Western coal companies, the Veterans' Bureau hospitals and the Department of Indian Affairs requested that "before your company becomes a party to any decrease in miners' scale of wages, you no doubt will consider the policy enunciated by the President that there shall be no reduction in wages in any contract entered into or in the process of fulfillment"

Several other departments also have sent out similar letters, though coal was not the only commodity singled out for attention. The departments buying coal, it was reported, have received several offers of tonnage at lower prices, based on the wage scale provisions of the standard coal contract, and the stand taken was to support the government's policy of no wage reductions.

Ending the legal battle for control of District 12 of the United Mine Workers, which has raged since Oct. 11, 1929, Judge Harry Edwards, of the Sangamon County (Ill.) Circuit Court, decided on Feb. 13 that the group of United Mine Workers headed by John L. Lewis, international president, was the only valid international union of that name. The decision, however, premanently enjoined Lewis from revoking the charter of the Illinois district or from removing from office the district heads. At the same time Judge Edwards upheld Harry Fishwick, preesident of District 12, and Alexander Howat, now president of the insurgents, in calling the famous "Springfield convention" to discuss union affairs, but declared that the insurgents had no right to act on the theory that the union constitution had expired with the failure of Lewis to call a convention in 1929, as the consituation had been continued by a referendum.

Judge Edwards directed attorneys for both factions to prepare a written decision in line with his pronouncements for him to sign. Counsel for both factions met in Chicago Feb. 24 to work out the decision, but considerable animosity featured the sessions, with the result that a settlement was postponed.

Indiana shaft operators and miners began in February to prepare for the coming wage conference. According to reports, the operators have prepared eleven points for consideration, including a uniform agreement for loading machines to eliminate local agreements; limitation on the check-off, and adoption of the November, 1917, wage scale. Miners' demands include tonnage rates for loading machines and conveyors, and for cutting machines in mechanical mines; a uniform agreement for mechanical loading, displacing local agreements; a $9 day rate for electricans and mechanical repair men; a six-hour day and five-day week; and elimination of the conciliation clause in the present agreement.

Operators in Kansas and representatives of Districts 14, 21, and 25 of the regular United Mine Workers signed a four-year agreement on Jan. 21. The contract, expiring April 1, 1935, continues the present wage scale.

In northern West Virginia, the New England Fuel & Transportation Co. on Feb. 2 cut wages at the Grant Town and Everettville mines 12 per cent, it was reported. Officials of the company, when queried by *Coal Age*, refused to comment on the move. The Peabody Coal Co., it was announced Feb. 10, declined to meet miners at the No. 16 mine, West Frankfort, Ill., in relation to a dispute on employment which is keeping 800 men idle.

Personal Notes

DOUGLAS MILLARD, manager of fuel sales, Colorado Fuel & Iron Co., Denver, Colo., has been elected a director and vice-president of the National Coal Association, vice J. F. Welborn, chairman of the board of directors of the company.

HOWARD J. THOMAS, Birmingham, Ala., formerly superintendent of mines for the Sloss-Sheffield Steel & Iron Co., has been made general· superintendent of the Davis Creek Coal & Coke Co. and the Yolande-Connellsville Coal Corporation. A. B. ALDRIDGE was recently made general manager of the Davis Creek and Yolande-Connellsville companies.

DAVID H. MUIR, veteran pit boss at the Robinson No. 1 mine of the Colorado Fuel & Iron Co., Walsen, Colo., has been retired after serving over 39 years. Mr. Muir operated the Robinson mine for more than thirteen years without a fatal accident, mining 2,475,553 tons of coal. In 1929, he was awarded the first Joseph A. Holmes Safety Association certificate ever given to an individual west of Pennsylvania. JOHN McQUADE, who started with the company at the Crested Butte mine in 1899 will succeed Mr. Muir at Robinson mine.

FRANK A. GLEASON, West Scranton, Pa., superintendent of the Baker colliery of the Glen Alden Coal Co., has been appointed state mine inspector, vice the late John L. Picton.

J. P. WILLIAMS, JR., formerly vice-president of the Koppers Coal Co. and subsidiaries, Pittsburgh, Pa., has been elected president to succeed H. B. Rust. P. C. THOMAS, manager of mines, Pittsburgh, has been chosen to succeed Mr. Williams.

DR. B. R. MACKAY, of the Geological Survey of Canada, has been awarded the Barlow Memorial Prize for 1930 by the Canadian Mining Institute for his paper on the "Stratigraphy and Structure of the Bituminous Coal Fields in the Vicinity of Jasper Park, Alberta." Presentation was to be made at the annual convention of the Canadian Institute of Mining and Metallurgy, in Ottawa, Canada, March 4-6.

RALSTON FOX SMITH, for twelve years sales manager of the W. H. Warner Co., Cleveland, Ohio, has been made vice-president of the Central West Coal Co.

F. S. Landstreet Dies

Fairfax Stuart Landstreet, chairman of the board of the Pennsylvania Coal & Coke Corporation, died of heart disease Feb. 5, at the Union Memorial Hospital, Baltimore, Md., at the age of 69. Early in life Mr. Landstreet became connected with the Davis and Elkins mining and railroad interests in West Virginia. At various times he was executive officer of the Western Maryland Ry., Davis Coal & Coke Co., and Consolidation Coal Co.

King Coal's Calendar for February

Feb. 1—Penn Anthracite Collieries Co. formally organized in Philadelphia, Pa., to merge the properties, equipment, and facilities of the South Penn Collieries Co., Elk Hill Coal & Iron Co., and the Southern Pennsylvania Anthracite Co. Penn Anthracite Mining Co. was formed to operate the nine collieries included in the merger.

Feb. 9—Coal miners and operators in the South Wales district of Great Britain sign a new wage agreement at Cardiff to run to Jan. 1, 1934. One hundred and fifty thousand men are employed in the field.

Feb. 13—Judge Harry Edwards, Sangamon County (Ill.) Circuit Court, in a decision on the controversy between the regular United Mine Workers and the insurgents over the control of District 12, recognizes the Lewis group as the only valid United Mine Workers, but enjoins Lewis or any of the regular organization from interfering in the affairs of District 12.

Feb. 15—Twenty per cent increase in underground miners' wages goes into effect throughout the Union of Socialist Soviet Republics.

Feb. 18—Coal and dock operators of the Northwest meet at St. Paul, Minn., to develop plans for the formation of a local association to further the Committee of Ten—Coal and Heating Industries movement in the Twin Cities.

Feb. 20—National council of the French Federation of Miners, at a meeting in Paris, decides to call a national strike unless present wage negotiations go through without carrying a reduction in pay. Unless the miners' demands are met by March 10, it was reported that a general strike would be called.

Feb. 21—Explosion of fire-damp in the Eschweiler mine, near Aachen, Germany, kills 31 men.

Coal-Mine Fatality Rate Rises in January; Accidents Kill 174 Men

ACCIDENTS in the coal mines of the United States in January, 1931, caused the loss of 174 lives, according to information received from state mine inspectors by the U. S. Bureau of Mines. This was a reduction of 56 deaths from the 230 reported in January, 1930, but is an increase of 48 over the fatalities which occurred in December, 1930. Production of coal in January, 1931, was 44,699,000 tons. This was a decrease both from the output of the preceding month and from that of January, a year ago. The death rate per million tons of coal mined in January, 1931, was 3.89, a decrease of about 4 per cent from January, 1930, but an increase of more than 40 per cent over December, 1930.

Considering bituminous mines alone, the January fatality rate was slightly lower than for January a year ago, but higher than for December, 1930, the rate being 3.48 per million tons, as compared with 3.60 for last January and 2.42 for December. There were 134 men killed in January of the present year, which was 45 less than in January a year ago, and 38 more than in December, 1930. The production of bituminous coal for January was 38,542,000 tons; for the same month a year ago it was 49,778,000 tons; and 39,716,000 tons for December, 1930.

In the anthracite mines of Pennsylvania, 40 men lost their lives during the month. Production was 6,157,000 tons, giving a death rate of 6.50. This rate was lower than that of January a year ago, which was 7.25. The figures also represent a reduction in the number of men killed and in the production of coal, there having been 51 fatalities and 7,038,000 tons recorded for January last year. Similar records for December, 1930, showed 30 fatalities, 6,086,000 tons of coal produced, and a rate of 4.93 per million tons.

Three major disasters—that is disasters in which five or more lives were lost—occurred during January of the present year. These were explosions, as follows: Midvale, Ohio, Jan. 3, 5 deaths; Beckley, W. Va., Jan. 6, 8 deaths; Dugger, Ind., Jan. 28, 28 deaths. During the same month in 1930, two major disasters occurred, which resulted in 15 deaths. Based exclusively on these major disasters, the fatality rates per million tons of coal mined were 0.917 for January of the present year and 0.264 for the same month last year. The major disasters in January, 1931, occurred at the rate of 6.71 separate disasters (as distinguished from the number of deaths resulting from the disasters) for each 100,000,000 tons of coal produced, as compared with 3.52 separate disasters per 100,000,000 tons for the corresponding month last year.

Comparing the accident record for January, 1931, with that for the same month of 1930, a reduction is noted for falls of roof and coal, haulage, explosives, and electricity. The comparative rates are as follows:

Cause	1929	1930	Jan., 1930	Jan., 1931
All causes	3.592	3.790	4.048	3.893
Falls of roof and coal	1.941	2.008	2.235	1.835
Haulage	.678	.570	.704	.537
Gas or dust explosions:				
Local explosions	.082	.115	.088	.067
Major explosions	.238	.402	.264	.917
Explosives	.145	.147	.194	.045
Electricity	.133	.143	.141	.067
Miscellaneous	.375	.405	.422	.425

Mining Operation Under Way

Development work at the Webster Springs (W. Va.) mine of the Minds Coal Mining Corporation, Ramey, Pa., which was opened in 1929, is well under way, and the company expects to arrive at a production of 200 tons per hour in the summer of this year. At present, the output is 150 tons per hour, and the limit of 300 tons will be attained in 1931. The mine is equipped with shaker screens to prepare the following sizes: mine-run; coarse stoker special, 1 in. and under; extra coarse stoker special, 2 in. and under; 1-in. lump; and 2-in. lump.

Safety Conference Postponed

The conference of state mine chiefs, U. S. Bureau of Mines officials, secretaries of operators' associations, and members of the safety committee of the National Coal Association, scheduled to meet in Chicago in February to draw up a national safety program, has been postponed until March 18.

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

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

State	Underground												Shaft					Surface							Total by States	
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining Machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip, or bucket	Other causes	Total	Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	1931	1930
Alabama	1											1								1				1	2	14
Arkansas																									0	0
Colorado		1	2					1				4													4	7
Illinois	6		1				1		1			9													9	10
Indiana	2		1	28								31													31	3
Iowa	1											1													1	3
Kansas																									0	3
Kentucky	3		1				1					5											1	1	6	23
Maryland	1											1													1	1
Michigan																									0	0
Missouri	2											2	1				1								3	1
Montana																									0	0
New Mexico																									0	1
North Dakota																									0	0
Ohio	3			5								8	1				1								9	7
Oklahoma																									0	3
Pennsylvania (bituminous)	6	4	4								1	15		1			1			1				1	17	33
South Dakota																								0	0	0
Tennessee	2		1									3													3	1
Texas																									0	0
Utah			2									2													2	7
Virginia	1											1													1	8
Washington																							1	1	1	1
West Virginia	15	7	9	8			1		2			42						1						1	43	49
Wyoming	1											1													1	4
Total (bituminous)	44	12	21	41			3	1	3		1	126	2	1			3	1		2			2	5	134	179
Pennsylvania (anthracite)	19	7	3	3	2						4	38	1				1	1						1	40	51
Total, January, 1931	63	19	24	44	2		3	1	3		5	164	3	1			4	2		2			2	6	174	
Total, January, 1930	113	14	48	28	11		4	1	3	2	7	219		1			1	3		2		3	2	10		230

Safety in Pneumatic Plants Subject of New Code

A safety code for pneumatic coal cleaning plants has been adopted by the American Standards Association. This code is aimed at the prevention of dust explosions in dry plants, though to date no serious accident has resulted from their operation. However, safety experts were unanimous in a declaration that the explosion hazard existed in such measure as to warrant the adoption of a national code, which contains comprehensive provisions for the construction and ventilation of buildings in which pneumatic screening and cleaning equipment and dryers are located; the safeguarding of equipment; and methods of dust collection.

Dunglinson Elected President Of Williamson Group

George Dunglinson, Jr., manager, fuel department, Norfolk & Western Ry., Bluefield, W. Va., was elected president of the Operators' Association of the Williamson Field at a meeting of the executive committee on Feb. 3. Mr. Dunglinson succeeds W. A. Richards, Bluefield, president, Majestic Collieries Co., who resigned as a result of holding a similar office in the Winding Gulf association, and because the organization of the Sovereign Pocahontas Coal Co. made heavy demands on his time. E. E. Ritter, general manager, Red Jacket Consolidated Coal & Coke Co., Red Jacket, W. Va., was elected to the office of vice-president, vice J. W. Mayhew.

Dock Operators to Form Heating Group

Coal and dock operators of the Northwest, together with representatives of the heating industries, met at the Minnesota Club, St. Paul, Minn., Feb. 18, to discuss plans for the formation of a Twin City organization to co-operate with the Committee of Ten—Coal and Heating Industries. J. A. Maher, manager, Maher Coal Bureau, St. Paul, presided.

Research Positions Offered

Four fellowships in mining and metallurgical research are offered by the School of Mines of the University of Alabama in co-operation with the Southern experiment station of the U. S. Bureau of Mines, Tuscaloosa, Ala. These are open to graduates of universities and engineering schools with the proper background, and work will begin on Sept. 1. The following problems will be covered: "Ore Dressing Problems of Alabama Ores" and "Coal Preparation Problems of Alabama."

The Engineering Experiment Station of the University of Illinois, Urbana, Ill., has established two additional research graduate assistantships under the patronage of the Illinois Gas Association. The station already maintains fourteen assistantships in the conduct of engineering research and to extend and strengthen the field of its graduate work in engineering. Nominations to the new positions will be made from applications received before April 1.

Red Coal Decision

The Philadelphia & Reading Coal & Iron Co. has been upheld in its use of the color "red" by the Commissioner of Patents in the case of the Blackwood Coal & Coke Co. The Reading company color is applied "indiscriminately over all or a part of the surface or all or a part of the pieces of coal and ordinarily being irregular and discontinuous whereby portions of the natural portions of the surface of a piece of coal are exposed and give a variegated appearance to the piece," the commissioner stated. The Blackwood mark is described as consisting of a plurality of red specks of irregular size on the surface of the lump. The Commissioner ruled that the Reading company has the right to use this color scheme by priority and that, therefore, the Blackwood company has no right to register the color. An appeal was taken from the decision.

Industrial Notes

Southwark Foundry & Machine Co. has transferred the major portion of its assets to the Baldwin-Southwark Corporation, Philadelphia, Pa. No change was made in the management, sales, or engineering personnel of the Southwark company.

Clifford F. Messinger, formerly vice-president and general manager of the Chain Belt Co., Milwaukee, Wis., has been elected president of the company, succeeding C. R. Messinger, who resigned to become president of the Oliver Farm Equipment Co. and chairman of the board of the Chain Belt Co. G. K. Viall, works manager of the Chain Belt Co. since 1929, was elected vice-president.

Link-Belt Co., Chicago, has appointed the following sales agencies: shovel-crane-dragline division—Stockland Equipment Sales Co., Minneapolis, Minn.; McFarland Tractor & Equipment Co., St. Joseph, Mo.; portable loaders—Joe C. Tucker, Morganfield, Ky. The company also has appointed the following Canadian sales representatives: Manitoba Bridge & Iron Works, Ltd., Winnipeg; Riverside Iron Works, Ltd., Calgary.

Herbert A. May, director of a number of steel concerns and banks in the Pittsburgh (Pa.) district, has been made assistant to the president of the Westinghouse Electric & Mfg. Co.

William B. Todd, formerly assistant general manager of sales, has been appointed general manager of sales of the Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

H. W. Foulds, assistanet to the president of Goulds Pumps, Inc., Seneca Falls, N. Y., has been placed in general charge of all sales work.

H. C. Beaver, formerly executive vice-president of Rolls-Royce of America, has been made vice-president of the Worthington Pump & Machinery Corporation, New York City. Mr. Beaver will devote his efforts largely to the administration of the sales department. E. E. Yake has been advanced to the office of vice-president in charge of manufacturing and engineering.

A. J. King, mining engineer and coal operator, of Huntington, W. Va., has joined the staff of the American Coal Cleaning Corporation, Welch, W. Va. Mr. King's headquarters will be in Pittsburgh, Pa.

Dardelet Threadlock Corporation, New York City, has granted licenses for the manufacture of the Dardelet self-locking screw thread to W. L. Brubaker & Bros. Co., Millersburg, Pa., and the Wm. H. Ottemiller Co., York, Pa.

W. W. Baker, Pana, Ill., has been appointed representative of the Mt. Vernon (Ill.) Car Mfg. Co., in the central Illinois field. The Industrial Supply Co., Birmingham, Ala., has been appointed to represent the Mt. Vernon company in the Alabama district.

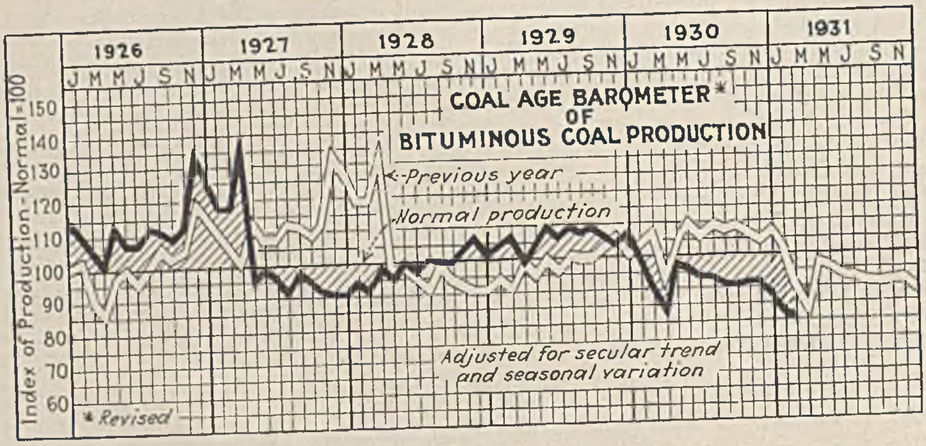
Burt B. Brewster, for many years manager of the branch of the Sullivan Machinery Co. at Salt Lake City, Utah, has been made manager of the company's Illinois-Indiana territory, with Headquarters at Mt. Vernon, Ill.

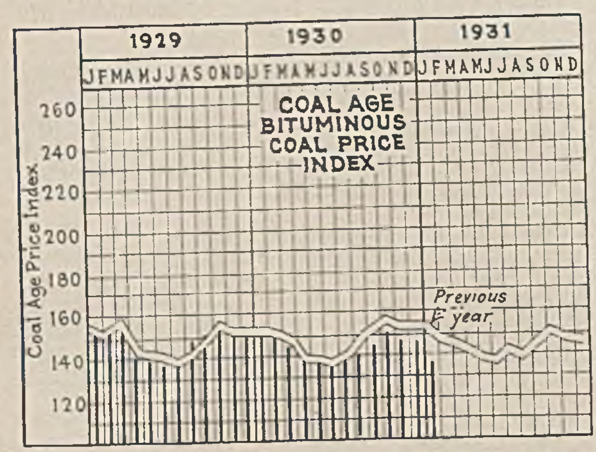
Bucyrus-Erie Co., South Milwaukee, Wis., has acquired a controlling interest in the Monighan Mfg. Corporation, Chicago, manufacturer of Diesel and electric dragline excavators, mounted on the Monighan walking device. The Monighan company will continue to operate as a separate company with the present management. Sales will be handled by Bucyrus-Erie.

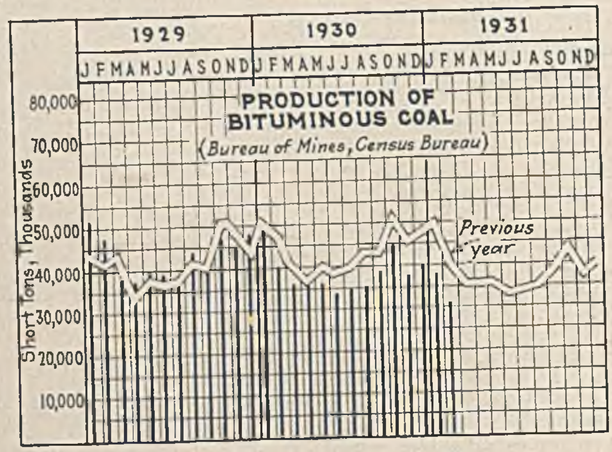
General Electric Co., Schenectady, N. Y., has disposed of its trolley-line material business to the Ohio Brass Co., Mansfield, Ohio. This includes overhead materials for electric railways, electrified mines, industrial haulage, and electrified steam roads. This is a field in which the Ohio Brass Co. has specialized quite intensively for many years. This transaction is relatively of small importance because of the volume of business involved, and although of some advantage to both companies, it is principally of benefit to the users of this class of material.

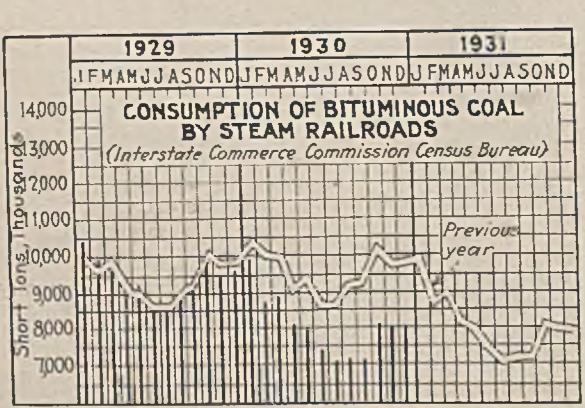
Thomas R. Akin, president, Laclede Steel Co., St. Louis, Mo., has been elected president of the Mancha Storage Battery Locomotive Co., of the same city. Mr. Akin succeeds the late Raymond Mancha.

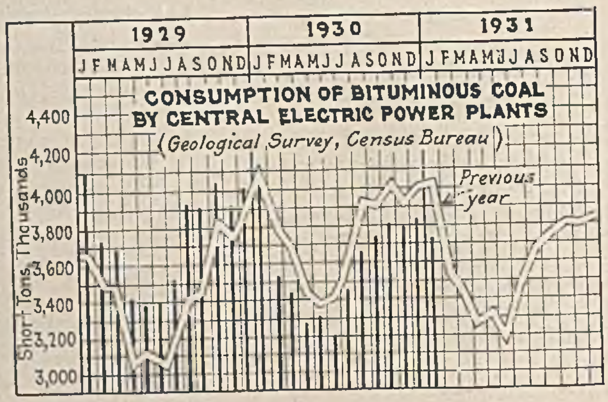
Indicators of Activities in the Coal Industry

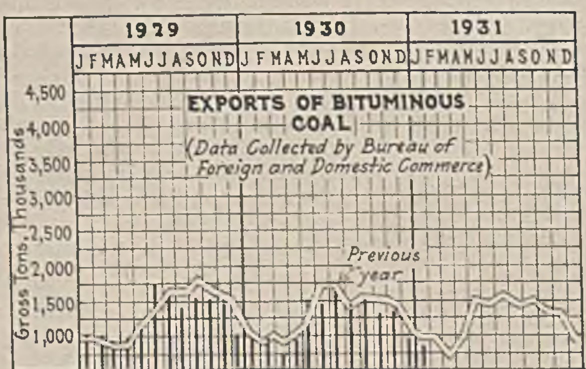


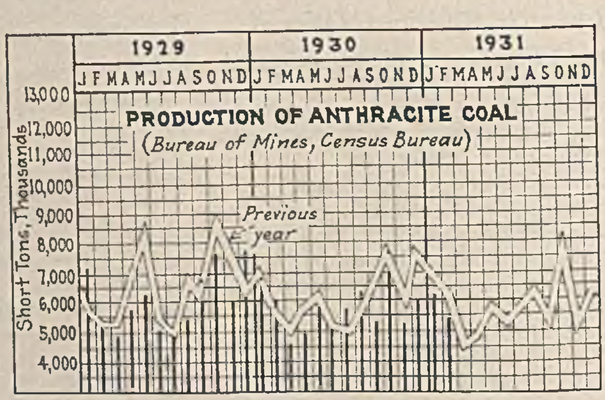












MARKETS

in Review

MILD weather, coupled with consumer indifference, played havoc with the demand for domestic coal in the bituminous markets of the country in February. Prices in most sections slumped, and in a few markets, under the strain of reductions announced for coming months, approached demoralization. Demand for industrial coal, reflecting the continued business depression, was slow in February, though a slight increase in activity was reported in some sections of the country. Curtailments in production caused by the declining domestic market resulted in a shortage of slack and screenings. Quotations on these sizes closed markedly higher at the end of the month.

February production of bituminous coal is estimated by the U. S. Bureau of Mines at 31,417,000 net tons, a decrease of 7,125,000 tons and 8,138,000 tons, respectively, from the totals for the preceding month and for February, 1930. Daily production in February was only 70.2 per cent of the normal figure for the month, as shown in the barometer on page 160. This barometer was formerly based on the year-to-year increase in average production characterizing the period up to 1919. Since that time, however, there has been a marked deceleration in the rate of growth, and the barometer has been revised to give effect to this condition, as well as to changes in seasonal activity. The graph showing consumption by railroads, which appears on page 160, also has been revised to include coal used in both road-train and switching service. Anthracite production is estimated at 5,391,000 net tons for February. This compares with 6,157,000 tons in the preceding month and 6,048,000 tons in February, 1930.

Coal Age Index of spot bituminous prices (preliminary) was: 147, Feb. 7 and 14; 146, Feb. 21; and 145, Feb. 28. Corresponding weighted average prices were: $1.78, Feb. 7 and 14; $1.77, Feb. 21; and $1.76, Feb. 28. Revised Index figures for January were: 148, Jan. 3; 145, Jan. 10; 148, Jan. 17; 145, Jan. 24; and 146, Jan. 31. Corresponding weighted average prices were $1.79, Jan. 3; $1.76, Jan. 10; $1.79, Jan. 17; $1.75, Jan. 24; and $1.77, Jan. 31. The monthly Index for January was 146⅔ as compared to the unrevised figure of 146¼ for February.

In spite of unseasonable weather, the anthracite markets of the country enjoyed a fair month in February. Egg, stove, and chestnut were in free supply throughout the month, and at times accumulations of stove were sufficient to become embarrasing. Pea, reflecting a strong demand, was scarce and tight. Some producers, it was reported, crushed down the larger sizes to keep pace with the pea market. Of the steam sizes, buckwheat was scarce and tight, while rice moved freely in response to an excellent demand. Barley was so slow at times as to cause reserves to pile up.

REDUCTIONS on the larger sizes made the whole Chicago domestic price structure soft in February. Following a cut by the smokeless operators late in January, lump and egg were freely offered at $2.25, with some sales as low as $2. In February, despite protests from the retailers, a cut on mine-run for March also was announced. This size afterward sold as low as $2 on contracts, with spot quotations as low as $1.65.

The smokeless reductions brought in their train cuts of 15@50c. on Illinois, Indiana, Kentucky, and West Virginia high-volatiles for March. Southern Illinois circulars will be: lump, $2.75; furnace, $2.55; smill egg, $2.40; stove, $2.25; chestnut, $2.05. These represent the following reductions: lump, 50c.; furance, 45c.; small egg, 35c.; stove, 25c.; and chestnut, no change. Western Kentucky lump will sell at $1.60 in March, with egg at $1.40. Eastern high-volatile circulars show the top for ordinary lump to be $2.25, with egg at $1.75. Premium coals will bring only slightly more.

DEMAND for domestic coal was extremely light in February, despite low stocks in the hands of country dealers. Metropolitan stocks were spotty, with many dealers carrying higher reserves than the demand warranted. Retail sales were off 20 per cent in Chicago proper, and 35 to 40 per cent in the country districts. Unsold cars of prepared sizes filled the mine tracks in Illinois, Indiana, and western Kentucky.

Industrial demand was slow, but curtailed production at the mines made steam sizes scarce. Operators in the Middle West frequently had difficulty in providing enough screenings to fill contracts, while in southern Illinois in particular, storage piles were smaller than ever before in February. While prices on high-quality screenings were strong, miscellaneous varieties barely held firm. Secondary grades sold at about $1, partly because a number of operators burdened with domestic sizes shipped them on steam accounts, adversely affecting the smaller sizes.

The depression in the St. Louis market failed to lift in February. Warm weather slowed the domestic sizes, though curtailed production made screenings strong and caused some

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

		Week Ended— Feb. 7, 1931		Feb. 14, 1931		Feb. 21, 1931		Feb. 28, 1931	
	Market Quoted	Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken	New York	....	$8.50	....	$8.50	....	$8.50	....	$8.50
Egg	New York	$8.65	8.65	$8.50@$8.65	8.65	$8.50@$8.65	8.65	$8.50@$8.65	8.65
Egg	Philadelphia	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65
Egg	Chicago*	7.77	7.77	7.77	7.77	7.77	7.77	7.77	7.77
Stove	New York	8.90@ 9.15	9.15	8.75@ 9.15	9.15	8.75@ 9.15	9.15	8.75@ 9.15	9.15
Stove	Philadelphia	9.15@ 9.40	9.15	9.15@ 9.40	9.15	9.15@ 9.40	9.15	9.15@ 9.40	9.15
Stove	Chicago*	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21
Chestnut	New York	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65
Chestnut	Philadelphia	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65
Chestnut	Chicago*	7.77	7.77	7.77	7.77	7.77	7.77	7.77	7.77
Pea	New York	5.00@ 5.50	5.00	5.00@ 5.50	5.00	5.00@ 5.75	5.00	5.00@ 5.50	5.00
Pea	Philadelphia	5.00@ 5.25	5.00	5.00@ 5.25	5.00	5.00@ 5.25	5.00	5.00@ 2.25	5.00
Pea	Chicago*	4.46	4.46	4.46	4.46	4.46	4.46	4.46	4.46
Buckwheat	New York	3.00@ 3.15	3.00†	3.00@ 3.25	3.00†	3.00@ 3.50	3.00†	3.25@ 3.75	3.00†
Buckwheat	Philadelphia	3.00@ 3.25	3.00	3.00@ 3.25	3.00	3.00@ 3.25	3.00	3.00@ 3.25	3.00
Rice	New York	1.90@ 2.10	2.00	2.00@ 2.15	2.00	2.00@ 2.15	2.00	2.00@ 2.15	2.00
Rice	Philadelphia	2.00@ 2.10	2.00	2.00@ 2.10	2.00	2.00@ 2.10	2.00	2.00@ 2.10	2.00
Barley	New York	1.15@ 1.40	1.50	1.15@ 1.40	1.50	1.15@ 1.40	1.50	1.15@ 1.40	1.50
Barley	Philadelphia	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50

*Net tons, f.o.b. mines. †Domestic buckwheat, $3.50 (D. L. & W.).

crushing of large sizes. Lump prices held up well in the face of light sales.

Distress conditions prevailed in the Southwest domestic market in February. Mild weather cut demand to the point where some Arkansas shaft mines were forced to close down, while those in Kansas and Oklahoma ran only one day or two days a week. Strip mines supplied the bulk of coal from the Kansas field. Oklahoma, Arkansas, and Kansas lists were reduced 50c. on Feb. 15, though the cut had no appreciable effect on the trade. Light production, however, resulted in a strong screenings market, with the Arkansas variety advancing from $1 to $1.25@$1.50.

Business at the Head of the Lakes failed to show any improvement in February, largely because of the continuance of mild weather. Both domestic and industrial buyers purchased cautiously. Shipments from the docks are expected to fall materially below the January figure of 20,575 cars, and also far below the total of 26,390 cars moved in February, 1930. Prices were steady, as follows: Pocahontas egg and lump-and-egg, $8; stove, $7.75; mine-run, $5; slack, $4.35; Kentucky block, $6.90; egg, $6.65; stove, $6.40; mine-run, $5; slack, $4.35; Youghiogheny block, $5.60; lump and egg, $5.35; stove, $5.10; mine-run, $5; slack, $4; splint block, $5.85; lump, $5.60; egg, $5.80; stove, $5.35; dock-run, $4.75; slack, $4.

Extremely mild weather in February resulted in continued quiet in the Rocky Mountain market. Demand was stagnant, with the result that the number of "no bills" on prepared sizes rose materially. The ensuing curtailment in production resulted in an extreme shortage of screenings and slack. Ruling prices in February were: bituminous lump, $4.50; nut, $4.50; washed chestnut, $3.25; steam sizes, $1.25@$1.50; Crested Butte anthracite furnace and egg, $9.25; base burner, $8.25; small base burner; $7; Rock Springs-Kemmerer 7-in. lump, $4.50; 3-in. lump, $4.25; 7x3-in. grate, $4; nut, $3.75.

The decline in volume of sales and in prices continued in the Louisville market in February. Steam and industrial demand was light. Production schedules at mines in both eastern and western Kentucky were cut materially. Prices on domestic sizes and mine-run were off, but the decreased production caused slack quotations to move up to the highest level they have attained for some months. The cheapest western Kentucky slack went at 55c., and a number of spot sales were reported at 85c.

PESSIMISM ruled the Cincinnati market in February. The month got off to an inauspicious start with smokeless operators reducing contract circulars a week ahead of the usual time and reports of crumbling prices on secondary grades of both low- and high-volatile varieties coming thick and fast. The full effect of the reductions was not felt in the market for three weeks after they were made, however, but its onset threw a number of firms into a near-panic. As a result, some of these concerns were selling lump at $1.25 and egg at $1 at the end of the month.

Production south of the Ohio River continued at a low ebb. At the first of the month this had no appreciable effect on the prices of screenings and slack, but a scramble for tonnage at the end caused quotations to stiffen materially. Demand for domestic sizes was practically nil. Unlike other years, the slump in prices could not be ascribed to distress coal, as railway reports showed the smallest tonnage of this character on hand since last August. Inquiry from industrial users improved somewhat, but lake buyers held off and retailers showed no interest in contracts.

Unseasonably warm weather in the Columbus market, coupled with the continued financial depression, reduced the demand for all grades of coal in February and weakened prices. Domestic activity was slow, largely because retailers, in view of the disturbed credit conditions and absence of any potential demand, were loath to add to stocks. Curtailed production, reflecting the domestic depression, made slack scarce, but the steam trade continued slow and irregular. Prospects of higher slack prices turned some steam users to the consideration of contracts, though most of them continued to resort to the spot market. Some agreements were renewed at the old figures. Railways and public utilities were the chief factors in the steam market.

Little change in either prices of demand was noticeable in the Cleveland market in February. Mild weather cut domestic sales, and railroads and industrial plants, in view of the financial situation, took little coal. Slack, for some time a drug on the market, improved slightly as the month wore on, and prices advanced 5c.

Close of the heating season and mild weather caused domestic demand to slide off rapidly in the Pittsburgh market in February, while industrial and railroad consumption failed to show any improvement over recent months.

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

	Market Quoted	Week Ended Feb. 7, 1931	Feb. 14, 1931	Feb. 21, 1931	Feb. 28, 1931
LOW-VOLATILE, EASTERN					
Smokeless lump	Chicago	$2.50@$2.75	$2.50@$2.75	$2.50@$2.75	$2.00@$2.75
Smokeless egg	Chicago	2.75@ 3.00	2.75@ 3.00	2.75@ 3.00	2.25@ 3.00
Smokeless stove	Chicago	2.75@ 3.00	2.75@ 3.00	2.75@ 3.00	2.75@ 3.00
Smokeless nut	Chicago	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
Smokeless pea	Chicago	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
Smokeless mine-run	Chicago	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
Smokeless slack	Chicago	.75@ 1.35	.75@ 1.35	.75@ 1.35	.75@ 1.35
Smokeless lump	Cincinnati	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.00@ 2.50
Smokeless egg	Cincinnati	2.50@ 2.75	2.50@ 2.75	2.25@ 2.75	2.25@ 2.75
Smokeless stove	Cincinnati	2.50@ 3.00	2.50@ 3.00	2.25@ 2.75	2.25@ 2.50
Smokeless nut	Cincinnati	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.85@ 2.00
Smokeless mine-run	Cincinnati	1.75@ 2.25	1.75@ 2.25	1.75@ 2.00	1.75@ 2.00
Smokeless slack	Cincinnati	.75@ 1.35	.75@ 1.25	.75@ 1.25	1.00@ 1.25
*Smokeless nut-and-slack	Boston	3.64@ 3.75	3.64@ 3.69	3.53@ 3.64	3.48@ 3.53
*Smokeless mine-run	Boston	4.25@ 4.40	4.15@ 4.35	4.10@ 4.30	4.00@ 4.25
Clearfield mine-run	Boston	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Clearfield mine-run	New York	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Cambria mine-run	Boston	1.85@ 2.10	1.85@ 2.10	1.85@ 2.10	1.85@ 2.10
Somerset mine-run	Boston	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pool 1 (Navy Standard)	New York	2.15@ 2.35	2.10@ 2.35	2.10@ 2.35	2.10@ 2.35
Pool 1 (Navy Standard)	Philadelphia	2.15@ 2.45	2.15@ 2.45	2.15@ 2.45	2.15@ 2.45
Pool 9 (super low-vol.)	New York	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pool 9 (super low-vol.)	Philadelphia	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pool 10 (h. gr. low.-vol.)	New York	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pool 10 (h. gr. low-vol.)	Philadelphia	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pool 11 (low-vol.)	New York	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50
Pool 11 (low-vol.)	Philadelphia	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.)	New York	$0.95@$1.15	$0.95@$1.15	$0.95@$1.15	$0.95@$1.15
Pool 54-64 (gas and st.)	Philadelphia	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15
Pittsburgh sc'd gas	Pittsburgh	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80
Pittsburgh gas mine-run	Pittsburgh	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60
Pittsburgh mine-run	Pittsburgh	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60
Pittsburgh slack	Pittsburgh	.90@ 1.10	.90@ 1.15	.90@ 1.15	.90@ 1.15
Connellsville coking coal	Pittsburgh	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75
Westmoreland lump	Philadelphia	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
Westmoreland egg	Philadelphia	1.75@ 1.85	1.75@ 1.85	1.75@ 1.85	1.75@ 1.85
Westmoreland ¾-in. lump	Philadelphia	1.80@ 1.90	1.80@ 1.90	1.80@ 1.90	1.80@ 1.90
Westmoreland mine-run	Philadelphia	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
Westmoreland slack	Philadelphia	1.05@ 1.25	1.05@ 1.25	1.05@ 1.25	1.05@ 1.25
Fairmont lump	Fairmont	1.65@ 2.00	1.65@ 2.00	1.50@ 1.90	1.40@ 1.90
Fairmont egg	Fairmont	1.45@ 1.90	1.45@ 1.90	1.40@ 1.75	1.35@ 1.90
Fairmont ¾-in. lump	Fairmont	1.45@ 1.90	1.45@ 1.90	1.40@ 1.75	1.30@ 1.75
Fairmont mine-run	Fairmont	1.05@ 1.45	1.05@ 1.45	1.00@ 1.40	1.00@ 1.40
Fairmont slack	Fairmont	.50@ .90	.50@ .80	.40@ .85	.35@ .90
Kanawha lump	Cincinnati	1.65@ 2.50	1.60@ 2.25	1.50@ 2.25	1.50@ 2.25
Kanawha egg	Cincinnati	1.25@ 1.65	1.25@ 1.65	1.10@ 1.65	1.10@ 1.65
Kanawha nut-and-slack	Cincinnati	.50@ .75	.60@ .75	.60@ .85	.65@ .90
Kanawha mine-run (gas)	Cincinnati	1.35@ 1.60	1.35@ 1.60	1.25@ 1.50	1.25@ 1.60
Kanawha mine-run (st.)	Cincinnati	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	1.00@ 1.35
Williamson (W. Va.) lump	Cincinnati	1.60@ 2.25	1.50@ 2.25	1.50@ 2.00	1.35@ 2.00
Williamson (W. Va.) egg	Cincinnati	1.25@ 1.60	1.25@ 1.60	1.10@ 1.60	1.10@ 1.60
Williamson (W. Va.) nut-and-slack	Cincinnati	.50@ .75	.60@ .85	.60@ .85	.60@ .90
Williamson (W. Va.) mine-run (gas)	Cincinnati	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50	1.25@ 1.50
Williamson (W. Va.) mine-run (st.)	Cincinnati	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	1.00@ 1.30
Logan (W. Va.) lump	Cincinnati	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00	1.40@ 2.00
Logan (W. Va.) egg	Cincinnati	1.25@ 1.60	1.25@ 1.60	1.10@ 1.50	1.10@ 1.50
Logan (W. Va.) nut-and-slack	Cincinnati	.50@ .75	.50@ .75	.50@ .85	.60@ .85
Logan (W. Va.) mine-run	Cincinnati	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	1.00@ 1.35
Logan (W. Va.) slack	Cincinnati	.50@ .75	.50@ .75	.50@ .75	.50@ .85
Hocking (Ohio) lump	Columbus	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00
Hocking (Ohio) nut-and-slack	Columbus	.75@ .90	.75@ .90	.75@ .90	.75@ .90
Hocking (Ohio) mine-run	Columbus	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65
Pitts. No. 8 (Ohio) lump	Cleveland	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50
Pitts. No. 8 (Ohio) ¾-in. lump	Cleveland	1.25@ 1.35	1.25@ 1.35	1.25@ 1.35	1.25@ 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
Pitts. No. 8 (Ohio) slack	Cleveland	.55@ .65	.55@ .65	.55@ .65	.55@ .65

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

Domestic coal sold down to the abnormally low price of $1.75@$2 over the whole of the month, while production eased off materially. Despite the scarcity in slack coal caused by the falling off in lump production, steam slack prices weakened to 60@75c.

Continued depression in the northern West Virginia market in February was featured by wide variations in quotations. Some of the smaller companies sold large lump for as little as $1, and disposed of $\frac{3}{4}$-in. lump for 90c., while the larger companies received 30c. more. Such fluctuations were frequent and demand was slow. Mild weather decreased domestic sales, and the steam trade reflected the slow business conditions.

Unseasonable weather restricted the central Pennsylvania market in February, though production continued on a comparatively even basis. Some contracting was reported, with prices at former levels. Ruling quotations at the end of the month were: Pool, 1, $2.15@$2.40; Pool 71, $2@$2.15; Pool 9, $1.80@$2; Pool 10, $1.65@$1.75; Pools 11 and 18, $1.40@$1.60.

A quiet tone pervaded the New England steam trade in February. While there were some rumors of contracts at advanced prices, buyers showed little interest. High-grade smokeless mine-run sold at the end of the month at $4@$4.10 a gross ton f.o.b. vessels at Hampton Roads. Quotations on stoker coal were $3.42@$3.53. Demand for all-rail coal from central Pennsylvania slumped in the last week of the month to an unseasonably low level.

Retail dealers in New York curtailed purchases in February, but demand for steam coal held up fairly well. Prepared sizes were most affected by the decline in dealer takings, but the decreased demand also affected mine-run to some extent. A few manufacturing plants requested heavier shipments of steam coal on contracts, and in some cases tonnage was bought in the open market. Lump coal slumped, which caused slack to move into a stronger position. Mine-run prices softened slightly. A number of public utility contracts were renewed, usually at a few cents under the former prices. Other consumers showed a disposition to defer contracting, or refused to consider the move at all.

QUIETNESS featured the Philadelphia market in February, though there were some signs of a revival in industrial activity. Retail dealers continued hand-to-mouth buying tactics, taking, however, a fair tonnage under the circumstances. Interest was chiefly centered in contracting. The volume signed up, however, was smaller than in preceding years. Bunkering held up fairly well, and showed signs of improving in the future.

Mild weather in February stifled the Birmingham domestic market. While a few spells of colder weather brought about feeble spurts of buying, dealers were able to take care of demand without calling for shipments from the mines. Prices were stable at the following levels: medium grade lump, $2.25@$3.25; nut, $2@$2.75; good to high-quality lump, $4.25@$5.75; nut, $3.25@$3.50. At the end of the month, a slight increase in demand and restricted production bettered the condition of the screenings market and caused prices to stiffen to $1.25@$1.50. Other steam sizes dragged. Mine-run ranged from $1.65 to $2.25; washed from $1.50 to $2.25.

The New York anthracite market absorbed its usual share of a rather heavy production in January. Mild weather prevailed, but the departure from normal temperatures was not great enough to affect consumption seriously. Egg, stove, and chestnut were in free supply, with stove, at times, over-plentiful. Pea and buckwheat were the favorite sizes, and commanded premiums of 25@75c. when offered in the open market in straight lots. Rice also enjoyed a good demand, with prices firm at the circulars. Independent barley, however, moved only after price concessions. Supplies of buckwheat in retail yards neared exhaustion in the middle of the month, and this size was scarce for the rest of the period. Pea, on the other hand, which up to Feb. 15 had been the shortest size, eased slightly when certain producers augmented the supply by resizing chestnut.

The Philadelphia anthracite market, while sluggish in February, managed to get through the month in good shape. An extraordinary demand for pea coal continued to be an upsetting factor, with the result that some producers crushed the larger sizes to round out the supply. Stove lagged, and while nut enjoyed a fair demand, it lost decidedly to pea. Steam sizes moved well, largely because of the limited production. Buckwheat was scarce, as usual. Rice moved well most of the time, but oversupplies of barley existed at times.

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

	Market Quoted	Week Ended Feb. 7, 1931	Feb. 14, 1931	Feb. 21, 1931	Feb. 28, 1931
MIDDLE WEST					
Franklin (Ill.) lump	Chicago	$3.25	$3.25	$3.25	$3.25
Franklin (Ill.) egg	Chicago	2.75@ 3.00	2.75@ 3.00	2.75@ 3.00	2.75@ 3.00
Franklin (Ill.) mine-run	Chicago	2.15	2.15	2.15	2.15
Franklin (Ill.) screenings	Chicago	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Central Ill. lump	Chicago	2.40@ 2.65	2.40@ 2.65	2.40@ 2.65	2.40@ 2.65
Central Ill. egg	Chicago	1.85@ 2.40	1.85@ 2.40	1.85@ 2.40	1.85@ 2.40
Central Ill. mine-run	Chicago	1.70	1.70	1.70	1.70
Central Ill. screenings	Chicago	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25	1.00@ 1.50
Ind. 4th Vein lump	Chicago	2.50@ 2.65	2.50@ 2.65	2.50@ 2.65	2.50@ 2.65
Ind. 4th Vein egg	Chicago	2.40@ 2.50	2.40@ 2.50	2.40@ 2.50	2.40@ 2.50
Ind. 4th Vein mine-run	Chicago	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00
Ind. 4th Vein screenings	Chicago	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Ind. 5th Vein lump	Chicago	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10
Ind. 5th Vein egg	Chicago	1.85@ 2.00	1.85@ 2.00	1.85@ 2.00	1.85@ 2.00
Ind. 5th Vein mine-run	Chicago	1.20@ 1.75	1.20@ 1.75	1.20@ 1.75	1.20@ 1.75
Ind. 5th Vein screenings	Chicago	.90@ 1.10	.90@ 1.10	.95@ 1.25	.95@ 1.25
Mt. Olive (Ill.) lump	St. Louis	2.50	2.50	2.50	2.50
Mt. Olive (Ill.) egg	St. Louis	2.25	2.25	2.25	2.25
Mt. Olive (Ill.) mine-run	St. Louis	1.55@ 1.80	1.55@ 1.80	1.55@ 1.80	1.55@ 1.80
Mt. Olive (Ill.) screenings	St. Louis	.80@ 1.00	.75@ 1.10	.75@ 1.10	.75@ 1.10
Standard (Ill.) lump	St. Louis	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Standard (Ill.) egg	St. Louis	1.65@ 2.10	1.65@ 2.10	1.65@ 2.10	1.65@ 2.10
Standard (Ill.) mine-run	St. Louis	1.25@ 1.65	1.25@ 1.65	1.25@ 1.65	1.25@ 1.65
Standard (Ill.) screenings	St. Louis	.50@ 1.00	.60@ 1.00	.60@ 1.00	.60@ 1.00
West Ky. lump	Louisville	1.60@ 2.00	1.60@ 2.00	1.50@ 2.00	1.50@ 2.00
West Ky. egg	Louisville	1.65@ 1.85	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00
West Ky. mine-run	Louisville	1.00@ 1.25	1.00@ 1.25	.90@ 1.30	.90@ 1.25
West Ky. screenings	Louisville	.30@ .40	.35@ .40	.55@ .75	.55@ .85
West Ky. lump	Chicago	1.75@ 1.85	1.75@ 1.85	1.75@ 1.85	1.65@ 1.75
West Ky. egg	Chicago	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
West Ky. screenings	Chicago	.40@ .65	.40@ .65	.55@ .70	.65@ .85
SOUTH AND SOUTHWEST					
Big Seam lump	Birmingham	$2.25	$2.25	$2.25	$2.25
Big Seam mine-run	Birmingham	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Harlan (Ky.) block	Chicago	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50
Harlan (Ky.) egg	Chicago	1.40@ 1.85	1.40@ 1.85	1.40@ 1.85	1.40@ 1.85
Harlan (Ky.) slack	Chicago	.70@ 1.00	.70@ 1.00	.70@ 1.00	.70@ 1.00
Harlan (Ky.) block	Louisville	2.00@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
Harlan (Ky.) egg	Louisville	1.50@ 1.75	1.40@ 1.85	1.40@ 1.85	1.40@ 1.85
Harlan (Ky.) nut-and-slack	Louisville	.65 1.10	.75@ 1.00	.75@ 1.00	.75@ 1.10
Harlan (Ky.) mine-run	Louisville	1.40@ 1.60	1.25@ 1.60	1.30@ 1.60	1.30@ 1.60
Harlan (Ky.) block	Cincinnati	1.75@ 2.50	1.75@ 2.50	1.75@ 2.50	1.50@ 2.50
Harlan (Ky.) egg	Cincinnati	1.35@ 1.75	1.25@ 1.75	1.25@ 1.75	1.10@ 1.75
Harlan (Ky.) nut-and-slack	Cincinnati	.60@ .75	.50@ .75	.60@ .80	.65@ .90
Harlan (Ky.) mine-run	Cincinnati	1.10@ 1.60	1.10@ 1.60	1.10@ 1.60	1.00@ 1.50
Hazard (Ky.) block	Chicago	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50
Hazard (Ky.) egg	Chicago	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65
Hazard (Ky.) slack	Chicago	.70@ .90	.70@ .90	.70@ .90	.70@ .90
Hazard (Ky.) block	Louisville	1.75@ 2.25	1.75@ 2.25	1.50@ 2.00	1.50@ 2.00
Hazard (Ky.) egg	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Hazard (Ky.) nut-and-slack	Louisville	.65@ .90	.75@ 1.00	.75@ 1.00	.75@ 1.00
Hazard (Ky.) mine-run	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Hazard (Ky.) block	Cincinnati	1.75@ 2.25	1.60@ 2.25	1.50@ 2.00	1.25@ 2.00
Hazard (Ky.) egg	Cincinnati	1.35@ 1.65	1.25@ 1.65	1.25@ 1.50	1.00@ 1.60
Hazard (Ky.) nut-and-slack	Cincinnati	.50@ .75	.50@ .75	.50@ .85	.50@ .85
Hazard (Ky.) mine-run	Cincinnati	1.10@ 1.35	1.10@ 1.35	1.10@ 1.25	1.10@ 1.25
Elkhorn (Ky.) block	Chicago	1.75@ 2.50	1.75@ 2.50	1.75@ 2.50	1.75@ 2.50
Elkhorn (Ky.) egg	Chicago	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00
Elkhorn (Ky.) slack	Chicago	.75@ 1.00	.75@ 1.00	.75@ 1.00	.75@ 1.00
Elkhorn (Ky.) block	Louisville	2.00@ 2.25	1.75@ 2.25	1.50@ 2.00	1.50@ 2.00
Elkhorn (Ky.) egg	Louisville	1.25@ 1.50	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75
Elkhorn (Ky.) nut-and-slack	Louisville	.65@ 1.00	.75@ 1.00	.75@ 1.00	.75@ 1.10
Elkhorn (Ky.) mine-run	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Elkhorn (Ky.) block	Cincinnati	1.65@ 3.00	1.65@ 3.00	1.50@ 2.75	1.25@ 2.50
Elkhorn (Ky.) egg	Cincinnati	1.30@ 1.75	1.30@ 1.75	1.30@ 1.75	1.10@ 1.75
Elkhorn (Ky.) nut-and-slack	Cincinnati	.50@ .75	.50@ .80	.60@ .85	.65@ .90
Elkhorn (Ky.) mine-run	Cincinnati	1.10@ 1.65	1.10@ 1.60	1.10@ 1.60	1.00@ 1.50
Kansas shaft lump	Kansas City	3.75@ 4.00	3.75@ 4.00	3.75@ 4.00	3.75@ 4.00
Kansas strip lump	Kansas City	2.25@ 2.75	2.25@ 2.75	2.25@ 2.75	2.25@ 2.75
Kansas mine-run	Kansas City	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
Kansas screenings	Kansas City	1.50	1.50	1.50	1.50

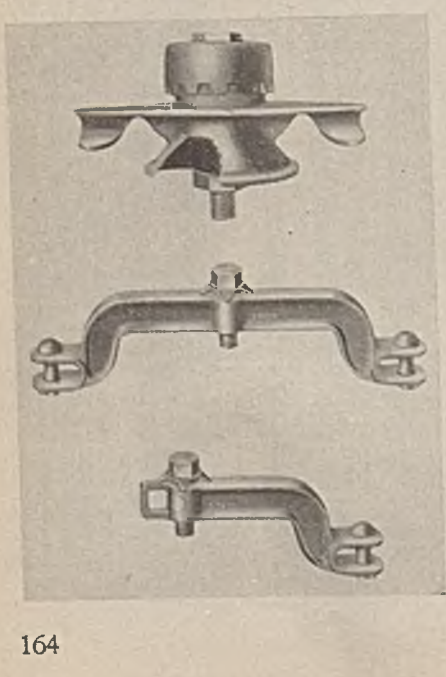
WHAT'S NEW

IN COAL-MINING EQUIPMENT

Overhead Trolley Materials For Mining Use

Electric Railway Equipment Co., Cincinnati, Ohio, has developed new designs of hangers and pull-overs for coal-mining and railway use. Ease of replacing the insulating portion is one of the features of the new straight-line hanger (Type "CD") stressed by the company. To prevent drawing an arc from the line ear to the hanger skirt, the maker has increased the width of the shell to 3½ in., thus providing the requisite air gap. According to the company, the body is made of the highest-grade malleable iron, reinforced at strategic points to provide the necessary strength to resist the bending action of the span wire. Castings, it is stated, are carefully machined and heavily cadmium-coated to resist corrosion. "West End" insulated bolts with a head diameter of 1⅞ in. are used for the insulating members. These bolts, the company says, are interchangeable with those of other manufacture, and can easily be replaced at any time by removing the cap casting from the body. Height from ear face of bolt to top of hanger is 3½ in. Maximum over-all length of arms is 6½ in., and diameter of the skirt is 3½ in.

Top—Type "CD" Straight-Line Hanger; Middle—Drop-Forged Double-Curve Pull-Over; Bottom—Single Curve Drop-Forged Pull-Over



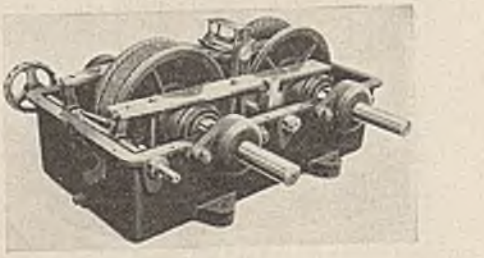
The drop-forged, double-curve pull-over, says the company, was formerly made of malleable iron, necessitating a heavy cross-section and bringing in its train a tendency for the castings to become brittle when coated with zinc by the hot-dip process. Substitution of drop forgings, it is said, has reduced the weight considerably and increased the strength, thus making a practically unbreakable double-curve pull-over body. The equipment is coated with zinc by the hot-dip process to resist moisture and atmospheric conditions. The company also offers a single-curve pull-over of the same construction as the double.

Variable Speed Transmission Is All-Metal

The Link-Belt Co., Chicago, has brought out the P. I. V. (positive, infinitely variable) gear, which it declares is the first all-metal, variable-speed transmission on the market. Construction details outlined by the company are as follows:

Basically, the unit consists of two pairs of wheels of the opposed, conical-disk type, between which a chain transmits power. Effective diameters of the wheels can be altered under load to change the speed ratio without stops and without dependence on friction. On changing speed, the self-pitching chain rises in one set of wheels and descents in the other. Thus, while the input shaft turns at a constant speed, the output shaft is brought to the desired speed.

The original feature of the P. I. V. gear, as compared to former equipment employing adjustable disks and belts with side-friction contacts, is the use of a positive chain drive to transmit power. Radial teeth are cut in the conical faces of the driving disks and self-adjustable teeth projecting beyond the sides of the chain are arranged to engage the former. The chain used in the gear is made up of a series of steel leaves, or links, with joints of hardened steel pins turning in segmental bushings. Inside each of the links is a container holding what might be called the teeth of the chain. Each such tooth is composed of a number of hardened steel laminations, or slats, which project about ⅛ in. from each side of the chain. The laminations are free to slide from side to side in the container and adjust themselves to engage with the radial teeth of the disks over substantially the full range of diameters. The teeth of the disks widen from the center outward toward the rim, but are of uniform depth. Teeth on each of the wheels making up a pair are staggered with relation to those on the opposite wheel to allow the slats to move back and forth and mesh correctly as the chain comes in contact with the wheels. At each engagement of the chain with the wheels the slats are regrouped within their separate containers, but do not slide or move under the working load. Movement in engaging the wheels is completed before the load is applied.

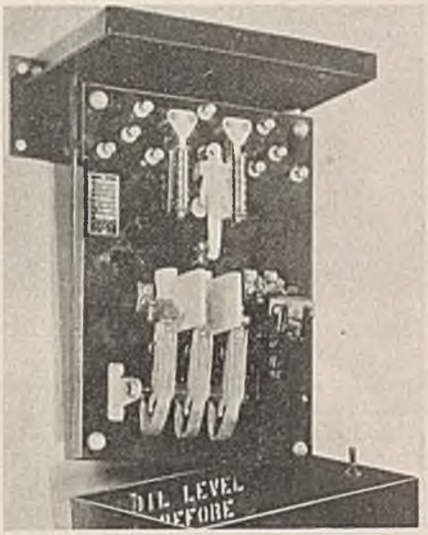


Link-Belt P.I.V. Gear

All elements of the gear are built into and protected by a compact, oil-tight housing and are automatically lubricated by a splash system. The hardened steel wheel faces are mounted on cast-iron hubs backed by ball thrust bearings, and move axially on the shafts, which are in turn mounted on radial ball bearings. Movement of the pairs of wheels together or apart, in order to increase or decrease their effective pitch diameters, is controlled by a pair of pivoted levers operated through a hand-control shaft with right- and left-hand screw motion. Initial chain tension is provided by an external adjustment screw, and correct operating tension at all ratios is maintained by two hardened steel shoes which, under constant spring pressure, ride on the upper and lower strands of the chain. The P. I. V. gear can be obtained in five sizes, ranging from 1 to 10 hp., and providing speed-change ratios up to a maximum of six to one.

Starter Said to Give Full Protection

In its oil-immersed "Thermaload" starter, the Monitor Controller Co., Baltimore, Md., offers a piece of control equipment which it declares will



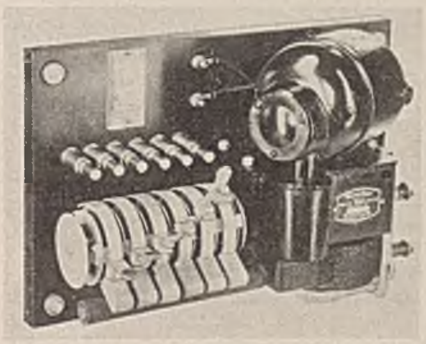
Monitor Oil-Immersed "Thermaload" Starter

provide across-the-line, full-voltage starting with overload and low-voltage protection. The equipment, it is said, consists of a standard magnetic starter mounted on a panel with a thermal relay. The whole is inclosed in an oil-tight box. Contactor and relay contacts are completely immersed in oil, while the thermal relay elements are above the oil level. This starter, it is asserted, gives positive protection to polyphase and single-phase motors both while starting and running. It permits, according to the company, full-voltage, full-current, full-torque starting, and yet protects the motor from harmful overload. In addition to the overload protection, the maker says that the equipment will disconnect the motor if the voltage fails or drops excessively, and that it will prevent damage to polyphase motors from running single-phase.

For momentary contact control, especially in machine service, the Monitor company offers the "Ironclad" push-button switch for a.c. or d.c. circuits. Features claimed for the switch are: quick-action inching, massive and flexible contacts, and unusual safety, because of the location of the buttons. The stop button is at the top and fully exposed for easy operation, while the start button is below, where it is protected from accidental contact. Special construction, the company says, makes the switch drip- and splash-proof. Simplicity also is claimed, the equipment consisting of the base, which carries the wiring and fixed contacts, and the cover, carrying the buttons. Conduit connections can be made, it is stated, from the top, bottom, or either side. Over-all dimensions are: height, $4\frac{1}{4}$ in.; width, $2\frac{13}{16}$ in.; and depth, $2\frac{5}{8}$ in.

"Ironclad" Push-Button Switch

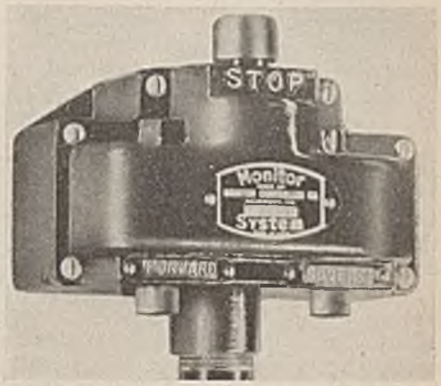
The Monitor company also has developed the work-cycle timer, which it states is designed to meet the timing requirements of electrically controlled work cycle. The equipment will, the company says, start, stop, accelerate, decelerate, reverse, heat, cool, open, close, raise, lower, or perform operations that can be done by electricity, and will do them in sequence and at definite time intervals that may easily and accurately be adjusted. A feature stressed by the company is the fact that the timer can instantly be reset at the starting point at any time during or after the completion of the cycle.



Monitor Work-Cycle Timer

Current-carrying switches in a given timer unit are all electrically connected on the pivoted side. Each switch consists of a rotatable disk carrying an adjustable contact point and a post fixed on the panel and connected directly to the circuit to be controlled. There are as many switches as there are circuits in the sequence. The disks are mounted loosely on a sleeve on a revolving hollow shaft, and each is between two other rotating disks keyed to the shaft. The latter are equipped with carbon blocks that bear lightly on the switch disks. The rotating hollow shaft is driven by a constant-speed electric motor. Through its center extends a clutch rod that can be moved by the action of a magnet.

When the magnet is excited, the clutch rod is pulled to the right and all the disks are pressed together. The switches then rotate, being driven through friction by the driving disks. Rotation of each switch continues until it closes on its stationary contact post.



Monitor Push-Button Master Station

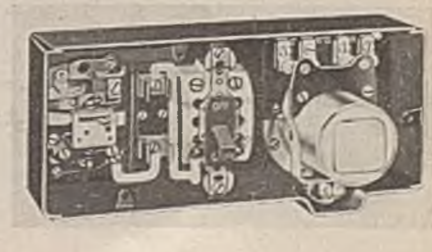
It then slips between the driving disks. When the magnet is released, the pressure is removed from the disks and the reset weights cause all the switches to drop back into their normal postion.

Addition of the "Ironclad" push-button master station to its line of control switches has been announced by the Monitor company. This station, the company says, is available for use in either alternating- or direct-current circuits, and provides the forward and reverse momentary contact control particularly suited to machine service. Features emphasized by the company are: massive, yet flexible contacts; mechanically and electrically strong insulation; and safety in operation, as the forward and reverse buttons are in a protected position on the bottom of the case and the stop button is on the top where it is easily accessible. Fixed contacts and wiring are carried in the base, with the push buttons fixed in the cover. Position of the buttons is said to give quick-action inching when desired, and the company asserts that the construction makes for compactness and positive contact.

Pressure Switch for Work Up to 150 Lb.

The Allen-Bradley Co., Milwaukee, Wis., offers its Bulletin 830 automatic pressure switch for the control of compressors, pumps, and other pressure equipment not exceeding 150 lb. per square inch. Size B switches provide two-pole switching and handle a.c. motors up to 1 hp. at 110 volts or 2 hp. at 220 volts, and d.c. motors up to 1 hp., 110 or 220

Allen-Bradley Bulletin 830 Pressure Switch With Overload Breaker, Disconnect Switch, and Fuse Clip



volts. Size C switches provide three-pole switching and handle the following equipment: single-phase motors, up to 1½ hp. at 110 volts, and up to 3 hp. at 220 volts; three-phase motors, up to 3 hp. at 110 volts, and up to 5 hp., 220, 440, 550 volts; d.c. motors, up to 2 hp., 110 or 220 volts, and up to 1 hp., 550 volts. For larger ratings, the Size B switch is used as a pilot control for magnetic starters.

The switch is of the contactor type operated by a diaphragm working against an adjustable spring, and will operate successfully, the company says, in either the horizontal or vertical position. Overload breakers may be provided if desired. Advantages claimed for the equipment are as follows: Size B switch is about the size of a small outlet box and can easily be installed on any pump or compressor; "open" and "close" pressures can be changed by making one adjustment of the pressure spring; four forms, including combinations with overload breakers, disconnect switches, etc., are available; tampering is discouraged, as the pressure spring and overload breaker cannot be disturbed without removing the cover plate of the inclosing case; overload breaker is capable of any number of operations without failure; silver contacts and Bakelite mounting blocks insure reliability of operation; and the switches may be used as the pilot control for motors of any rating.

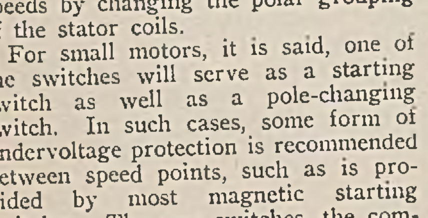
Equipment for the Use and Control of Power Offered Coal-Mining Men

THE General Electric Co., Schenectady, N. Y., offers two new switches for use with changeable-pole, multi-speed motors. These bear the designations CR-2960-SY-108 and SY-113. The first is for use with smaller motors, while the second may be applied to larger equipment. According to the company, use of these switches with multi-speed squirrel-cage induction motors permits obtaining different speeds by changing the polar grouping of the stator coils.

For small motors, it is said, one of the switches will serve as a starting switch as well as a pole-changing switch. In such cases, some form of undervoltage protection is recommended between speed points, such as is provided by most magnetic starting switches. The new switches, the company says, can be used with two-, three-, and four-speed motors for constant-horsepower and constant-torque service without change in mechanical construction. Unit construction is employed, making a wide variety of internal connections possible. This construction, it is asserted, also makes replacement of individual contact assemblies possible. By removing the tierod spacers and compound space washers, the movable contacts are accessible for replacement without dismantling the switch.

In operation, the speed point is selected by turning the knob handle to the required position. Depressing the knob completes the main circuits and the magnetic line switch is picked up through momentary disk contacts. The holding interlock is then closed and the switch latched in position. Pressing the "stop" button trips the holding interlock, dropping out the magnetic switch and opening the main contacts. Undervoltage protection is thus provided between speed points. Action, it is asserted, is very rapid and positive.

General Electric Switch for Changeable-Pole Motors



A portable, semi-automatic, arc-welding equipment for either open- or shielded-arc welding has been brought out by the General Electric Co. One simple adjustment, requiring but a few minutes, according to the company, is all that is necessary to make the conversion. The equipment consists of a welding head for feeding the electrode, an inclosed line contactor with interlock, a field rheostat for controlling the motor on the welding head, and a welding tool and lead for directing the electrode toward the work. The welding head is a motor-driven, wire-feeding device to supply electrode wire to the arc. Wire is drawn from a reel by means of a pair of geared feed rollers propelled by an adjustable-speed, 60-volt, direct-current motor through a train of gears. A gear shaft on the head is used for obtaining the approximate speed, final adjustment being made by the motor field rheostat.

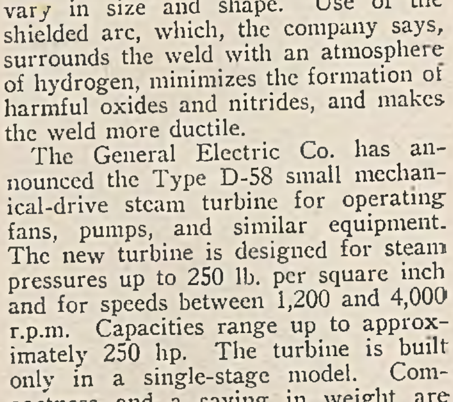
Welding tool and lead consist of a 10-ft., insulated, flexible conduit with a handle and nozzle so that the operative can direct the electrode. The feed motor is started by a tumbler switch in the handle. When it is desired to weld with a shielded arc, it is only necessary to change the nozzle accessories, the company says. Also, it is stated, the electrode feed can be adjusted for various sizes of wire up to a possible maximum of 3/16 in. Either a constant-energy or a constant-potential welding set can be used for welding current, though the welding head control requires 60-volt, constant-potential power.

Semi-Automatic Shielded-Arc Welder

Semi-automatic arc-welding equipment can be used in place of hand-controlled equipment where the latter is too slow and where full-automatic systems cannot be applied, the company claims. The chief advantage, it is claimed, is the elimination of time lost in changing electrodes in hand-welding. Also, the company says, the equipment can be advantageously used where the work is too complicated for automatic welding, and on a line of products which vary in size and shape. Use of the shielded arc, which, the company says, surrounds the weld with an atmosphere of hydrogen, minimizes the formation of harmful oxides and nitrides, and makes the weld more ductile.

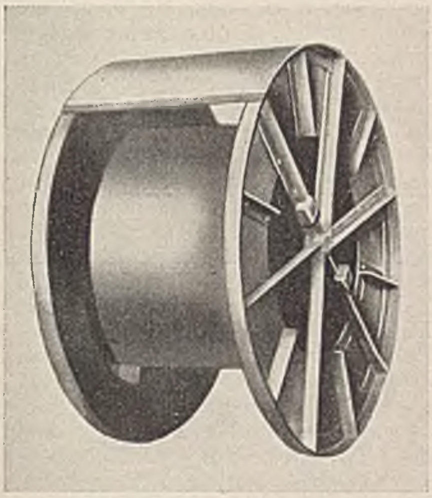
The General Electric Co. has announced the Type D-58 small mechanical-drive steam turbine for operating fans, pumps, and similar equipment. The new turbine is designed for steam pressures up to 250 lb. per square inch and for speeds between 1,200 and 4,000 r.p.m. Capacities range up to approximately 250 hp. The turbine is built only in a single-stage model. Compactness and a saving in weight are claimed by the company. The turbine is supported at the center to permit expansion without affecting the shaft alignment. Speed-regulating and emergency governors and carbon shaft-packing are part of the equipment of the machine. Pipe connections are made to the lower half of the turbine.

Type D-58 Steam Turbine



Steel Reels Developed

The Pressed Steel Division of the Truscon Steel Co., Cleveland, Ohio, is now manufacturing a new line of steel reels which are said to approximate the weight of corresponding wood reels, but which will not shrink, splinter, swell, or become affected with either damp or dry rot. Construction of the



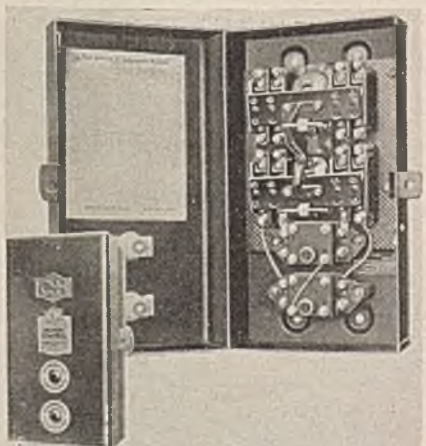
Truscon Steel Reel

reels, the company states, is such that inspection, marking, labeling, and spray painting is facilitated. Features noted by the maker include rigidity, strength, durability, and resistance to wear, which, it is declared, insures an almost indefinite life at a negligible maintenance cost. The reels can be stored either indoors or outdoors without the weight being affected by weather conditions. Steel or wood lagging may be supplied with them if desired.

Automatic Starters Offered For Multi-Speed Motors

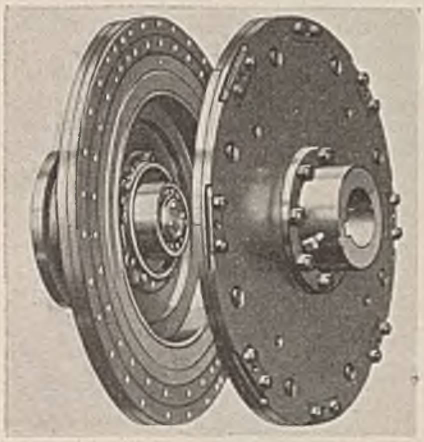
Cutler-Hammer, Inc., Milwaukee, Wis., offer a new line of inclosed automatic motor starters for two-speed, separate-winding-type, squirrel-cage

Cutler-Hammer Automatic Motor Starter for Multi-Speed Motors



motors, known as Bulletin 9736. These starters are of the across-the-line type. Both windings in the equipment are protected against dangerous overloads by means of thermal relays, the company says. A push-button master switch, with "stop," "low," and "high" buttons is used for remote control.

These starters can be obtained in three types, for starting on either winding, with sequence-compelling control or with the automatic sequence-control relay. For starting on either winding, depressing either the "low" or "high" button starts the motor on the respective low- or high-speed winding. The sequence-compelling feature requires that the motor always be started at low speed. Depressing the "high" button will not start the motor. The automatic sequence-control relay in-

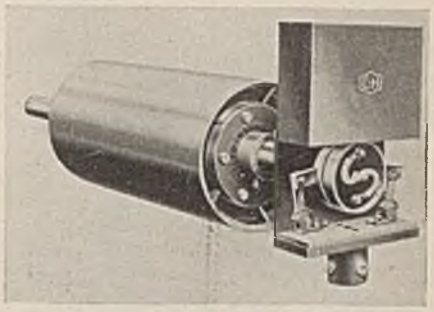


Cutler-Hammer Magnetic Clutch

sures that the motor will always start at low speed and pass to high speed if the "high" button is pressed. On all three types, the company says, if the motor is operating at one speed, it can be transferred to the other speed by depressing the other speed button. It is not necessary to stop the motor.

Better and more consistent operating characteristics, easy installation, greater safety, and easy access to parts which have to be renewed are claimed for the new line of magnetic clutches brought out by Cutler-Hammer. These clutches (Type L) have an L-shaped cross-section to fit around the magnet coil, which is said to give a greater and more stable magnetic pull over the life of the winding. The magnet coil is wound on a sheet-metal form, and is vacuum-impregnated before it is inserted in the field member. Four mounting studs extending through the field casting lock the coil in place. Loosening of the studs allows its removal. All coil terminals are recessed below the surface of the field member to protect them against damage, the company says.

A centering bearing, which fits into a recess in the armature hub, forms a common support for both clutch members, yet allows, according to the company, either member to revolve independently of the other when disengaged.

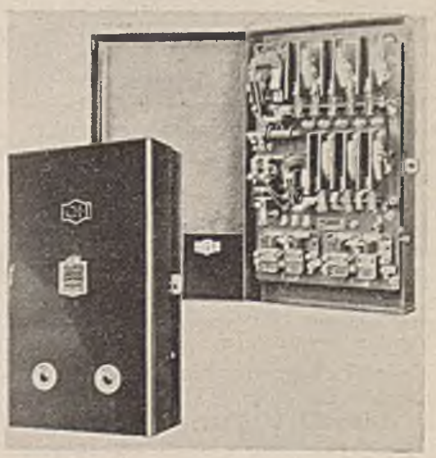


Type "W" Magnetic Separator Pulley

Perfect alignment and eccentric engagement are thus assured, it is claimed. Improvement in the design of collector rings for the clutches also is claimed. These rings are made of brass to prevent corrosion, and are mounted away from the hub on four insulated studs, so that it is practically impossible, according to the company, to cause creepage between the rings. Two carbon brushes are used with each collector ring to assure good contact without arcing. A lining wear indicator is installed to show when readjustment of the lining is necessary.

Simple construction, better wearing qualities, and lower price are claimed for the new Type "W" magnetic separator pulley developed by Cutler-Hammer. The pulley, according to the company, has only three major parts: a machined, cast-steel spool; magnet coil; and coil shield. Magnet coils are wound on the steel spool and vacuum-impregnated. The coil shield is then welded to the spool so that it incloses the coils. The Allegheny metal used in the shield, according to the company, provides a tough, long-wearing, non-magnetic surface. Mounted on one end of the pulley shaft is the commutating mechanism. Heavy brass collector rings and carbon brushes give good contact at all times, it is asserted. A dust-proof cover protects the commutating mechanism from dust and flying particles and eliminates the danger of contact with live wires. The pulleys are made with a 12-in. diameter and six different lengths for belts from 12 to 30 in. wide.

Type AAA Starter



Bulletin 9739 Automatic Controller for Multi-Speed Motors

Bulletin 9739, automatic controller for two-speed, consequent-pole-type (reconnected) squirrel-cage motors, has been developed by the Cutler-Hammer company for starting this type of motor and changing its speed by reconnecting the windings. This equipment, the company says, provides thermal overload protection at both motor speeds, as well as low-voltage protection. A separate push-button master switch with "stop," "low," and "high" buttons provides three-wire, remote control. Particular applications of the controller, the company says, are for constant-horsepower, constant-torque, or variable-torque motors. Sequence-compelling control can be furnished. The entire mechanism, it is said, is mounted on a single slate panel, which is easily removed from the case by loosening four screws. Easy access to all parts is made possible by the split-type inclosing case, it is claimed. Conduit knockout holes are provided in the top, bottom, and sides of the case.

The Cutler-Hammer company has redesigned its line of Type AAA automatic starters to incorporate a new "Twin-Break" magnetic contactor. This contactor has heavy coin-silver contacts which retain their current-carrying capacity even when oxidized, thus making good contact at all times with a slight temperature rise, according to the company. It is further declared that the "twin-break" principle reduces the arc voltage by one-half, and that the "Thermoplex" arc pockets, by reducing the air content around the contacts, actually prevents the formation of a destructive arc. The arc pockets also act as a shield so that the wires which are run along the side of the contactor cannot interfere with its operation.

A magnetic clutch has been added, the company states, to prevent accidental closure if the starter is bumped or tilted. The latch must be drawn aside by the operating magnet before the contacts can close. Hinge construction, it is said, facilitates removing and replacing the contact board, and insures its correct replacement, without which the starter cannot operate. The contactors are made in three- and four-pole types. Maximum rating for two or three phases, according to the company, is: 3 hp., 110 volts; 5 hp., 220 volts; and 7½ hp., 440 or 550 volts.

Fiber Pipe Developed

Brown Co., Portland, Maine, now offers the new "Bermico" fiber pipe. This product, it is stated, is made of tough, long-lived fiber, impregnated with pitch, making it a non-conductor immune to acids, alkalis, and electrolysis. Also, it is said, the pipe has a smooth surface inside and outside, and will not develop scale or rust. It does not offer any resistance to the flow of water, the company declares, and is both weatherproof and waterproof.

The pipe, the maker states, is supplied only with couplings. These may be secured with either standard or special threads, and are said to be exceptionally

"Bermico" Fiber Pipe, Showing Coupling

light in weight. The product can be secured in the following sizes: 5-ft. lengths, with a diameter of 1½ to 3 in.; 8-ft. lengths, having a diameter of 3 to 6 in. It also may be assembled in longer sections if desired. No tools are required with "Bermico" pipe, the company says, though the use of a strap wrench is suggested.

Self-Vulcanizing Claimed For New Rubber

The Hitchcock Co., Boston, Mass., offers "Covulc," said to be a self-vulcanizing rubber compound for resurfacing conveyor belts, covering pipes and shafts, and for lining chutes, hoppers, agitators, and mixing tubs. According to the company, "Covulc" is a soft, plastic rubber compound having exceptional toughness and resistance to abrasion. It is available in two forms, a thick paste which can be applied in the purchaser's plant and in sheets already vulcanized to a fabric or wire mesh. The latter may be cut to size and used for lining chutes, hoppers, and similar equipment.

In the paste form, "Covulc," according to the maker, is simply spread on, smoothed, and rolled flat. It vulcanizes itself when exposed to the air and forms a permanent rubber covering on any surface to which it is attached. After vulcanizing, it is stated, the compound remains soft and flexible during its life, and will not overcure or age. Extremes of heat and cold will not affect application, it is claimed, and sun, heat, or rain does not cause it to deteriorate after application. The paste form is recommended by the company for covering worn parts of conveyor belts or, when spread over joints or rivet holes, for preventing wear or entrance of gritty matter. It also is recommended for covering pipes, unions, valves, and other fittings exposed to acid water.

"Covulc" paste may be obtained in two units, based on 100 and 50 lb. of the paste itself, together with the necessary cleaner, rubber solution, and tools. The sheets are stocked in 6-ft. rolls, ¼ in. thick, and either 36 or 48 in. wide. Use of these materials, the company claims, reduces expenditures for new equipment and cuts maintenance costs on equipment in place materially.

Automatic Ring Oiler Developed For Chain Drives

For lubricating chain drives, the Morse Chain Co., Ithaca, N. Y., has developed an automatic ring oiler. Running chain drives in oil baths is not advisable, the manufacturer states, unless the speed is low, as the oil is churned into a mist which may seep out through the case. Also, the churning oxidizes the oil rapidly. Both the oil and mechanical parts become heated to an undesirable degree, it is said, because the oil prevents rapid radiation of heat from the moving parts. Any dirt in the oil bath also is carried up with the oil, causing unnecessary abrasion.

To eliminate these conditions, the ring oiler was developed, the company says. The ring is made from rod steel, with the ends sweated together, and travels in a groove turned in the hub of one of the sprockets. Oil is taken off the ring by a wiper. From the wiper it is carried in a pipe to near the center of the chain. Here it is dropped on the inside.

Morse Ring Oiler