COAL AGE

Devoted to the Operating, Technical and Business Problems of the Coal Mining Industry

McGRAW-HILL PUBLISHING COMPANY, INC.
JAMES H. McGRAW, *President*
E. J. MEHREN, *Vice-President*

JOHN M. CARMODY
Editor

Volume 32 NEW YORK, OCTOBER, 1927 *Number 4*

MANAGEMENT FUNCTION
In Industry

PROFITABLE operation is the first responsibility of management. If this were not true industry might well be the plaything of men whose chief goal is authority without regard to results achieved. A generation ago when the day by day problems of business were simple the tasks of industrial management likwise were simple. Not only has our civilization grown infinitely more complex but economic pressure, growing out of this intricate structure, has thrown constantly increasing burdens on those charged with the managerial functions.

THAT business is passing through a period when prices tend downward, for the first time in a generation, further intensifies the situation. The peak that was reached in 1920 had been rising gradually since 1896. It was only accelerated by the war. An entire generation of business men thus got their experience almost wholly on a rising price market. Except for minor reactions and the cycle disturbances of 1907 and 1914 they knew little of price recession.

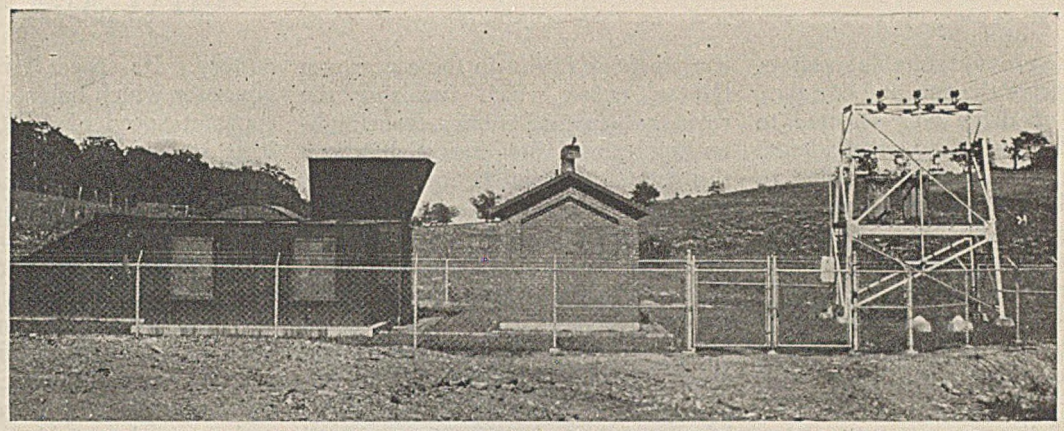
TODAY the world finds itself in a new economic atmosphere. In spite of steady and stubborn resistance, commodity prices tend gradually to work to lower levels. This always intensifies competition which in turn hastens the process. Only a keener understanding of world economics, on the part of industrial leaders, and an appreciation of the stabilizing influence of sustained purchasing power has acted as a restraining agent.

FORTUNATELY profits do not necessarily depend on a high price level. History records fortunes accumulated during lower price levels and failures quite as numerous during periods of price inflation. Skill in management has always been a potent factor. It is more necessary today than it was thirty years ago. Research will play a larger part in success during the years immediately ahead than it has hitherto. Business is learning how to make effective use of knowledge released by scientific study. The whole field of management, conscious of a new economic situation, is searching for effective technique.

GENERAL MOTORS is a splendid example of successful operation based on research in the fields of engineering and merchandising. Here management has reached new tablelands of achievement at the very time many business executives are concerned for normal profits. The coal industry will do well to inquire by what process accomplishment may be won for itself, similar to that of this youthful industrial giant.

Photo by Hine

"The Human Equation" in Coal Mining



EMERGENCY FAN DRIVE *Takes Load* AUTOMATICALLY

By Edgar J. Gealy
Electrical Engineer, Coal Age
New York City

MINE ventilation requires equipment which is thoroughly reliable. The necessity of circulating a continuous supply of fresh air at all times is well recognized and mine fan equipment must always be selected with this thought in mind.

Frequently mines are provided with one or more emergency fans which may be placed in operation quickly when the regular fan equipment fails. These fans are usually steam operated, especially where the cessation of ventilation for even a short period might result in the accumulation of gases that would prove dangerous to workmen. In the past, important fans have rarely been driven with electric motors, because of the chances of power failure, even though more economical and convenient.

At the present time, where modern mines are approaching total electrification and where new fan installations are being made in out-lying sections at considerable distances from a steam plant, the operation of mine fans by electric drives becomes almost a necessity. Furthermore, modern electrical equipment of proven dependability can now be obtained, thus making possible the use of electric mine fans which have a high degree of reliability. Continuous ventilation can also be assured these days by the installation of suitable emergency equipment to keep the fan in operation during periods when power failures occur.

Gasoline engines have recently become popular as emergency drives for electric-operated mine fans. A gasoline engine emergency unit has the advantage of convenient fuel storage, small space requirements, low installation cost per horsepower and the ability, if properly designed, to carry the fan load quickly after a power failure from the normal source of energy. Furthermore, a gasoline engine may be operated at speeds that are well adapted to mine fan practice and a number of gasoline-engine emergency units have already been successfully applied to this service.

IN ALL cases the emergency engines have been more or less manually attended. This has necessitated keeping an attendant on duty at the fan to start the engine in case of power failure, or the gasoline-generator set must be located at some point where an operator is always on duty performing other work.

A novel installation of an electric mine fan with a gasoline engine emergency unit has recently been placed in operation by the Lehigh & Wilkes-Barre Coal Co. of Wilkes-Barre, Pa. This outfit consists of a marine-type gasoline engine designed to start automatically when the electric power fails. It is the first installation of its kind that has been attempted and proven successful. The complete equipment is fully automatic, operating without the presence of an attendant, and is so arranged that continuous operation of the mine fan is obtained under all emergency conditions. It should, therefore, prove an important development in furthering the electrification of mine fans or other equipment where continuous operation is important.

An idea of the method of operation, and the manner in which the equipment functions under emergency conditions, may be had from a general description of the apparatus employed.

The mine fan, which is of Jeffrey manufacture, is equipped with an extended shaft on each end for a power drive. On each end of the shaft complete motor and pulley drives are provided. Both drives are exact duplicates except that they are right- and left-hand drives so as to suit the building layout. The motors are 60-hp., 690-r.p.m., 440-volt, three-phase, 60-cycle Allis-Chalmers slip-ring induction type units. They are provided with anti-friction bearings of the Timken roller type to minimize liability of shutdown due to bearing trouble.

The motors are connected to the fan by Allis-Chalmers Texrope

drives which provide suitable speed reduction to drive the fan at 112 r.p.m. This type of drive was selected to minimize the possibility of accidental shutdown due to belt failure and to eliminate belt slippage during the starting period of the fan. Also, considerable saving of space in the separate motor houses is made possible because of the small shaft-center permissible between the motor and fan with the Texrope drive.

THE gasoline engine and its control equipment is located in a brick engine house separate from the fan. The engine is arranged to drive an alternating-current generator and thus provide electrical energy for the fan motors during periods when the normal power supply fails. The electrical power from the gasoline-engine generator is applied to the fan through whichever motor happens to be the auxiliary one at the time, so that the fan may be kept in continous operation either during a failure of the regular power supply or when difficulties may develop in the regular driving equipment.

A view of the complete installation is shown in the headpiece. This photograph shows the mine fan on the left. The houses containing the motors, on each side of the fan, are of steel and are incorporated as part of the steel housing of the fan. The brick building containing the gasoline-engine generator set and its control equipment is shown in the center and the substation which furnishes the regular source of energy from high-tension transmission lines is shown on the right. The entire installation is surrounded with a Cyclone steel fence so that only authorized inspectors are permitted to enter.

A photograph of the gasoline-engine generator set is also shown. The gasoline engine is a Sterling four-cylinder, heavy-duty marine engine having a maximum rating of 120 b.hp. at 1,200 r.p.m. This engine is of standard design and has been developed especially for high reliability on emergency service.

THE engine starts quickly in cold weather and will carry full load immediately after starting. The design is also such as to lend itself readily to automatic control. Each engine cylinder is equipped with two inlet and two exhaust valves of the overhead type. The water jacketing surrounds the valve seats in such a manner as to prevent warping or cracking of valves when the engine is required to undergo long periods of service on heavy loads. Each cylinder is also provided with three spark plugs, each fed by a separate system of ignition from a storage battery. Pressure lubrication is provided to all moving parts.

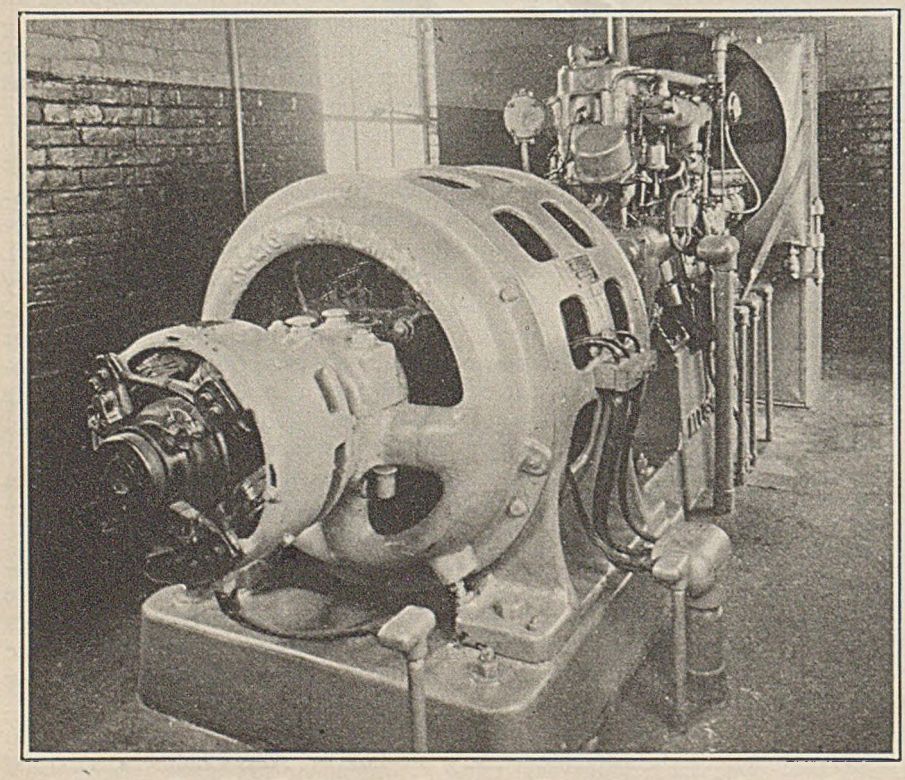
The engine is equipped with the standard starting motor for cranking the engine from a 12-volt storage battery. Its speed is regulated by a governor which holds the engine at a constant speed of 1,200 r.p.m. after it is started. Quick starting is assured by an electrically-operated priming system which injects a high-pressure supply of priming fuel into the cylinder intakes during the starting period. Fuel is supplied from an overhead tank on the outside of the building. This tank is filled by means of a Bowser pump which elevates the fuel from a large storage drum buried underground outside the building. To further facilitate quick starting during the winter months, a system of electric heaters is provided under the crank case. These heaters are operated from the regular 440-volt power supply and prevent thickening of the crankcase oil during periods of low temperatures.

A radiator is provided on the front of the engine for the cooling water. A supply of outside air for the radiator is furnished by an air duct leading from an outside intake connected under the floor to the radiator. When the engine is in operation, air is drawn from the outside intake over to the radiator, by the radiator fan, and exhausted from the engine room through a Swartwout roof ventilator. This prevents overheating the room.

THE engine is directly connected to an Allis-Chalmers 60-kw. 80-per cent power factor, 480-volt, three-phase, 60-cycle, 1,200 r.p.m., alternating-current generator with a direct-connected exciter. The design of this generator is such that satisfactory voltage regulation is obtained under high peak loads. This makes the maximum output of the engine readily available during the period when the mine fan is being accelerated. Consequently, the fan is brought to full speed under any load condition with the minimum time delay.

The electrical system for starting the gasoline engine and controlling the emergency power is the invention of Clinton Ide, sales engineer of the J. H. Weir Co., Incorporated, Wilkes-Barre, Pa. The scheme of control is such as to accomplish quick and reliable starting of heavy-duty engines of this type with greater accuracy and speed than has previously been possible by manual operation.

All engine control equipment is operated from a 12-volt storage battery and was constructed specially for this service by the Cutler-Hammer Manufacturing Co. The system of control is such that two 160-ampere-hour, 12-



Gasoline Engine and Generator Start Automatically

volt, storage batteries are sufficient for cranking the engine and operating all engine control apparatus. These batteries, when fully charged, have sufficient capacity to give the engine from 150 to 200 starts.

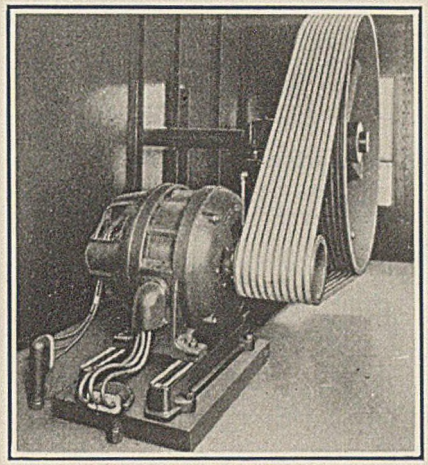
THE complete control equipment functions as follows: In case of power failure on the driving motor for the fan, or in case of abnormal conditions such as phase failure, phase reversal, low voltage or overload on the regular power supply, a master controller is provided to disconnect the driving motor from its supply lines. At the same time this master controller places the engine-control equipment in operation. The gasoline engine is then started from the storage batteries and automatically brings the generator up to speed. The generator, upon reaching full speed, develops its normal voltage and is ready for the fan load.

An automatic controller, provided on the auxiliary fan motor, gradually applies the power from the engine generator to the auxiliary motor. This controller is arranged to function as soon as the generator voltage is built up to normal. It is so designed that the resistance is cut out of the rotor circuit of the auxiliary motor in equal steps by a timing relay, and the starting resistor is so proportioned that the fan is accelerated to full speed without overloading the gasoline engine or causing it to slow down. The gasoline-engine generator set will then continue to operate the mine fan until normal conditions are restored on the regular power supply lines. Upon return of normal power, the master controller on the regular motor connects this motor to the regular power supply. At the same time the engine controller shuts down the gasoline-generator set. The fan is thus automatically put back into normal operation.

All electric control equipment was built by the Cutler-Hammer Co.

THE average time which elapses from the instant of a power failure until the emergency power is applied to the mine fan is approximately fifteen seconds. This is the time required for the gasoline engine to start and bring the generator to full speed, and for all control apparatus to function. This time is not sufficient to allow the mine fan to come to rest. Hence, the fan is kept in continuous operation during the period while the source of power is being changed. Actually, the fan falls off in speed about 25 per cent while the engine is getting started and consequently the mine ventilation is not interrupted.

It is interesting to note that at no time has the gasoline engine failed to start successfully. It is estimated that, at the present writing, the engine has been given, either on test or in actual service, approximately a



Duplicate Drives Are Provided

thousand starts under automatic control and starting has, in each case, been effected in less than fifteen seconds.

The engine was assembled at the factory with its control equipment and thoroughly tested for accurate starting before shipment. This was accomplished under the direction of T. R. Larkin, chief engineer of the Sterling Engine Co., who is responsible for the design of the engine. Mr. Larkin also worked out the various modifications of the engine necessary to adapt it to the automatic control system.

The equipment was placed in actual service on January 1, 1927. Since that time, the emergency equipment has gone into service on several occassions—most of them, however, for periods of short duration. The longest emergency run which the engine has been called upon to make was for a duration of approximately two hours. In each case the engine has responded promptly and kept the fan in operation until normal power was restored to the regular driving motor. During severe thunder storms the engine will frequently make several starts but be shut down almost immediately upon return of normal power.

The installation was made under the direction of Frank C. Nicholson, electrical engineer of the Lehigh & Wilkes-Barre Coal Co. In connection with the equipment, an interesting alarm and signal system has been installed by the coal company's electrical department whereby colliery officials are always informed as to whether the fan is under normal or emergency service.

AN alarm cable has been installed from the mine fan, which is approximately half a mile distant from the colliery offices, to an engine room where an attendant is always on duty and also to the office of the fire boss. At each location, an alarm is sounded at the instant a power failure from the normal source occurs on the mine fan. This alarm continues to sound until the gasoline engine starts and brings the fan back into full operation. If the fan should come to rest due to failure of any equipment an alarm will be given by this system.

Indicating and recording instruments also record the time and duration of a power failure, the time required for the emergency equipment to start, and the length of time the emergency equipment is in service on each emergency run. These records thus furnish an accurate check on all equipment and give the operating department full information as to the length of time required for the gasoline engine to respond to any emergency.

THE performance of this equipment is as perfect as possible due to its design and the thorough system of inspection which the coal company gives it. The complete fan equipment is inspected daily for normal operation. On these daily inspections particular attention is given to the regular driving equipment, its adjustment and lubrication. A weekly inspection is also made over both the regular driving equipment and the emergency apparatus. This inspection is made on Sunday when the colliery is idle. At such time all equipment is shut down for a sufficient period to allow a thorough inspection of the fan itself as well as the driving mechanisms. The gasoline engine is then placed in operation and required to start and operate the fan under the close observation of the inspector. Careful adjustment and proper operation of all equipment is thus maintained.

The control equipment on any gasoline engine may be arranged to start the engine upon failure of a regular source of power or by remote control from a manually-operated push button. This permits the use of many combinations of control to secure quick starting of a gasoline engine on almost any type of emergency drive.

COMPENSATION INSURANCE

Whither Trending?

By R. Dawson Hall
Engineering Editor, Coal Age
New York City

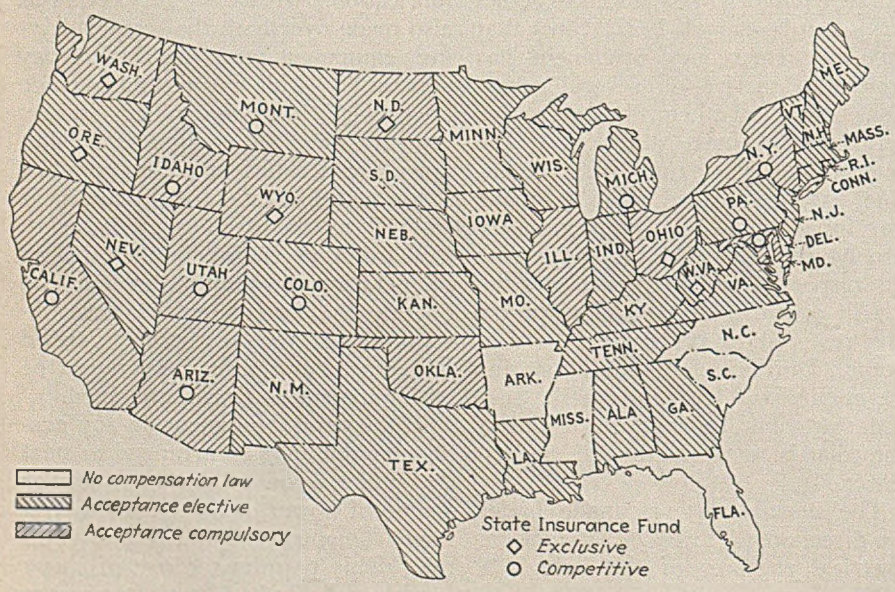
FIFTEEN years of competition between state-fund coal-mine workmen's compensation insurance and other forms of insurance by mutual, stock and reciprocal companies have not brought the rivalry between them to any final conclusion. Time alone will tell what the upshot of the present situation will be.

Most of the liability companies have doubted their power to make workmen's compensation pay under its industrial handicaps and drastic regulation, but still a few insurance companies are hopeful, and until they either despair or are successful the issue between governmental and private insurance will hang in the balance.

The insurance companies' position was well explained by John A. Arnold, general manager, The Associated Companies, Hartford, Conn., in August *Coal Age*. With all his statements regarding the difficulties of the insurance companies in obtaining suitable rates, it is hard, indeed, to find fault though some will greatly question whether the introduction of loading machinery into mines is increasing hazards. It may even be decreasing them.

HERE MAY BE ADDED a point that Mr. Arnold did not make. The insurance companies reluctantly feel that the coal companies which operate in states where coal mining is a predominant industry can, and do, occasionally bring, on the insurance commissioners of those states, so strong a pressure that the liability companies will never be able to get rates that will enable them to "break even" in the conduct of the insurance part of their business. However, in most, if not all, cases, the rate indicated by past experience has been eventually granted, but only after a heavy loss consequent on the long delay.

Furthermore, where the casualty ratio is going up, or wages are changing, a projection factor is needed to make rates fair, but how shall it be determined? The buyer of insurance will come to one conclusion and the seller to another.



Compensation Law Arrangements by States

The stock insurance companies have always desired to insure coal-mine workmen's compensation risks because, like good business men, they have not cared to see the state in any part of their business. There is always the possibility that the camel having put its nose through the canvas at some available opening will later follow with its whole body and upset the tent. The fact that the government during the World War insured the soldiers itself rather than through the liability companies is an evidence that the authorities of the state or nation may be called on at some time by their respective legislatures to assume the functions of liability companies. This the insurance companies would prevent, if possible, by providing satisfactory service for all desiring it, with a rate as low as they believe will justify itself.

FURTHERMORE, the liability companies feel that the public looks to them to supply protection against all insurable hazards and that they cannot continue in its good graces unless they do so. The public has been wrathful when the coal man failed to provide coal, when and where it was demanded. The insurance companies, like the coal men, are likely to be held blamable if they fail to supply workmen's compensation to those who desire it, even to those who make no real effort to deserve it. The coal operators might not be able to create a sentiment against the insurance companies for such a failure, but uninsured mine workers facing accidents without hope of compensation for themselves or their families might quite conceivably do so.

Another reason why the insurance companies have been willing to undertake all forms of workmen's compensation business has been because it puts funds in their hands for banking

purposes. Fire insurance, as a simonpure insurance venture, has been conducted at a loss, but the banking of the funds has put a silver lining on the cloud. It has doubtless helped also with coal-mining risks, but the losses have been so heavy as to overbalance the benefit.

INSURANCE, of course, like all human developments, is not without its drawbacks. When a property is insured, the owner naturally declares that if it is destroyed: "He should worry, let the insurance company attend to that." With regard to fire, the owner would have little incentive to protect and defend his property against loss if he were 100 per cent insured. Therefore, the coinsurance plan has been devised under which the insurer cannot protect himself against the full amount of the loss, but must expose himself to a part of the risk.

In fire insurance, the practice for many years has been to use a schedule rating based on the physical condition of the property, as for instance whether close or distant from another risk, whether the structure insured is lofty or low, whether the neighboring buildings are a hazard or fireproof, whether the insured property is built of relatively combustible or incombustible material, whether it is ill or well provided with facilities for fire extinguishment.

It was found advantageous to make these various ratings, for otherwise a man building a relatively safe building would find it best to carry his own risk rather than to pay a rate based on the greater risk of the average structure, or would place his insurance with a more discriminating company which, taking only the better risks, could give a better rate. Furthermore, it was only just that the safer risk should pay a lower percentage.

When workmen's compensation was introduced it was natural that a similar plan should be adopted. Out of that arose schedule rating which carefully designated reductions in rate for certain physical conditions. Going further, the Associated Companies made allowances in rate where the moral hazard was reduced, lowering the rate in cases where an organization was set up within the company for the promotion of safety, first aid and mine rescue.

It was hoped that this would rapidly cause coal companies to revise their methods of doing business, and indeed many made their mines conform to the standards which the rating books set. In Pennsylvania for a while the self-insured companies maintained lower fatality ratios than those which were insured, but after a while the schedule rating and inspection service brought the insured companies to a lower fatality ratio than the self-insured. Probably because they observed this, the self-insured made further efforts in some cases, instituting inspection for themselves and rating the mines in accordance with the schedule.

This inspection and rating is a fairly expensive operation. To many it has always seemed cheaper to insure without it, as is being done, for instance, in West Virginia, Wyoming and Ohio; but though 8 per cent may be added in the loading for that service, it is easy to earn that 8 and more per cent by increased safety and so wipe out this additional charge. The Associated Companies have for years held that mines should be inspected and rated because these provisions give a careful operator an advantage over a careless one and save lives.

> Insurance companies fear that if their rates are made uniform for all risks there will be no disposition to reduce hazards, so they have devised ratings based on physical conditions, on means adopted for awakening a safety spirit and on experience. Some of the state funds in order to save money have neglected this feature of tried insurance practice and have thus failed by their insurance to render aid to the cause of safety.

Inspection would be cheap, even if it should cost far more than it does. To the Associated Companies it has seemed that a state which does not have schedule rating or its equivalent is not saving money but wasting it and also the lives and limbs of its workmen. But with workmen's compensation insurance, humanity is a greater factor than with fire insurance and, in the case of coal mines, the deductions for safety provisions, in proportion to the whole expenditures of the company, are so much larger than in fire insurance that an effect on the economic policy of the insurer greater than that attained might have been anticipated.

One cannot fail to record that the insurance companies' spokesmen feel bitterly that the coal operators as a whole have not made a sufficient attempt to decrease their hazards, especially in certain states.

The insurance company practice now, outside of Pennsylvania, is to base ratings partly on the experience of each particular risk and partly on that of other mines in the same region. This has the advantage that the actual past accomplishments of the insurer are considered. A plant may be physically suited to safety and may have all the social framework that should assure a minimum of casualties, yet it may have none of the living and breathing spirt of safety, but instead an appalling disorganization that makes accidents frequent.

A visit to the mine may not reveal the actual conditions. So many of them are intangible that, in a tour of the working places and offices, they might easily be overlooked. Experience, however, rapidly and correctly evaluates the past, and from it the future may be surmised, though a new manager, superintendent or foreman may at any time change the record for better or worse. Because mines and minds do not run down overnight, but have a certain stability in the main, the use of experience to modify the base rate is likely to be an effective method of fitting the rate to the risk and decreasing accident frequency and severity.

BETWEEN these two methods of adjusting rates is one proposed by the Travelers Insurance Co. and favored by the United States Fidelity & Guaranty Co. This is based on physical conditions, some of which can be corrected by the operator and others that can be changed only by working in another place or in another seam. This plan, as modified on discussion, contemplates the segragation of all coal-mine risks into five or six groups, each group carrying a "modified base rate."

This segregation would be established by a physical inspection of each mine based on the conditions of (1) haulage, (2) roof, (3) timbering, specifying the condition of each item as good, average or bad. Specific credits and charges would be assigned to each of these three conditions, and the grouping into which the mine would fall would be determined by the algebraic addition of charges or credits.

However, discussion developed that, by reason of careful operation, some of the mines with bad roof had

been more fortunate in avoiding accidents than those that had a good roof, so the modified schedule as proposed reads: "The application of the modified base rate to any risk would, however, be contingent upon whether the actual loss ratio of the risk departed from normal in the same direction as the physical conditions departed from average physical conditions." With the provision, apparently the modified base rates must each rest on experience and not on physical condition where experience of reliable proportions is available.

THE National Convention of Insurance Commissioners, believing that measures should be taken to facilitate the covering of coal-mine risks for compensation insurance, appointed a special coal-mine committee which met on April 29 of this year and requested the Committee of Insurance Commissioners to circularize the insurance carriers to ascertain their views as to the program which the Coal Mine Committee proposed. Clarence W. Hobbs of the National Council on Compensation Insurance was requested to prepare a report which he submitted July 25.

The opinions expressed were that the present "expense loading" (overhead or spread) which is, in most cases, 34 per cent of the whole rate or 51.5 per cent of the pure premium rates was adequate, though the United States Fidelity & Guaranty Co., wanted an expense loading equal to 40½ per cent of the whole rate and a safety margin and minimum catastrophe loading of 15 cents.

THE ASSOCIATED COMPANIES, though not declaring that they would re-enter the field, suggested that the following conditions were desirable: (1) Assurance that supervising officials would grant adequate rates; (2) the use of a projection factor that would bring the rates to an appropriate level for the midpoint of the period during which the rates were to be in force; and (3) an adequate expense loading which the person who filled in the questionnaire thought should be 40 per cent. Any superfluity would not be in his opinion in excess of what might be reasonably permitted for profit.

The Continental Casualty Co. similarly indicated that the expense loading should be slightly larger than in the past three years as expenses had increased, that base rates should be established solely on the experience of those insuring in stock companies,

> The tendency is towards frequent revisions of workmen's compensation rates. One company changes them month by month and most of these companies seem to be of the opinion that rates should be revised twice a year so that any trends in accident frequency and severity, in wages, in regularity of employment, in morale, in the disposition of the compensated to abstain from work and in the decisions of compensation boards, may be reflected promptly in the rate.

that a projection factor should be used, and that experience rating should be eliminated or greatly modified. The United States Casualty Co. also wanted a safety margin and a suitable association of companies.

All the liability companies that replied seemed to be of one mind in favor of the promulgation of rates twice each year, thereby bringing the experience used in this rating down closer to the rating date. They also favored increasing the minimum premium to $150 and the rating of such risks as were too small to qualify for experience rating at a level of 20 per cent higher than the normal base rate.

In small mines accidents are more numerous, in proportion to the number of men employed, than in large mines, and the expense of insuring and inspecting such mines is greater. This accounts for the desire of the insurance companies that a minimum premium payment shall be established with a 20 per cent increase in rate for the smaller companies. It was stated in the questionnaire to the carriers that insurance companies, seeking establishment in general or in states in which they had not formerly operated, might find it necessary to ask more than a 34-per cent loading and might need a safety or contingency factor over and above that figure.

INSURANCE men recall that the commissioner was at first expected only to regulate rates upward so as to make them "adequate." The insurance companies advocated this provision, because they feared that fly-by-night companies would arise, as they frequently had in the past, in the life insurance business. These companies, in order to get the operator's money and speculate with it would offer insurance for an inadequate sum and would be unable to pay the compensation when accidents occurred. This was recognized as a possibility against which the state should guard itself. But if the state regulates upward, why not downward also? Why not require that the rate be "reasonable" as well as adequate?

So the words "and reasonable" were added. Unfortunately, the commissioners have set the rate absolutely and not between two limits, and the tendency has been to make it barely adequate. The purchasers of insurance have argued that this could not do any harm to any one in the state provided that the liability company was an outside corporation. Seeing that the company was writing many kinds of insurance in many states and had large reserves, there was no occasion to fear that it would fail to meet its obligations.

THE operators for their part viewed The Associated Companies as a big trust and were frankly skeptical of the reasons for its formation. Open and above board with good reasons for amalgamations, which were that unified operation made administration and inspection simpler and met the problem of the catastrophic hazard, it was nevertheless regarded as a malignant development.

When it put rates too low and found it necessary to raise them, as occurred in some cases, the clamor against the association was loud. The coal fields mentioned could not see why rates should be higher there than in other states. Every state believes it has a condition just a little better than any other.

Now that The Associated Companies are out of the field and in some states only one or two companies are writing, there is still much plausibility for assuming the existence of an oppressive monopoly, and it is difficult indeed to convince the operator that he should stand for high rates lest he have sooner or later to carry his own risk.

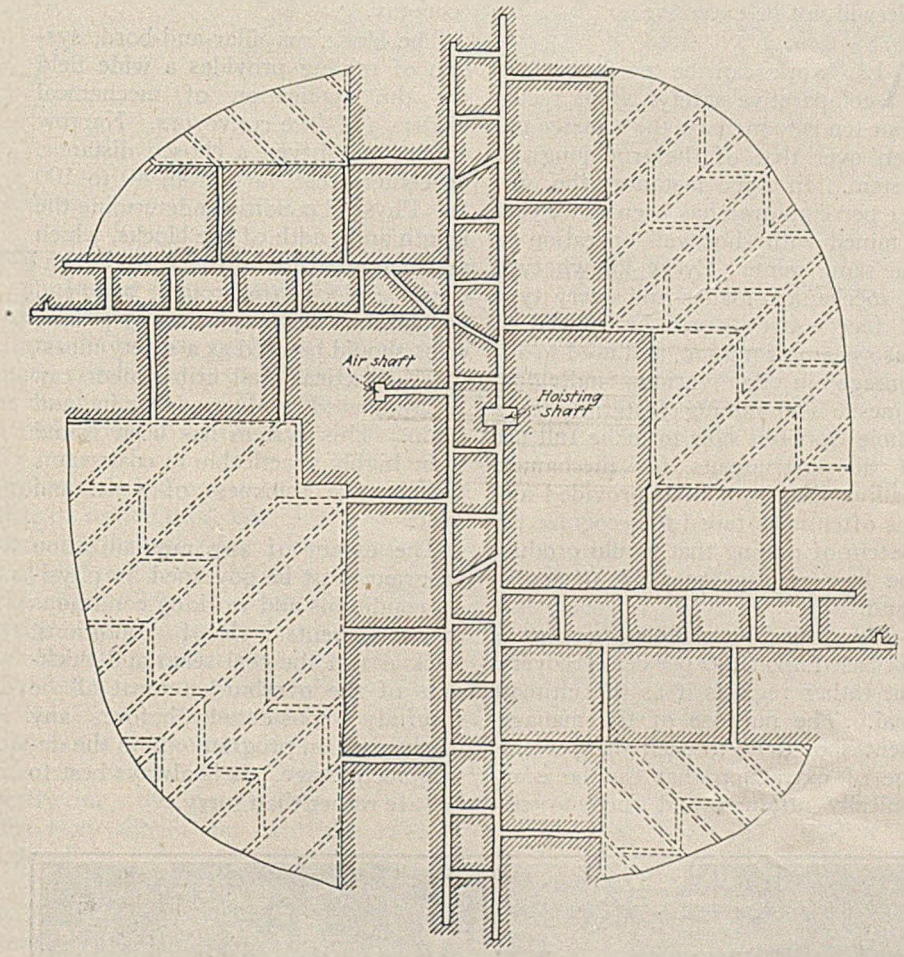
The stock insurance companies are picking and choosing. Some risks they refuse to take. Some states have required them to take all risks or none, but this either causes them to retire from the field or, if they have no rate set by a commissioner or rating bureau, and so can charge what they please, makes them demand an excessively high percentage on the payroll in order to take care of losses arising from the insurance of extra-hazardous risks.

Right Place for

LONGWALL

AS I SEE IT

By J. C. Abram
Superintendent and Mining Engineer
Hooversville, Pa.



This Is Real Longwall Advancing with Main Entries in Solid Coal

ONLY where the overburden is considerable, where the coal seam is thin, or where a longwall operation affords a product superior to that produced by shortwall, is the true longwall method of operation to be preferred. Wherever the coal lies deep and cars cannot be loaded at the face without lifting bottom or shooting top, longwall may be a necessity. It can be justified in other cases only when its introduction makes a large increase in the coarse coal and a similar decrease in fines.

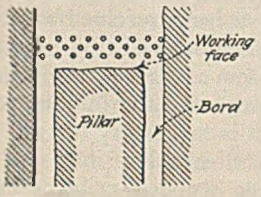
One hundred per cent recovery never has, and never will, suffice in itself to make longwall operation an economic success, the value of any method depending entirely upon the cost of production. The same is true of any system of mining. One hundred per cent recovery is excellent in theory and on it many engineers lay great stress, but what is it worth unless it will pay dividends? In some European countries, because of the thickness of the overburden, it is necessary to mine nearly all the coal as advancing longwall. The American operator naturally wonders why it will not suit his mines, but when he learns that each man employed produces only a small tonnage and at a correspondingly high cost, he loses all desire for this system of mining.

In recent years, of all longwall methods, those embodying a true retreat have been received most favorably in the mines of this country. As this system does not produce sufficient refuse for the building of pack walls, it is necessary to use timber chocks, cribs, collapsible steel props, collapsible wooden cribs, sand jacks and various other contrivances as a means of roof control. The operator will find that the timber cost for this system of mining will be a rude shock to his dreams. Timber costs of 30c. per ton and even more are not uncommon. This charge can be balanced only by an increased tonnage per man employed or by a large increase in the percentage of coarse coal. The best results in the latter case could be expected from a coal seam having unusually well-pronounced cleavage.

IN THE retreating-longwall system it is customary to use conveyors and to load them by hand. Because only a limited space can be kept open between the face and the nearest timber, it is rarely possible to load coal into conveyors by machinery. With a light cover and a good roof, an open space could be maintained of such size as would permit of a mechanical loader delivering coal to a conveyor, but conditions like these are not generally found. As practically all labor, therefore, must be performed by hand, the labor cost must be high. In some instances the coal has been dropped or shot down directly into the conveyor, thus saving some handling. But even in this case, much hand labor remains to be performed.

Up to the present time, the true

retreating-longwall system of mining has not been able to compete in face cost with shortwall. These facts will be borne out by all who have attempted to put this system into operation. True, some companies or individuals appear to have made a success, but they have kept their experiences as trade secrets. Such action cannot be too strongly condemned. All experiments along these lines should be the property of the mining fraternity. Seventy-five per cent of all of the true retreating-longwall operations that have been attempted during the past several years have been abandoned. It would be interesting to know why. The operator who will attempt to put into operation a retreating-longwall system in the face of these facts must possess a high degree of courage and have extreme confidence in the engineer or executive who proposes this system.



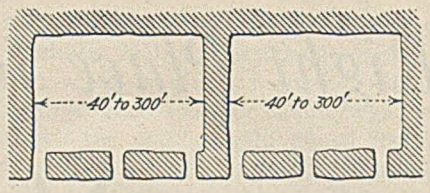
Some People Call This Longwall

As a high degree of concentration is demanded for the success of any mechanization program, the executive will find a fertile field for his efforts in long-face slabbing methods. The limits of width may vary from 40 ft. to 300 ft. dependent on the conditions at each individual mine.

Here will be found a system free from many of the inherent defects of the true longwall. With this method, if the thickness of the seam permit, mechanical loaders can be used in conjunction with face conveyors. Ample space can be maintained between the face and the nearest timbers without difficulty. Conveyors can readily be moved forward as a unit. The cost of timber and of maintaining the face when the mine is idle will not be excessive.

ALL work can be performed in comparative safety. This factor alone tends to increase the tonnage per man over that of the true longwall system. In some instances the output per employee has been twice that obtained with shortwall operation in the same mine. Every known type of mechanical loader and every type of face conveyor can be applied to this system of mining, and used to advantage in the various individual mines. The mining fraternity as a whole has been slow to make full use of the instruments for mechanical loading that have been provided and has oftentimes failed to recognize the system of mining that would produce the best results from the device at hand.

The long-face slabbing system is not based upon 100-per cent recovery, but rather regards it as the ultimate goal. The purpose of the management should be to seek the percentage of extraction that can be economically attained and then to rest



Slabbing Also Is Called Longwall

satisfied with that result. The executive must not press for a percentage of extraction beyond the bounds of economy.

The block, or pillar-and-bord, system of mining provides a wide field for the application of mechanical loaders and face conveyors. Narrow entries are driven a chosen distance, on centers that vary from 40 to 100 ft. Physical conditions determine the length and width of the blocks, which are then recovered on retreat. Whenever the blocks are brought back end on, without much splitting of pillars, cribs should be used as a safety measure. Practically all crib timber can be recovered and used again and again. This system has been found to be highly practicable in coal seams that have a thickness of 4 ft. and over.

The extent of any mechanization program must be governed by physical conditions and working conditions or agreements. Roof conditions, thickness of the coal seam and thickness of the overburden must all be carefully considered before any mechanization program enters the development stage. It is always best to be safe rather than sorry.

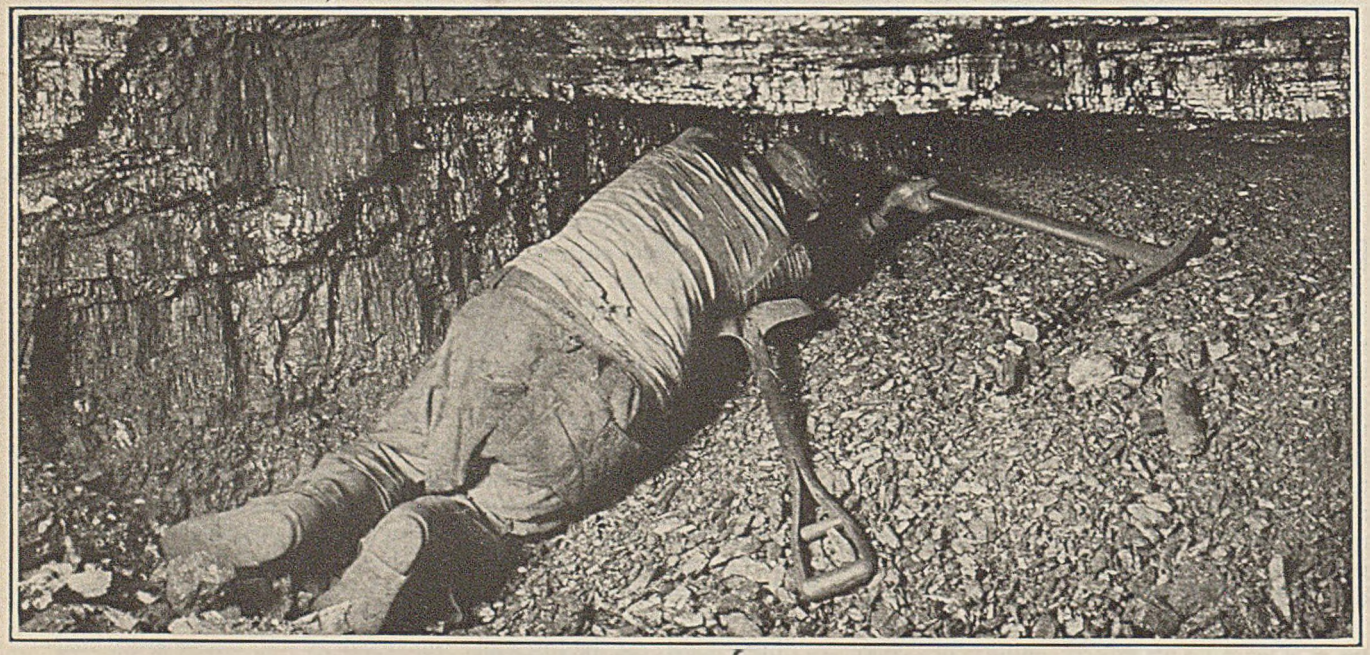


Photo by Ewing Galloway, N. Y. C.

Inching Ahead—The Tragedy of the Undercut, Before the Days of Mining Machines and Longwall

Can the BITUMINOUS INDUSTRY *Avoid Federal Regulation?*

By Mark M. Jones
Management Consultant
New York City

THE dire consequences of allowing the government to tinker with the bituminous industry have been expatiated upon by many persons in the industry as well as outside of it. There appears to be a willingness to admit that the industry presents a national economic problem second only in importance to that of agriculture, but little willingness to believe that the industry may be too sanguine as to its own capacity to solve the problem. The writer is sympathetic with those who aim to preserve the utmost in individual initiative, yet he believes that if the form of government co-operation could be constructive and permissive rather than limiting and restricting, the possibilities in that direction should be carefully considered.

The view that the subject should be studied with an open mind is based on the opinion: First, that what is necessary cannot legally be done by the operators alone under the laws in effect in 1927. Second, that it would take too long and cost too much for the industry alone to work out a program as to which mines it is in the public interest to operate, even if the selfish interests of powerful persons and groups could be held in restraint without legislation. Third, that to go about the stabilization of the industry in a way that promises anything worthy of the effort will require the industry itself to set up an organization that will tend to develop into a bureaucratic machine no less than one under government auspices. Fourth, the industry is not sufficiently in good standing either with the public or investors to secure complete relief from restrictive legislation now in effect or to feel assurance that it will be left free to deal with labor problems without interference on the part of national and state legislative and executive departments. Fifth, other important lines of industry have benefited from government co-operation as has the public in general.

Legal Obstacles

THE anti-trust laws and the miners' license laws of certain states are serious obstacles to the stablization of the bituminous industry. What is needed is a form of receivership for the entire industry, and the industry itself is deterred from taking steps to that end because of existing laws under which many necessary and proper acts might reasonably be construed as in restraint of trade. Restraint of trade in the coal business is precisely what is needed, and until something is done to bring it about, the industry will represent one of the sore spots in our economic structure. No manager in his right mind, however, is going to try to do something very much needed by the industry when he knows that the chances are about five to one that he will receive a jail sentence and a fine as a reward for his efforts.

As a nation we are once again confronted by the fact that conditions change. The conditions which created the need for the Sherman anti-trust law and the Clayton Act have changed sufficiently so that these acts need very careful revision. The facts of present-day experience are directly contrary to the underlying principle of laws based on the static theory of life. It should no longer be possible to pass general laws with the expectation that they would continue in effect indefinitely. One who studies the industrial world today is soon impressed by the growing need for a time limit on any plan or policy. The Sherman anti-trust law may have served a useful purpose at the time it was passed. Its chief usefulness, however, expired within a few years after its passage and, from the standpoint of the public, it has long been a liability rather than an asset. In the opinion of the writer, it is the cause of unconscionable waste in industry and requires the consumers of the country to pay higher prices for many of the things they buy than would be necessary if our national policy with respect to the regulation of group action could be revised progressively. By this I do not wish to be understood as advocating the elimination of laws such as those dealing with restraint of trade. My belief is that they should be revised so that they continue to operate in the public interest rather than against it.

ALL this is of importance from the standpoint of stabilization of the bituminous industry because it indicates at the very outset that the coal operators alone can do very little of importance without some form of governmental co-operation—even if they desire to do so. If there is to be co-operation to the extent of revising laws which now present obstacles to progress, why should one not proceed a little farther and give other desirable and needed assistance?

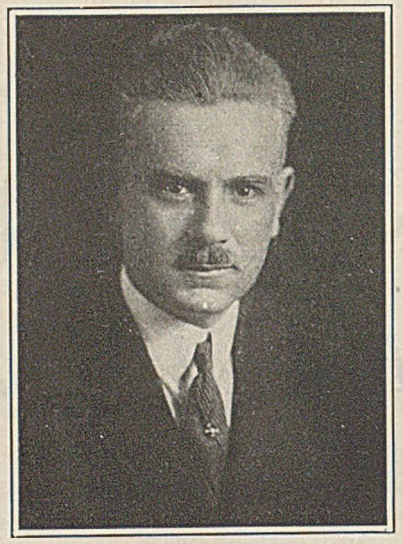
The second reason for believing that the operators might as well make up their minds to take the lead in arranging the most helpful form of

government co-operation to stabilize the industry, emerges from consideration of the task itself. There are no adequate statistics of consumption, there are too many management units and too many mines.

HOW can adequate statistics of consumption be secured economically as a basis for estimating demand and formulating satisfactory production programs without government co-operation? Assuming that there are no legal obstacles to collecting and maintaining such figures under private auspices, one needs but to consider the physical task of building up the information. If it were sought from the retailers, there would be so many that the cost would be prohibitive even if their co-operation could be enlisted; if sought from the producers of coal, there would be many who would fear that they were divulging secrets of their business and would refuse to co-operate even if they knew where their coal is finally consumed—and they often do not. If secured in what appears to be the most logical way, that is through the railroads, there is considerable doubt that the necessary information would be made available without legislation. The Interstate Commerce Commission would be the medium through which the information logically might be assembled. An appropriation for the expense in that conection would be necessary even though permission to do the work in the form of legislation should not be necessary and even though the railroads would be willing.

WHEN we come to the problem of reducing the number of mines and the number of management units the difficulties are even greater. Ordinarily, one might look upon the method of arranging for consolidations as the one to effect the necessary integration of control and thus make possible a reduction in the number of autonomous management units. The futility of anything of this kind will be evident to one who undertakes the necessary studies with that end in view. The cost of attaining the end would be so much greater on that basis as to make it extremely difficult, if not entirely impossible, to finance such a course of action. One but needs to try to formulate a consolidation plan to realize the futility of this method alone.

But if we assume that the necessary degree of control can be exerted on a financial basis through the consolidation of ownership of



Mark M. Jones

producing properties, we still have the question as to what to do in those cases where someone desires to open a new mine. Certainly the industry itself will find it difficult to prevent the opening of new mines without legislation to permit it to do so. Once it has permission, however, it will be confronted by an equally serious problem when it attempts to determine in an equitable way when mines should be opened and when they should not. Certainly operators interested in established concerns will have difficulty in being impartial when it is proposed to open a new mine even though the new property might well be opened. Then one must consider how to deal with the investment in developed mines that are closed down and with that in undeveloped coal lands.

These but suggest a few of the important questions that are involved in the problem of stabilizing the bituminous industry and, while one should not say that the industry cannot work out the problem alone if given sufficient time, it does not seem to the writer that it is in the public interest or that the public patience will hold out for the hundred years or more that would be necessary if such a policy were adhered to.

The Bureaucracy Bugaboo

MANY have cited the dangers in enlargement of the federal bureaucracy in Washington, as might be the case if the dominion of bituminous coal were added to the industrial empire subject to varying degrees of federal supervision. The writer has much sympathy with this point of view and, as a student of organization and management, thinks it of more than ordinary importance that the autonomy of the industrial executive be limited as little and as intelligently as possible. Experience with the income tax authorities and the Interstate Commerce Commission appears to have caused many to prefer almost anything to further extension of federal supervisory powers.

THE main need is to consider just what it is that we object to in a bureaucratic organization. Is it not the bureaucratic attitude? Does this not consist of a lack of open-mindedness, a self-centered endeavor to protect the job of the bureaucrat, an unwillingness to place a constructive interpretation on regulations which may be construed to control a given situation although not intended for that purpose, an unwillingness to co-operate in revising regulations to meet changes in conditions, a willingness to "pass the buck" to others and indefinitely extend litigation and discussion, and a general lack of interest in the progress of a business or in progress toward the solution of an important economic problem? If it is these things to which we object in what we term a bureaucracy, are they peculiar to governmental organizations alone? Will they not be found in every large organization in varying degrees? Are they not usually the result of adhering too long to what we might term a static economy and too much delay in adopting a progress economy?

Is it not a fact that we have far worse bureaucratic situations in large businesses than we have in the government? In business, control is often continued because of ownership and the factor of fitness may be entirely disregarded. To effect a change under such circumstances is but little short of impossible in case those who are both owners and managers do not wish to sell their holdings. In a governmental situation it is difficult enough to effect a change when civil service is involved but as a rule it is not necessary to exert influence on persons far enough down the line in the machine so that the civil service obstacle is an important factor. Therefore, it is far easier to effect a change of personnel in a federal organization, especially so far as the important and controlling personnel is concerned, than it is to effect a change in the controlling personnel of a large corporation. Of course this bureaucracy bugaboo takes on less importance when we apply our minds to the question as to just what might be

done by the federal organization that might be created and how its controlling personnel might be made up.

WHILE the writer does not profess to have thought the question through, he believes that any one of several possible answers to it will indicate that a governmental agency can best function in the bituminous situation in ways which require the exercise of little further control than that necessary to secure answers to questions and information requested, to call meetings, to formulate programs and rely upon publicity. While something more would be necessary to control the opening of new mines, so much can be done before the factor of control becomes important that to delay longer an attempt to formulate a constructive program of co-operation on that account seems entirely unwarranted.

Of course if the problem of reconstruction were approached on a receivership basis, any machinery set up might well be created but for a limited period such as five years. A relatively temporary organization of this sort need not be made subject to civil service even in its junior personnel. The leaders would naturally be men selected from the industry itself and other important lines of industry in the United States. The plan thus might become that of the industry itself carried out by representatives and friends of the industry but, within limits, having government sanction.

Removing Restrictions

IT SEEMS clear that the industry is not sufficiently in good standing, either with the public or other industries, to expect the necessary relief from restrictive legislation now in effect or to proceed with assurance that it may expect to deal with labor problems without interference from persons in national and state legislative and executive departments.

More than ten years' time has been lost on an unsound labor policy for the bituminous industry and no small part of the responsibility for this can be placed on the doorstep of various leaders in legislative and executive departments of the federal and state governments. In saying this I specifically except the Jacksonville agreement as I do not feel that I am in possession of sufficient information to enable me to reach a conclusion as to the responsibility in that particular case. There have been many instances otherwise, however, all of which have tended to so cloud understanding of the bituminous problem that its labor aspect has been emphasized out of all proportion to its importance.

The bituminous industry is confronted by the need for a fundamental reorganization that will effect a transition from the methods of the handicraft system to the methods of the factory system. The industry already lags far behind other leading industries in this respect. To consider at this late date that it is possible to do the necessary through private initiative and without government sanction, appears to the writer to fail to appraise the economic ignorance of the public. There are still many who believe that free competition is so important that it should be the policy of the government to enforce it. Those who have studied the situation have long since observed that free competition is not in the public interest any more than the opposite extreme of complete monopoly. A new synthesis is highly important in order that serious obstacles now in the way may be removed, that new measures of constructive nature may receive official sanction, and that those reluctant to take necessary steps may be encouraged to do so. Certainly, one who reviews the record of the bituminous industry for the last ten or fifteen years is not going to be very enthusiastic about giving any of the parties immediately interested the necessary leeway to work out the problem by themselves alone even if it were at all practicable to secure the necessary co-operation within the industry to do so.

> Because bituminous coal is the largest single source of power for our industrial system, the industry most certainly is "affected with a public interest." This is true to a degree that is not true in the case of others except possibly agriculture, the railroads, and finance. These are the Big Four of our industrial system and two are in a bad way for want of a plan. It is high time that the enormous cost of doing without a constructive program for the bituminous industry be saved. If someone can show how it can be done without federal co-operation let him step forward at once. If not, let us stop temporizing.

If the co-operation of the federal government with those interested in stabilizing the bituminous industry can be approached on a temporary basis, the writer believes that the advantages might far outweigh the disadvantages. He is encouraged in this belief by the results secured through the Federal Reserve system which started on a temporary basis, by the case of the railroads even though they have had serious ups and downs, by consideration of the needs of agriculture and of the oil industry, in both of which producing capacity now exceeds demand. Such maladjustments may be continued or be accentuated unless a new and more constructive policy of federal co-operation with these more basic lines of industry is devised and adopted.

ONE needs but to consider the part played by the Federal Reserve system in stabilizing the price level and leading us through a period of declining prices without violent shocks, in practically eliminating the old time "runs" on banks, and in organizing basic economic information, not to mention its other achievements, to have his appetite whetted for machinery that might exert a similar stabilizing effect on the bituminous industry. The great progress and accomplishments of the Federal Reserve system are yet too little appreciated and, while it is a comparatively young organization, the method by which it was created is such that it is not entirely a federal department although it operates with full federal sanction. It is true that it can exercise control in a very important way but it is also possible for all those interested to secure consideration. One should not overlook the importance of the Federal Reserve system being so managed as to enable it to retain the confidence of the public and the financial interest of the country if it is to continue. Certainly the eminent gentlemen on the board will not jeopardize either their personal reputations or their positions (and their positions may not be a factor of much importance to most of them) by allowing the development of very much by way of a bureaucratic attitude. To the bystander there appear to be indications that some inertia is creeping into the Federal Reserve organization. But that it has proceeded far enough to be serious is not evident. That anything of the kind might have an important bearing on a project involving an organization of temporary nature for the bituminous industry,

even though its life might be as long as from five to ten years, is of course very doubtful.

THE Interstate Commerce Commission serves as an older but somewhat less satisfactory example of federal supervision. While there are individuals on the present Commission of ability and high intellectual capacity, many persons outside of Washington think that never since its powers were enlarged has the Commission as a group appeared at such a disadvantage. If we grant that there may be something in the general concern regarding the effectiveness of this body, and if we also grant that it is no longer necessary that the Commission exercise the number, kind and variety of powers with which it has been vested by law from time to time, the writer would still prefer that it continue rather than allow complete autonomy to the railroads. I say this after having spent a good many years in the railroad business and having chafed under the restrictions of the Commission.

Even though to many it appears that the Commission is lost in a maze of superficial details today, this does not seem a justification for delay in working out a program for government co-operation in stabilizing the bituminous industry. The bituminous problem is very much different than the railroad problem and an agency created by the government to deal with the bituminous situation might well be looked upon as temporary in nature and for the purpose of doing very much the same thing that is expected of a federal court when it supervises a receivership of one corporation, viz., see that a new program is formed, that the investment in it is protected to the maximum possible degree and that the new program devised is made effective. There need be no such delegation of powers to a bituminous board as have been delegated to the Interstate Commerce Commission and it should not be launched with a life expectancy as long as that of the Commission.

IF AFTER a five or ten-year period, it seems that the federal bituminous board should continue, a new program can then be made in the light of progress and of conditions prevailing as the end of the period approaches. As a matter of general policy it seems necessary for us to recognize that changes in our economic system are inevitable and that they may be expected to come so fast that we must limit the charter of an agency, such as the Interstate Commerce Commission, by providing that its life automatically come to an end within ten years unless an entirely new program for dealing with the problem is adopted. I should not consider this desirable in the case of the Federal Reserve system.

IF, IN considering the problem of the relation of the federal government to the bituminous industry, we also consider the plight of two other important industries the necessity of planning for some form of federal co-operation is again emphasized. While great care must be exercised as to the form it takes, it seems clear that very little can be done immediately to improve the agricultural situation without some form of federal assistance. In many respects the problem of agriculture and that of the bituminous industry are parallel. The oil industry is at the point where it is confronted by problems very much the same as those which confront the bituminous industry. When we consider the practices of so-called big business during the past twenty years, the public attitude in regard to so-called trusts, the existence of legislation such as the Sherman anti-trust law, the nature of the problem now confronting these industries, the fact that restraint of trade is an absolute necessity at this time and will continue to be for some time and will be decidedly in the public interest, it seems clear that we can not expect them to go far enough alone to warrant ignoring the importance of devising a new federal policy under which federal co-operation can be secured without so many of the disadvantages that have accompanied it in the past.

Cost of Delay

THE time element in this whole situation emphasizes the importance of putting aside prejudices and opening our minds even though the proposals advanced do not offer exactly the remedy that we as individuals would like to make effective. More than five billion dollars is invested in the bituminous industry and we are confronted by the fact that coal securities generally are now looked upon as a speculation and not an investment. We must also consider that the longer the delay the greater the possibility of the particular coal property in which we are individually interested going through a receivership by itself alone with not only a large financial loss but the actual destruction of capital.

Many do not seem to realize the unsettling effect upon the industry of receiverships and reorganizations. If, for example, we take a coal company that disinterested parties would consider worth fifteen million dollars and assume that it has outstanding bonds of five million dollars, the result of a receivership may be partially made clear. Under conditions in the summer of 1927 it might be possible to buy in a fifteen million dollar property for not much more than a million dollars. One needs but to consider the effect of this upon the persons who had money in the property, the effect upon the industry and the benefit to the public.

WHEN reorganized, the property is able to proceed with capital charges against operations that are so much lower than those of long-established competitors that it is not even in the same class.

The investor must either put in more money or lose his investment, the industry must adjust itself to a new factor in which the costs, at least temporarily, are lower than those in well-managed companies because of the elimination or reduction of financial charges, the consumer does not derive any early or perceptable price advantage from small and isolated reorganizations and the consumers and public are harmed by the unsettling effect upon our economic structure generally.

IN CONCLUDING I should make clear the view that, if federal co-operation is considered, its form would be the important thing. It does not seem to me that the problem is one that confronts the bituminous industry alone. Our economic situation at present and in prospect is such that we must devise a new national policy for dealing with these matters and, while separate legislation may be necessary in the case of each important industry dealt with, the same fundamental principles must control. These principles should be determined upon as soon as possible and should be made effective in the case of the bituminous industry at the earliest possible date. It is now clear that when a whole industry becomes unsettled the problem is not one which concerns the one industry by itself. Other industries and the general public are vitally concerned and increasingly so as co-ordination within each industry proceeds.

A Chemical Engineer Looks on Coal

By R. S. McBride
Assistant Editor, Chemical and Metallurgical Engineering
Washington, D. C.

BITUMINOUS COAL is the food of industry, without which industry would die. Obviously the use of coal directly for the raising of steam is of fundamental importance, but to restrict consideration to this use would be to take a narrow view of the job that confronts the bituminous-coal industry. Though about two-thirds of the coal requirement is absorbed in steam-raising that is no reason why the other third as a raw material of industry should be ignored.

In this latter capacity coal serves as the basis for the manufacture of special or refined fuels. Measured by tonnage, coke would appear to be the leading product. Measured, however, by their direct value to the public, coal gas, water gas and producer gas are of greater practical importance. In the form of powdered fuel, coal is as much a raw material for cement manufacture as the clay or other constituents which go into the cement clinker. Coal also is being used as a source of carbon or hydrogen compounds that are important commodities in the chemical trades and in these cases coal is truly a raw material entering into the process.

Though the carbonization of coal and the formation of the many products into which coal can be converted, or into the making of which the byproducts of coal enter, are in the main desirable, it is neither helpful nor interesting to theorize upon what are simply visionary impossibilities. At the outset, therefore, warning should be sounded against any fantastic or theoretical presumption that all bituminous coal should be carbonized before it is burned.

Even if by rubbing some Aladdin's lamp we could create sufficient coke-oven capacity to carbonize all the bituminous coal mined, it would be absurd to consider such an extreme measure seriously. In the first place, the products of coking are wholly unsuited to many purposes quite as vital as those which are well served by coke or byproducts. Furthermore, no market exists which could possibly absorb all the byproducts that would result.

The major limitation upon carbonization is the maintenance of balanced and equivalent markets for all the products of coking. An unlimited market for gas is not enough; we must also be able to sell, and at a profit, all the other products that are made. We cannot make any one of these without making several of the others, unless we take so radical a step backward as to consider making only coke, as in the beehive oven; and no right-minded person would recommend that.

If coal is powdered and then burned in a properly designed steam boiler, approximately 88 to 90 per cent of the energy in the original coal is available in the steam produced. When coal is crushed and then coked, even in the most efficient of modern coke ovens, only about 85 per cent of the heat originally in the coal is available as fuel in the combined output of gas, tar, light oil and coke. In other words, our engineers have given us a more efficient mechanical device in the powdered-coal steam boiler than has yet been developed for the carbonization of coal. Moreover, if one takes the products of coal carbonization and uses them for firing a boiler he cannot get as high efficiency from the coke, which is the principal fuel so made, as it is possible to realize from powdered coal or powdered semi-coke. It is obvious, therefore, that if we are seeking the highest heating efficiency we should burn powdered coal and not coke under our boilers.

There are today, and will be in the future perhaps, instances where the carbonization of coal and the use of semi-coke or coke for boiler firing constitute sound engineering practice. But those engineers and leaders of public thought who have argued in favor of wide-spread use of coke for boiler firing have apparently ignored the most important and the most convincing argument against such practice, namely, that coal so used gives much lower over-all efficiency than coal which is burned in the powdered form.

MANY OF the ardent advocates of coal carbonization on a broad scale have urged the national importance of greater supplies of liquid fuel made from coal, of city gas and of ammonium sulphate for fertilizer use. These individuals have called all burning of raw coal a waste. They have insisted that these products and byproducts "must be conserved." As material conservationists, perhaps they have the semblance of justification for their argument. But no one can

The Future of Coal

Coal is usually considered only as a crude fuel. Actually it is also a vital raw material of industry, a source of refined fuels and a wonderful storehouse of a great variety of chemical supplies. A full realization of the public-service value of coal requires an occasional return to the fundamentals and a new viewing of the whole situation in its right perspective. In this series of two articles such a presentation has been attempted.

afford to waste capital investment or to waste labor simply for so-called "conservation" of a natural resource. It is just as important to conserve our limited human effort and capital as it is to save the most important of our mineral resources.

Coal can be prepared for the boiler in pulverized form for less than $1 per ton with only a small investment of money and human effort. To take the same coal and carbonize it and then to prepare the coke for the boiler necessitates a tremendous investment for ovens and byproduct apparatus. Moreover, the man-days of effort expended for each million tons of coal thus processed is much greater than is required for pulverization of coal to be used in the powdered form.

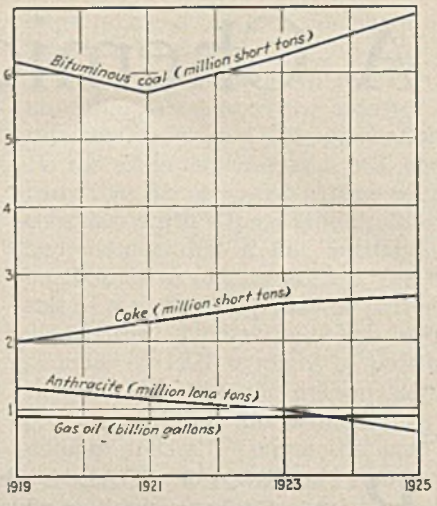
ALMOST any coal can be crushed to a suitable fineness for powdered-coal firing. This is in striking contrast with the fact that only a part of the coal available can be profitably carbonized. Any bituminous coal can be treated in the oven with the evolution of gas, tar and ammonia to form a residual product relatively low in volatile matter. But the yield of the important byproducts vary widely and the character of the remaining solid material (one dare not call all varieties of it "coke") extends over the entire range from a dry granular substance, wholly uncemented, to the hard blocky fragments, each bigger than one's head, that would be obtained if low-volatile coals of the Pocahontas type were coked without admixture.

One might, from this criticism of coal carbonization, infer that we need not expect any further advance in that field. Quite the contrary. The great opportunity of the future for the coal industry lies in a sound development of coking practice. This preliminary criticism has been advanced to guard against an unwarranted and extravagant advocacy of the making of coke, gas, and other products from bituminous coal without any regard for the economic considerations that should govern in each instance.

One of the most important fuel supplies in populous communities is city gas. Every year, approximately 1,000,000,000,000 cu.ft. of gas are supplied to cities by public utilities. Two-thirds of this is natural gas. Two-thirds of the remainder is either oil gas or carbureted water gas made with the use of oil. Only about 12 per cent is made from bituminous coal alone, either in coke ovens or in coal gas establishments.

It is true that this is only a temporary condition. The coal industry can safely look forward to the time when substantially all the city gas supplies will be made from bituminous coal. It is important for the coal industry to determine how soon this replacement of oil by coal can be accomplished and what business possibilities the substitution will afford. There is nothing inherently different in coal gas, oil gas, or water gas to make one preferable to another from the standpoint of the user. The gas consumer is, therefore, concerned with coal and oil as competing gas-making materials only as they affect the cost to him of the finished product.

WATER GAS can be made from bituminous coal alone, but under present conditions is not so made because the heating value of water gas is too low for practical distribution in cities unless carbureted, that is, enriched by an oil gas simultaneously made. It is possible to use much less oil in carbureting gas than

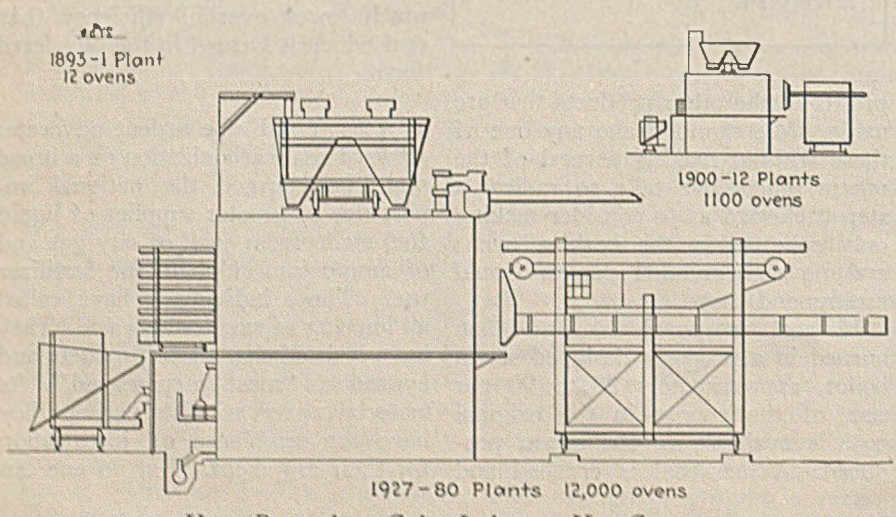


Fuels Used by the City Gas Works. Data from U. S. Census Bureau

is now commonly employed without producing a product that is objectionable to the householder or the industrial user, but such gas is leaner and less valuable per cubic foot in proportion to the decrease in its heating value.

It is not possible altogether to eliminate the use of oil, as the resulting product would be a "blue" water gas, commonly called "blue gas" because the flame is blue and non-luminous. Such blue gas has only about half as much heat value per cubic foot as can be obtained from the city gas now made. It requires also correspondingly larger distribution mains to convey it to the customer. Moreover, the blue gas made in this extreme fashion, entirely without oil, cannot conveniently be burned in the ordinary household cook stove, water heater, or other device, unless the burners are entirely reconstructed. Hence uncarbureted gas is not acceptable in a city public-utility system and the question at once arises, therefore, what will happen when oil for this purpose becomes more and more expensive. It is none too soon for the coal man as well as the gas man to begin to consider that possibility, the reasons for it and the consequences.

IN 1925 approximately 35 per cent of the crude oil which was distilled came from the refinery as gasoline; ten years ago only 15 per cent was obtained. Thirty-five per cent, however, is far from the upper limit which can be reached. Some refineries seem able to get 60 or 65 per cent by using the most advanced cracking methods. From the remainder of the crude oil, small percentages are available as kerosene, as coke, and as

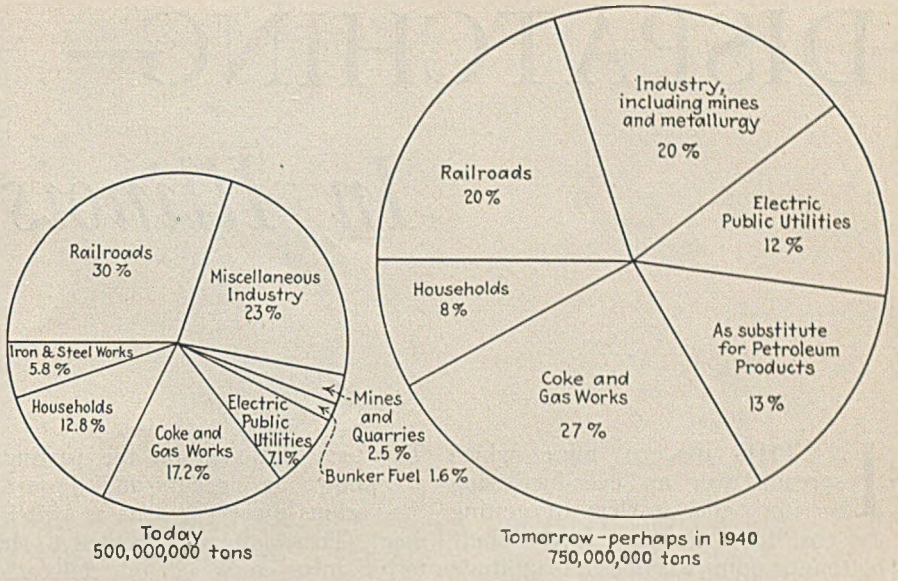


How Byproduct Coke Industry Has Grown

still gases. The rest is a heavy fuel oil which is virtually useless for either city gas or gasoline manufacture. None of the product is gas oil.

When a large percentage of our refineries get on such an operating basis, no longer will a sufficient quantity of gas oil be produced. As a matter of fact today, in any refinery equipped with modern cracking stills, the gas oil with which water gas can be carbureted is really worth more to the refiner for gasoline making than it can possibly be worth to the gas man who can also fall back on bituminous coal.

When gas oil becomes unavailable for gas making what will be the situation? The gas man will find himself confronted with one of two decisions: First, the making of uncarbureted water gas, which is not satisfactory for city supply; or second, a radical change to coal gas. That will be the great opportunity for the bituminous coal industry.



Who Uses Bituminous Coal

THE substitution of coal gas for water gas for the base load of the utility company is logical. Technical difficulties in the way of such substitution have been practically eliminated. It is time, therefore, to inquire what are the real or economic limits upon progress in this direction. Apparently there are three important ones:

(1) Lack of adequate capital; (2) limited coke markets; (3) limitations inherent in the present scheme for regulating public utilities.

Naturally any establishment, such as a gas works, which is operating satisfactorily and with a reasonable return on its investment, hesitates before discarding its present equipment and installing new plant facilities. The management has no desire to assume responsibility for a large new capital investment until it is really needed; and capital is properly timid about entering upon such investments until their importance and safety are both clearly demonstrated.

With the passing of the technical difficulties and the increase in confidence given public-utility investments, it now appears that ample capital will be available for these changes. It remains only for each individual locality to be convinced of the need for a coal gas oven-system to insure that the money will be promptly forthcoming for its erection. Any well-managed utility, whether local, or subsidiary to a holding company, can raise funds for such a project as soon as the time for changing its manufacturing system is deemed right.

The second limitation, that is, limited coke market, has not yet been adequately overcome. Such oven coal gas scheme, even where considerable blue water gas is made to supplement the oven gas, is likely to afford from a third to a half a ton of coke suitable for household fuel from each ton of coal carbonized. This quantity can be reduced somewhat by increasing the year around send-out of water gas in the mixture with the oven gas; but for stability of operation there must be a regular coke market, either local, among the householders, or in industries within short rail haul.

THE THIRD great limitation upon progress in substitution of coal gas for water gas indicated above is the inherent difficulty arising from our present system of public-utility regulation. The present scheme works out somewhat as follows. The cost of making gas is figured as the total expenditure for coal, for labor, and other materials, to give the "gross holder cost." From this is subtracted the total income from all the byproducts and coke sold. The result, in dollars per year, is divided by the total quantity of gas made to get the figure "net holder cost," expressed in cents per thousand cubic feet. This net holder cost is then taken as a starting point to figure what the customer should be charged for gas.

Obviously such a system of cost accounting means that all the profits from the sale of tar, light oil, ammonium sulphate, and coke simply reduce the apparent cost of gas. As a matter of fact, the establishment making a variety of products, like gas, coke, tar, ammonium sulphate, and light oil, is a factory and not really a public utility. It is allowing the tail to wag the dog to permit the gas price to dominate all others and to absorb all the profits from the other departments of the business. It would be almost as sensible for Henry Ford to charge $500 for a steering wheel and throw in the rest of the machine.

So long as our present system of utility regulation continues (and it seems the best that modern law and economic study can evolve) we shall have inherent difficulties in managing, under public-utility ownership, multiproduct factories, such as coal gas oven plants. This does not mean that many public-utility companies will not establish such works; but the greatest progress will probably come only when the manufacturing part of the business is detached and run as a chemical engineering plant, with its numerous products each bearing a fair share of expense and each returning to the owner the fair share of the capital profit expected.

ALL THREE of these major economic limitations can be met if there be joint effort among the interested elements in the fuel industries of the country. A definite proposal of the lines along which such effort should be directed will be presented in another article. The opportunity afforded to the bituminous coal industry is great and in a large measure the response to this opportunity made by the coal man will determine the extent to which his interest will be maintained in the future in the processing of coal and the distribution of processed fuels.

DISPATCHING—

In Illinois

By Frank H. Kneeland
Associate Editor, Coal Age
New York City

IN THE modern mine which spreads over an ever-increasing territory the problem of getting the coal from the face to the shaft bottom or dump assumes a magnitude that is roughly proportional to the area of operations covered. In not a few instances underground transportation represents the neck of the production bottle and unless it is carefully and scientifically handled may become the limiting factor positively fixing the size of the output.

The manner in which the various mines have "tackled" and solved this problem varies widely in detail yet the general plan adopted by most operations in a given region may be the same. Thus, many of the big coal producers of southern Illinois have borrowed, to a certain degree, the practices of the railroads. Many of the dispatching systems employed in this field bear strong resemblance to each other although, of course, differing in detail. Zeigler No. 1 mine is one of the oldest and most extensive operations in this territory and its dispatching system will serve as a typical example of those employed throughout the region in which it is located.

In this mine all loaded and empty trips are dispatched by telephone. The dispatcher's office is located near the rotary dump at a point where the grade of the loaded track is so steep that the cars require chocking. Every parting and important road intersection is provided with a telephone. The men stationed on the partings are known as blockers and those at the various junction points as switchmen. These latter correspond to the tower men employed on railroads. Signal lights are installed at each intersection and the switchmen in addition to handling the switches and signals at these points are charged with the care of the various substations located in their vicinity which feed direct current to the various sections of the workings.

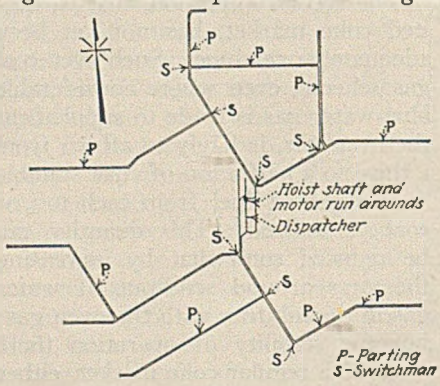
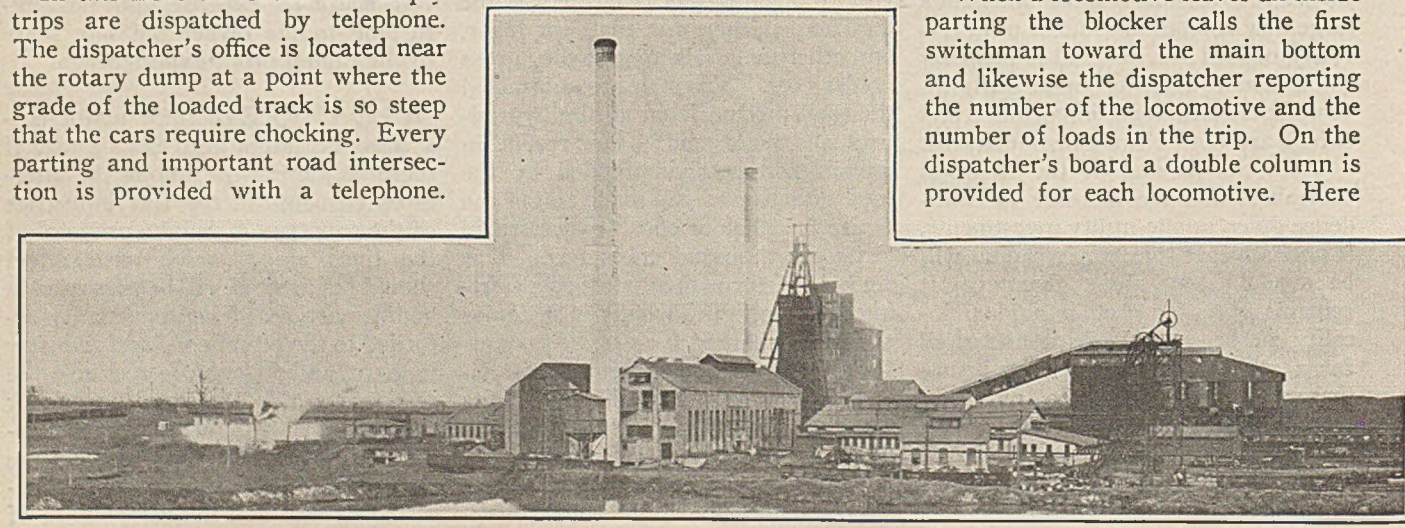


Diagram of Haulage in Zeigler No. 1 Mine

During last March the average daily output handled by this mine was 8,576 tons and the average number of cars dumped was 2,113. The average length of haul from all partings is about 6,500 ft., the longest main haul being 8,200 ft. The average distance from the partings to the faces is approximately 2,000 ft. The mine is equipped with about 820 cars, of which number approximately 30 are continuously out of service for repairs or other causes. From the above figures it will be seen that the average daily turn of each car amounts to almost 2.7 trips per day. At most mines, irrespective of the average length of haul, this would be considered good car duty. The maximum duty during March of 1927 amounted to over 2.8 loadings per day.

Practically all of the headings in this mine are single tracked. A general plan of the main haulage system is shown in the accompanying illustration. The longest trips come from the south side of the mine and consist of about 35 cars each. From the north side trips of approximately 20 cars each are the longest. Nine partings are now maintained in this mine and six main-line locomotives are in use.

When a locomotive leaves an inside parting the blocker calls the first switchman toward the main bottom and likewise the dispatcher reporting the number of the locomotive and the number of loads in the trip. On the dispatcher's board a double column is provided for each locomotive. Here



Panoramic View of Top

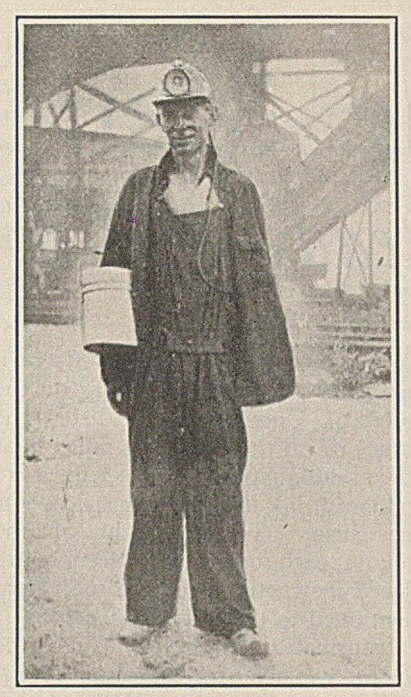
the time of its departure and the number of cars it is hauling are chalked up. If a motor pulls from more than one parting provision is made on the board so that trips from each sidetrack served may be recorded separately.

AS HAS been stated the switchman inby from the parting is notified of a trip's departure at the same time as the dispatcher. If he can give the trip the right of way he does so by throwing on a green light. He also calls the switchman next inby from him stating that locomotive number so-and-so is coming with so many loads. This process is repeated until the last switchman reports the trip to the dispatcher.

The dispatcher knows closely the time required for each locomotive to traverse the distance from the parting to the main bottom. If for any reason it does not arrive on time he successively calls the switchman inby along its course until he locates the trip and its difficulty. If this is serious he can isolate the section of the mine affected and shunt empties to other parts of the operation. In the past, because of this ability, some quite serious accidents affecting the haulage have not greatly reduced the output of the mine as a whole.

When the switchman nearest to the bottom gets word that a trip is coming he not only reports this fact to the dispatcher but also to the trip maker who proceeds to make up a trip containing the same number of empties as the full trip has loads, unless the main dispatcher directs otherwise. In any case a trip of empties is ready for the locomotive to couple onto as soon as it has dropped its loads. By this means the haulage motor loses no time in getting away from the main bottom. The process of dispatching empties back to any parting is naturally just the reverse of bringing loads out.

At Zeigler No. 1 mine the main dispatcher is a man by the name of Anthony Reedy. He is a member of



"Flat"

the miner's union and about the busiest individual underground. Some years ago he lost one leg and now wears a wooden one in its stead. To everyone in and about the workings, therefore he is known as "Flat," this nickname being short for "Flat Wheel."

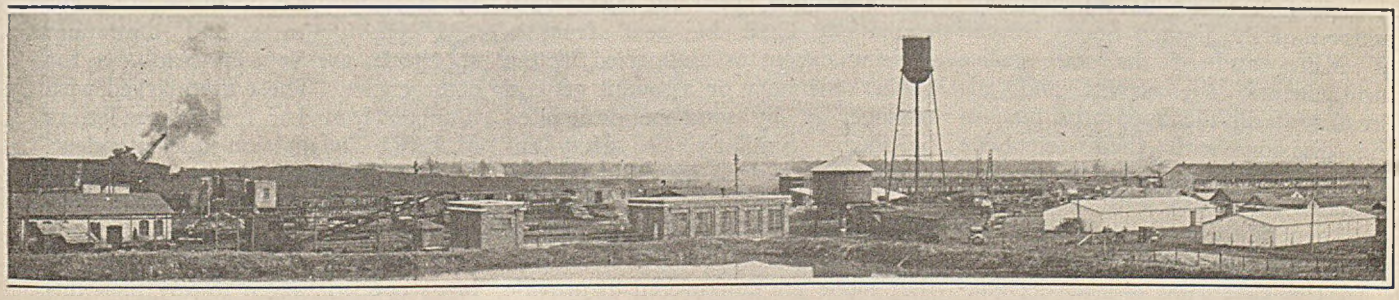
"FLAT" Reedy is the nerve center of Zeigler No. 1. Approximately 45 telephones are installed above and below ground most if not all of which connect with his office. He can answer almost instantly at any hour of the day any question concerning the whereabouts of any locomotive, trip rider, foreman, boss or track gang. If the superintendent wants to get in communication with any foreman "Flat" can locate him in a very few minutes. Having a telephone at each intersection and parting, with a man nearby, aids greatly in such a case.

Every morning by 7:00 o'clock "Flat" knows the condition of the bottom and decides whether the various locomotives should go in light or take in a trip of empties. As soon as the lamphouse man can check up on the lamps he notifies the dispatcher how many men are in each section and each part of each section, that is, how many men are loading after each cutting machine. This information enables him to distribute empties equitably.

ONE of the dispatcher's most important duties is to give a "fair turn" of cars to each man in the mine. Without such a turn the miners would soon become dissatisfied. This is by no means an easy job; yet it has been accomplished to the satisfaction of everybody for years. Not but what the miners "cuss" the dispatcher, vehemently at times, but they do most of it when he is not present—after they have left his office or have hung up the telephone receiver.

In addition to distributing empties for loading during the day the dispatcher must provide a man trip for each section at the close of the shift. It has become almost a custom for the first miner that gets his place cleaned up to telephone to "Flat" that so many men will want to come out in about so many minutes. And almost invariably enough empties to carry them are ready by the time specified. The dispatcher must also provide empties for the night shift. All in all the problem confronting the dispatcher is an intricate one. Naturally, single-track haulage is more difficult to handle than double-track.

Most other mines in southern Illinois employ a dispatching system that is in most respects similar to the one described. Naturally, because of local conditions, some of the plans adopted are more elaborate—as is that followed at Valier—while others are less so. In any case much of the practical success of any dispatching system will depend largely upon the personality and efficiency of the dispatcher. At Zeigler No. 1 everybody in the entire organization has implicit confidence in "Flat" Reedy's integrity, efficiency and fairness.



Works, Zeigler No. 1

Rescue Men Alert!

Plans Ready—Men Trained

WHEN mine disasters occur, minutes often are more important than hours were before the accident or will be thereafter. An efficient organization that will wheel into line and function immediately will often save lives and mines that would otherwise be lost. Men who may have barricaded themselves or otherwise protected themselves against suffocation may perish if not rendered prompt assistance. A fire reached quickly with proper equipment may be extinguished before it gets out of hand, thus saving the sealing of a section or possibly of an entire mine, a most expensive operation causing a loss of production to the company and a deprivation of employment to the mine workers.

Realizing how important it was to plan in advance as far as possible, the conduct of operation after an explosion or during a mine fire, a plan of procedure was developed several years ago which has been set forth on a framed chart which is posted for the information of everybody in division and mine superintendents' offices and in rescue stations.

ON THIS chart, part of which appears in an illustration herewith, are listed the names of the coal-company officials having authority in the particular division of the company's operation with the location of their residences and their telephone numbers. With these names are grouped those of the chiefs of the Departments of Mines in the states where the company operates with their official addresses, the names of the state mine inspectors with their residence addresses and telephone numbers, the address of the United States Bureau of Mines and of the state police headquarters, the names and addresses of all the apparatus men in the division with their telephone numbers, the quantity of equipment available for coping with the disaster and general directions for action should occasion arise.

In the chart the official designation of the man or men for whom instructions are given heads its own particular section to the left of the column. Underneath are listed the names of all those coming under that official designation. These names are written in ink in the blank spaces left for them. To the right of the column, each in its proper section, are placed instructions for the individual mentioned to the left of the column.

Information is given as to the places available for hospital, meals, morgue, etc. Consequently, everyone knows just what to do and how to do it should the fateful occasion ever arise.

ONE of the main problems at most mine fires and explosions is how to check the men into and out of the mine, how to issue to them wearing apparel and how to provide them with meals and sleeping quarters. By the use of the brass and aluminum checks hereafter to be described, a due record is kept of all these matters; consequently, there is no promiscuous use of flame safety lamps, and persons unauthorized to enter the mine are effectually excluded.

If any part of a mine catches fire or an explosion occurs, no matter how slight or serious the occurrence may be, the general manager or assistant general manager of coal mines of the company is immediately notified. One or both of them is also kept informed at all times as to the progress made in the extinguishment of the fire or in the restoring of the works.

In order to avoid unknown or ill-considered depletion of rescue equipment, it has been ordered that no oxygen breathing apparatus or oxygen equipment shall be sent from a division except as authorized by the general manager or assistant general manager or by someone designated by them. Similarly, no safety engineer or apparatus men may be sent from a division unless with the same authorization. If additional help is needed, application is made to them as they alone are empowered to provide it. The company has such a large number of apparatus men and so much equipment that they should suffice for any emergency without drawing on the forces and equipment of other companies.

When a man is ordered to do a certain piece of work, on the successful performance of which much depends, it is better not to rely on that one man but to provide two men, one of whom may be expected not to fail in its execution. Consequently, it is a rule at these mines that wherever a mine-rescue or fire-fighting job is such that one man can perform it, two men shall be assigned to it, one from the mine in which the disaster occurs and one from the nearest mine adjoining.

In order that the work shall be reported to the principal official in an orderly manner, it has been provided that the progress made in each shift in recovery work shall be reported to the division superintendent or to someone authorized by him as soon as the shift comes off duty. This shall be done by the man in charge of the shift. This official in turn reports to the general and assistant general manager. Either the division superintendent or the superintendent arranges to be in the office at all times during recovery work so as to assist in directing it or keeping in touch with the superintendents of the division. The office is regarded as headquarters for the information bureau.

All men report for duty to their respective superintendents and those who are about to assist in the advance work are sent to rescue headquarters to be assigned to regular shifts.

SPECIAL brass and aluminum checks are kept in readiness for emergencies. These are marked with numbers from 1 to 150 and the letters M.R.W. The division superintendent, or superintendents or someone designated by them, issues aluminum checks such as have been described to each man when he reports for duty. No brass check is given to any man unless he can show an aluminum check,

and no man is allowed to enter the mine, even for a short time, unless he surrenders the aluminum check and has it replaced by one of brass.

A record is thus kept of every man who enters the mine, for all the men whose aluminum checks are hung on the board are working underground. Each superintendent should have a crew of five trained men capable of replacing the men in the regular apparatus crew and ready for dispatch to any division when called.

THE superintendent notifies the general manager, assistant general manager, division superintendent, superintendents of the division, the mine foreman, the state mine inspector, chief company mine inspector, chief of mine safety, mine rescue and first aid, the safety engineer, firebosses, electricians, machinist, fire chief, chief of police, doctor and apparatus men as soon as a mine fire or explosion occurs.

He, the outside foreman or the supply clerk, promptly sees that the shaft and all entrances to the mine are roped off. They keep a man at the telephone and another at the fan. They provide a mess room, rest room, sleeping quarters, commissary, hospital, morgue, provisions, blankets, stretchers, first-aid material, doctors and nurses, nails, brattice cloth, hatchets, axes, picks, saws, shovels, flashlights and batteries, permissible cap lamps, flame safety lamps, boards, props, blueprints, identification checks, telephones, wire, insulators, sinking bucket and a rope for the latter.

The electricians and machinist, when authorized by the superintendents or those in charge to do so, pull all electric switches through which the lines are energized which pass into the mine. If the ventilating fan is not damaged and will continue to operate, they keep it running until authorized to stop it by those in charge. Should the fan or other equipment be damaged and not operating, the necessary repairs are made as quickly as possible, but the fan is put in operation only on the order of the official in charge of recovery work. The electricians are instructed to keep an attendant at the fan and to provide a telephonic connection between the fan house and headquarters. Similar connection is made between the fan house and the base of operations in the mines.

NO ONE is allowed to enter the mine, except with the approval of the official in charge of the shift, unless he has a written order from the superintendent and a numbered brass check. On presenting the aluminum check given him by the division superintendent, superintendent or person designated by him, the check men give each man about to enter the mine a numbered brass check which the recipient carries in his pocket.

The aluminum check corresponding to the number on the brass check is hung on the board provided for that purpose. The check number, the name of the man and the time at which he entered the mine are recorded in a book provided for that purpose. Thus the aluminum checks hanging on the board indicate plainly the number of men in the mine and the brass checks, the number of men off-shift on the outside. All men, except mine inspectors or officials, enter the mine in crews of five men, one of whom is an official in charge or some other competent man. A separate check-board is kept for all the men working on the outside.

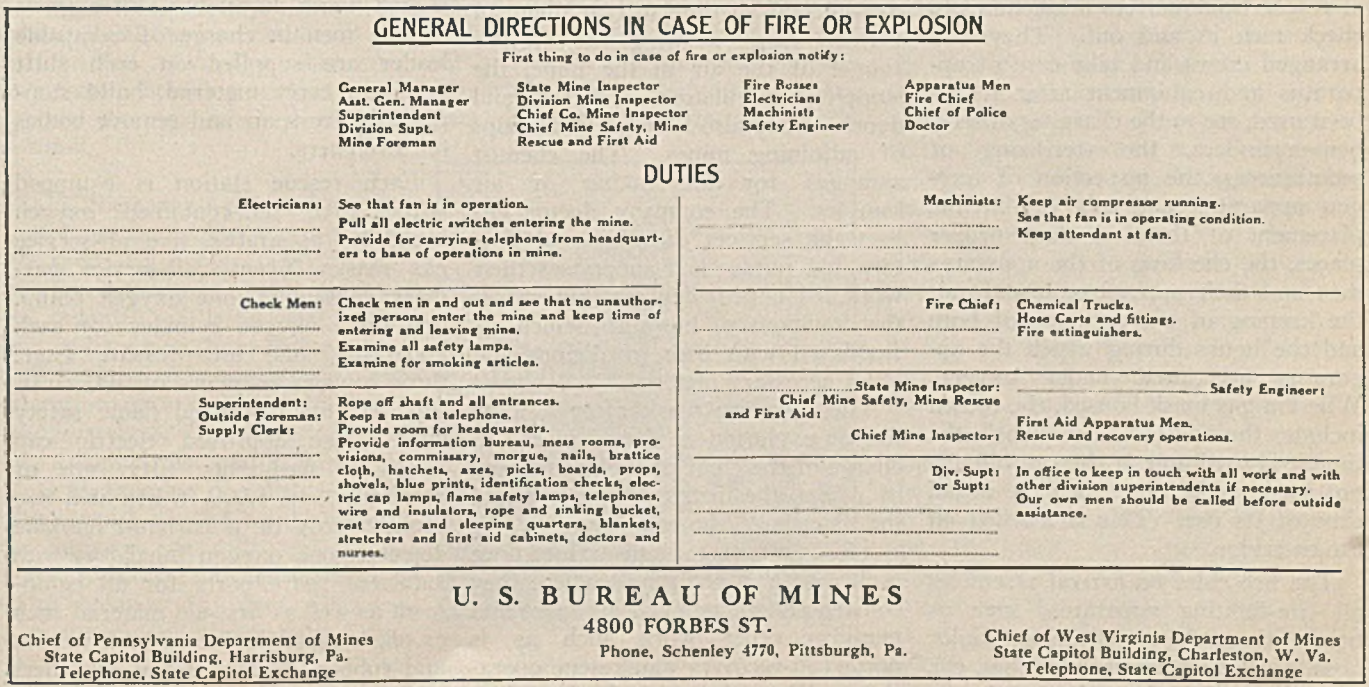
As he leaves the mine each man's brass check is collected and hung on the checking board and in return he is given his aluminum check. His check number, name and time of leaving the mine and the place where he worked is entered in the record book mentioned. Every man engaged in the recovery, whether on or off duty, has a check, either of aluminum or of brass, in his possession, the former admitting him to the commissary and sleeping quarters.

Clothing and supplies are given only to holders of such aluminum checks, when accompanied by an order made in duplicate, the original copy of which is signed by the division superintendent, superintendent, chief clerk or any one authorized to do so. This goes to the store manager or supply clerk. The duplicate is kept in the office.

Checking men at openings other than main entrance:—

Notify superintendent that you are leaving for opening assigned you if not already notified to go by him.

Take names, checks, hours of leaving and place men worked at, if any



Organization Chart Indicates Everyone's Duty in an Emergency

one leaves the mine, and allow no one to enter unless ordered to do so by those in charge.

BESIDE the check men mentioned, who are designated as Group No. 1, are others whose business it is to inspect lamps. These are known as Group No. 2. It is their duty to inspect carefully every safety lamp allowed to be taken into the mine, no matter by whom it is carried. No one is permitted to go underground with a safety lamp unless he is qualified to handle it.

This second group of check men examine every man carefully for smoking articles or combustible material and allow no one to carry such material into the mine. This search, no matter how great may be the hurry, is not perfunctory. Examination is made of every pocket and other place of concealment.

The men leaving the mine pass in their flame safety lamps, permissible cap lamps and flashlights to Group No. 2 before going to Group No. 1.

MEETINGS are held at rescue headquarters for the discussion of procedure in recovery work, to arrange shifts and to provide for cooperation with state mine inspectors and others. At these meetings the company chief and division mine inspector are present as are also the chief of mine safety, mine rescue and first aid and the safety engineers. The men of the latter two classifications post the names of the men chosen for each shift and select one man to be at rescue headquarters at all times to check men in and out. They also arranged crews and take care of apparatus and equipment after it has been used, see to the charging of oxygen cylinders, the sterilizing of mouthpieces, the inspection of oxygen apparatus and gas masks, the placement of these in their proper places, the checking of the apparatus men and their apparatus in and out, the keeping of the numbers of both and the hours during which the apparatus are used under oxygen. Where a gas mask is used, the record includes the number of the mask, the time it is used and, if the cartridge is not used all the time, then the actual time of its use. This is marked on the cartridge.

The fire chief on arrival assembles all fire-fighting apparatus, such as fire extinguishers, chemical tanks, hose, nipples, reducers, wrenches, etc. The chief of police and guards see that only authorized persons, as evidenced by aluminum checks, enter the rope-enclosed area.

> The fire alarm sounds. Every man goes quickly to his post. The motor starts and almost instantly the apparatus is on its way fully manned. The fire is attacked in orderly fashion, every man to his job. The modern city fire department, fully equipped, is a model of efficiency in emergency.
>
> No less important is preplanning and thorough organization for mine rescue work. Trained men are essential. Confusion must be avoided. This can be done effectively by charting in advance and broadcasting the responsibilities that fall to these men and to company and state officials in case of an explosion or mine fire.

The manager of the service stores is present. He sees that all necessary provisions are on hand and supervises their distribution. He provides a place in which the men may eat off shift or when working on the outside, and he supplies and sends food and drinks for those inside at the base of operations. No one, except those with aluminum checks, is provided with such services.

THE chief engineer and his assistants arrange to have a man in the office at all time so that they can furnish maps showing the regular course of the air in the mine, the stoppings, regulators, overcasts and doors. They also keep on hand maps of adjoining mines. The chemist arranges for the taking of air samples. The company doctor enlists the services of additional doctors and nurses and supervises their work. He provides and supervises the temporary hospital which is furnished with beds, medicines and other necessary material.

The recovery work after a mine fire or explosion is always placed in charge of the chief of the department of mines, the district inspectors and the officials of the company.

The apparatus men are trained once each month in the mines where they construct stoppings and air locks and perform other work such as is needed in recovery and rescue operations. They also work in formaldehyde fumes. This gives them confidence in their apparatus and skill in the handling of it. The men are trained in the use of self-contained oxygen breathing apparatus and the all-service gas mask. They learn not only how to use the oxygen breathing apparatus, but how to assemble and test it. They are also given a clear understanding as to the manner of its functioning.

In order to be sure that the main facts regarding the capacity, purpose, mode of operation and testing of rescue equipment and methods of recovery are known to every member of the mine-rescue teams, a catechism has been prepared containing 76 questions which are used in determining the best team in each division which competes in the finals at mine-rescue meets. This makes the study of the catechism a means whereby the prize cup may be obtained for the division in which each mine-rescue man is working. In consequence the catechism is closely studied. Every mine rescue man acquires a high degree of proficiency in it.

THE questions on the contents of the gas mask, the operation of the inhalator, the carbon-monoxide detector and self-rescuer are used only to break a tie should one occur. In the mimeographed manual a specific count is given opposite each question.

Each crew consists of five men in charge of a captain and the whole number of crews is so divided as to apportion an equal number to each shift which, if possible, should be of 6 or 8 hours duration. Other crews of five men in charge of a capable leader are supplied on each shift ready to carry material, build stoppings in fresh air and remove bodies on stretchers.

Each rescue station is equipped with: Five self-contained oxygen breathing apparatus, five all-service gas masks, twenty all-service gas-mask containers, one oxygen pump, one extra oxygen cylinder for each apparatus, one low-pressure gage, three oxygen cylinders of 100 cu.ft. capacity, five approved flame safety lamps, five approved electric cap lamps or flashlights, fifty cans of cardoxide, one 1,000-ft. life line, two canary birds or a carbon-monoxide detector, one oxygen inhalator, with sufficient spare parts for all equipment as well as first-aid material such as one complete mine cabinet, woolen and rubber blankets, army stretchers and sets of splints.

CRUSHING ROLLS

Their Effect on Preparation

By Frank J. G. Duck
Assistant Editor, Coal Age
New York City

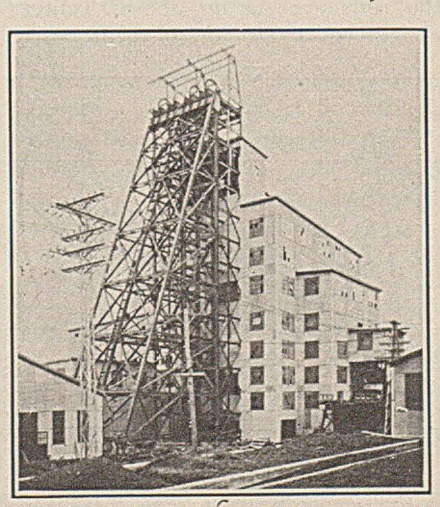
IT HAS always been the aim of the producers of anthracite to secure the maximum quantity of prepared sizes. Toward this end they have directed much energy and have spent much time and money. Preparation of anthracite involves many problems. Methods of mining, cleaning and loading have a direct and important bearing on the yield of large sizes finally obtained and loaded for shipment.

Probably no aspect of the complex problem has received less attention, until comparatively recent times, than has the importance and influence of properly designed and operated crushing rolls. Until the smaller sizes of anthracite (pea and under) were commercialized, rolls were generally considered a necessary but subordinate piece of equipment. As such, they were practically neglected and were usually in poor operating condition. In retrospect, it seems as though a deliberate attempt was made to produce the steam sizes. The rolls were of small diameter, ran at high peripheral speeds and the crushing teeth were small—all of which tended toward a shattering rather than a breaking action. Consequently, the yield of prepared sizes was small.

FROM the earliest times of anthracite mining, a peripheral roll or tooth speed of about 1,000 ft. per min. was considered to give the maximum quantity of large coal. The theory upon which these high rotative speeds were based is interesting. The acceleration of a falling body being approximately 32 ft. per sec. per sec., it was assumed that coal falling from a chute above a set of rolls operating at the speed indicated would directly enter between the rolls and, in its passage, would be crushed or cleaved without striking. However, sight was lost of the sudden stoppage and consequent shattering that the coal received when it struck the chute immediately under the rolls.

After thorough and exhaustive tests at various speeds had been made by the mining companies as well as by the manufacturers of crushing rolls, it was found that peripheral speeds of from 250 to 300 ft. per min. gave the best results. To compensate for the loss in power due to reduction in speed, compound gears were introduced. Today, the low speed compound-gear driven roll is used almost exclusively where high yields of prepared sizes are desired. Not only are they run at lower speeds but the rolls are of larger diameter than they were in the past, have larger teeth (usually of some patented design), are carefully maintained in excellent running order and generally are considered really to break the coal instead of shattering or practically pulverizing it as did the old rolls.

A PREVIOUS article (*Coal Age*, Vol. 32, No. 3; September, 1927; p. 146-148) contrasted the performance of the modern crushing rolls operated by a large independent producer with those of the old-style rolls. The author in presenting those test data did not intend to convey the impression that such results can always be obtained from each crushing installation. They were given, as is the material in the articles that will follow, merely to show what can be accomplished through carefully-controlled operation and with the thought of stimulating research and study by those operators who now are obtaining results less satisfactory.



Modern in Every Way

PERHAPS no one has given more attention to crushing rolls than has the Lehigh Valley Coal Co. This company operates over 25 collieries and washeries in every part of the anthracite field. Consequently, all of the difficulties—varying cleavage and changes in nature of the coal—previously mentioned are encountered. Paul Stirling, mechanical engineer, has devoted several years to a study of standardization of roll size, speed, etc., looking toward securing the maximum yield of prepared sizes. The author is indebted to him for the data which follow and to J. M. Humphrey, president, for permission to publish them.

As the result of thousands of tests, the Lehigh Valley Coal Co. has adopted a standard crushing roll for all of its collieries. Tests have been made on many types of coal breakers—gyratory and jaw crushers, smooth and toothed rolls, etc.—and roll diameters varying from 24 to 54 in. have been tried. In every instance, the company has gone back to their standard design or a close approximation to it. Although Mr. Stirling is of the opinion that the design of even the most modern roll is not entirely satisfactory—as they still have some tendency to crush instead of break the coal—he believes that the standards which his company have adopted are the best for their general practice.

The standard roll has a diameter of 36 in. and is 34 in. long. Eleven segments, either chilled cast

iron or manganese steel, having cast-in teeth are used per shell and the rolls run at 25 r.p.m.—giving a tooth speed, depending upon the length of the tooth employed, varying from 250 to 290 lineal ft. per min. Hawk-bill, square, pyramidal and chisel-pointed teeth are among those used, the type being determined by the size and kind of coal to be crushed. The same roll is used for all sizes of coal—only the segments and the driving-gears (to vary the roll centers) are changed.

Machined-steel teeth, in the opinion of Mr. Stirling, give better results (since the points are sharper) than do those of cast-iron. However, he states that the results of thousands of tests, with coals of varying characteristics, do not show a difference sufficient to warrant his company making any change. As it is quite difficult to change a driven tooth, this is not done. On the other hand, a segmented roll can easily be changed. For this reason, Mr. Stirling feels that perhaps his objection to cast iron teeth is not sustained.

THE accompanying chart shows the results—compiled from hundreds of tests—obtained with the standard 36x34-in. roll. Every roll in the service of the Lehigh Valley Coal Co. is tested at least once a month and an effort made to produce 90 per cent of prepared sizes. Naturally, the yield of the larger sizes varies with the coal and may be as much as 95 or as little as 85 per cent. Exceptionally high and unusually low results have been obtained but, as they are not average, they have been omitted from the compilation.

The No. 1 (crusher) rolls, average performance of which is shown in the graph at the left, have three rows of teeth per segment. There is a single row of hawk-bill teeth 4 in. high which are set diagonally with respect to the roll face. There are six of these teeth which are $3\frac{1}{2}$x$3\frac{15}{16}$ in. measured along the diagonals. Following this is a row of five small chisel-pointed teeth, 2x$1\frac{1}{2}$ in. and $1\frac{1}{2}$ in. high, set square with the roll face and staggered with respect to the "hawk-bills." The third row contains six wedge-shaped teeth, $2\frac{3}{4}$ in. square and 3 in. high, set square with the roll face and in the same radial plane as the teeth in the first row. The pitch distance between the teeth in any given row is $5\frac{1}{4}$ in.

THE feed to the No. 1 rolls is lump coal passing over a $6\frac{1}{2}$-in. circular mesh screen. Curve *A* shows the results obtained when the distance between roll centers is $42\frac{1}{8}$ in. Curve *B* indicates the yield of various sizes when the rolls are set on $42\frac{3}{8}$-in. centers. As will be seen, the quantity of domestic sizes varies between 85 and 90 per cent—a remarkably high average.

The second chart shows the performance of No. 2 rolls set on the following centers: Curve *A*, $40\frac{3}{4}$ in.; curve *B*, $40\frac{7}{8}$ in.; curve *C*, $41\frac{1}{8}$ in. Each roll segment carries 24 pyramidal teeth set in three longitudinal rows of 8 each. The teeth are in eight radial planes, are set square with the roll face on a pitch of $3\frac{3}{4}$ in., measure $2\frac{1}{2}$x$1\frac{3}{8}$ in. and are $2\frac{1}{2}$ in. high. The feed is steamboat coal passing through a $6\frac{1}{2}$- and over a $4\frac{1}{2}$-in. circular mesh screen. Depending upon the setting of the rolls, the yield of prepared sizes varies between 89 and 93 per cent.

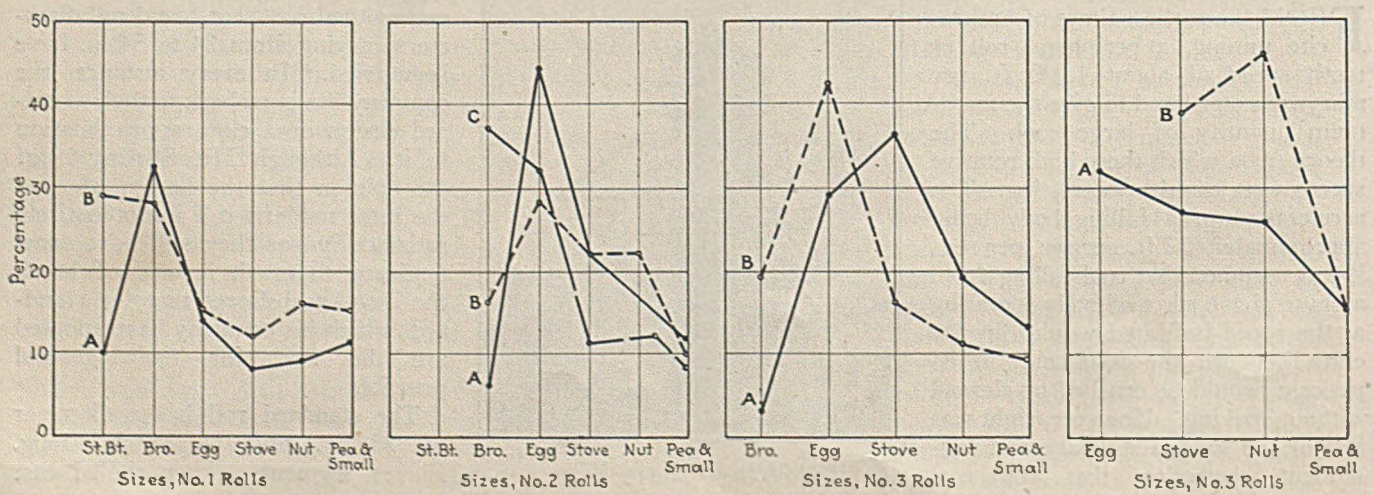
The third and fourth sets of curves illustrate the results obtained from the No. 3 rolls. In curves *A* the rolls are set on $38\frac{3}{8}$-in. centers and in curves *B* the roll centers are $38\frac{5}{8}$ in. apart. There are 65 pyramidal teeth per segment set in five longitudinal rows of 13 each. The teeth, which are in 13 radial planes, are set square with the roll face on a pitch of $2\frac{1}{4}$ in., measure $1\frac{3}{8}$x$\frac{7}{8}$ in. and are $1\frac{3}{8}$ in. high.

THE CURVES in the third graph were made from a feed of broken coal passing through a $4\frac{1}{2}$- and over a $3\frac{1}{4}$-in. circular mesh screen. The quantity of large sizes produced is between 88 and 91 per cent. When the feed to the No. 3 rolls is egg coal passing through a $3\frac{1}{4}$- and over a $2\frac{5}{16}$-in. circular mesh screen, the results are as shown in the fourth chart. In this case, the yield of prepared sizes amounts to about 85 per cent.

If it is desired to increase or decrease the yield of any particular size, all that is necessary is to refer to the charts just described. From these it can be determined, with sufficient accuracy, which roll settings and feed will give the maximum return of the desired size.

The charts also show that if a large percentage of the size of coal fed to the rolls (or oversize) is made by them, the total quantity of pea coal and smaller produced is the smallest. On the other hand, when the percentage of oversize (or size fed to the rolls) is low, the quantity of the smaller sizes that is produced increases. This point is worthy of particular attention for, according to Mr. Stirling, every increase of one per cent in the quantity of the smaller sizes produced results in a loss of at least 10 cents per ton of coal treated.

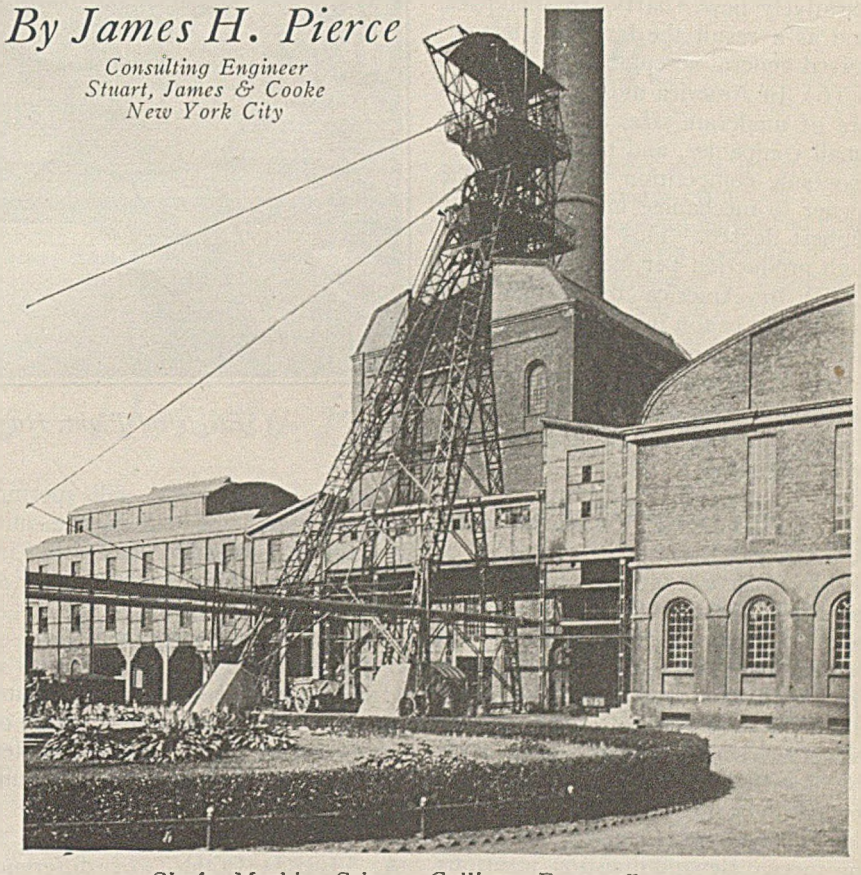
A subsequent article will present charts and data, unusually complete and instructive, prepared by another large producing company.



These Curves Indicate Performance of Standardized Rolls

Is EUROPE *Wrong or Are* WE?

By James H. Pierce
Consulting Engineer
Stuart, James & Cooke
New York City



Shaft, Mathias Stinnes Colliery, Essen, Germany

IN EUROPE mining engineers have methods of solving their problems different from those that American mining men have adopted. Is this due merely to idiosyncrasies or to reasons that justify their practice or ours, and are there any of their methods that we should adopt generally or under suitable conditions? This article is written to answer these questions, not as a whole, but as regards certain representative features, such as the triple shift, high-pressure ventilation, coal recovery and architectural elaboration of surface buildings.

American engineers plan their mines to transport, hoist and prepare the entire production in a single shift, whereas in Europe coal is everywhere hauled, hoisted and cleaned during two or three shifts.

Theoretically, it is wrong to have expensive machinery working only one third of the time. It seems self-evident that lower costs will result from multiple-shift operation. Some mining men in America are now giving thought to this principle, and it will be interesting to see what the future may develop.

EUROPEANS base their contention on the fact that the operating cost on the second shift should be the same as on the first shift, whereas the amortization cost will be much lower not only because many of the cars, locomotives and cutting machines can be used on the second shift, but because the entire hoisting and preparation equipment also will be busy for that length of time.

American mining men contend that the practice of multiple shifts, if designed to double or triple the single-shift tonnage, results in planning coal reserves two or three times the size needed if the mine was run single-shift. Consequently long haulage roads must be maintained at heavy cost, thus increasing the expense for transportation, ventilation and power distribution. They declare also that twice as many houses are needed by the miners where the mines are operated double-shift. These houses represent a big part of the mine investment, and are generally rented for less than their maintenance cost.

American engineers contend, also, that the difficulty of keeping development in advance of a double-shift mine militates against it and that mining machines, locomotives, hoists and cars are not kept in as good a state of repair in a double-shift as in a single-shift mine. Consequently, running a mine two shifts does not double the output.

My observation has been that both contentions have merit and that the wide difference in practice has resulted largely from different mining conditions. It would be necessary to have a specific mine in view, and to figure the problem both ways, to see which system is preferable. Such a system might be desirable in one mine and not in another.

IT IS EASY to understand why there is multiple-shift work in Europe and single-shift in America.

(1) In Europe most of the mines are old, and were sunk before the days of mechanized haulage. Most of them also are quite deep, and consequently the shafts are expensive. For these reasons and because most of the coal beds are thin, low-capacity cars and circular shafts of small diameter are in general use. The small car made it possible to transport and hoist in a single shift up a single shaft all the coal a large mine could produce. The tonnage of the mine is limited by transportation and hoisting facilities rather than by the possibilities of development.

(2) The mines being large and the shafts deep, the capital expenditure per ton of annual output is large, making it essential to keep the capital earning at all times.

(3) Labor is cheap and plentiful, and consequently the incentive to economize on labor is not always uppermost in the minds of European mine managers, but rather to get the biggest tonnage from any given plant. Economic use of equipment is regarded as more essential than economic use of labor.

(4) As a result of low production per man per day, European mines have a large labor force, and in deep mines it is almost impossible to get

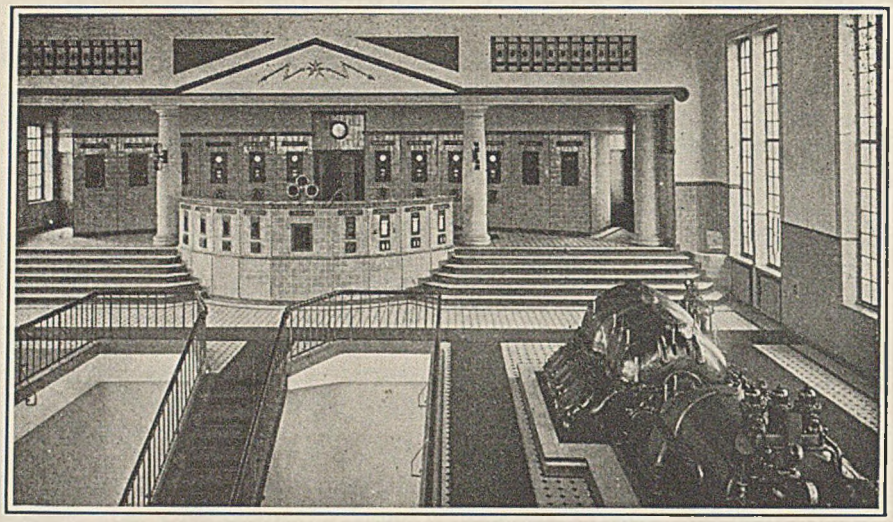
this regiment of men to its places in time, unless the work is spread over more than one shift.

(5) In America mines are comparatively new, shafts are shallower, and as a result the large car has received general acceptance.

(6) In America most of the mines are of moderate size, are worked by small companies, and the pressure of economic competition has forced the owner to mechanize his mines to the highest degree. This has resulted in high production per man day.

(7) In America the capital expenditure per ton is probably only one half that of European mines.

(8) American labor is the most expensive in the world, and in most mining districts can be obtained only with difficulty.



Electrical Plant, Hagenbeck Colliery, Germany

IT WOULD APPEAR, therefore, that conditions on the two sides of the ocean have forced on each entirely different systems. However, I have been in mines in Europe where the haulageways had to be made so large for ventilation purposes that they could accommodate a 4-ton car. Nevertheless the cars held only 1,600 lb., despite the fact that they were loaded by conveyors and never left the haulageways to enter the working faces. Beyond question, a serious mistake is being made in such mines, because the entire tonnage could be readily handled in one shift eliminating the necessity for the employment of several hundred men.

The second point of difference concerns ventilation. In Europe, the thought uppermost in the minds of engineers is that haulways can be maintained only at much expense and difficulty; consequently the cross-sectional area of each is kept as small as possible, and as few airways are provided as ventilation will permit. Water gages of 6 to 8 in. are quite frequently used, and I have been informed that a water-gage pressure of 12 in. is not unknown.

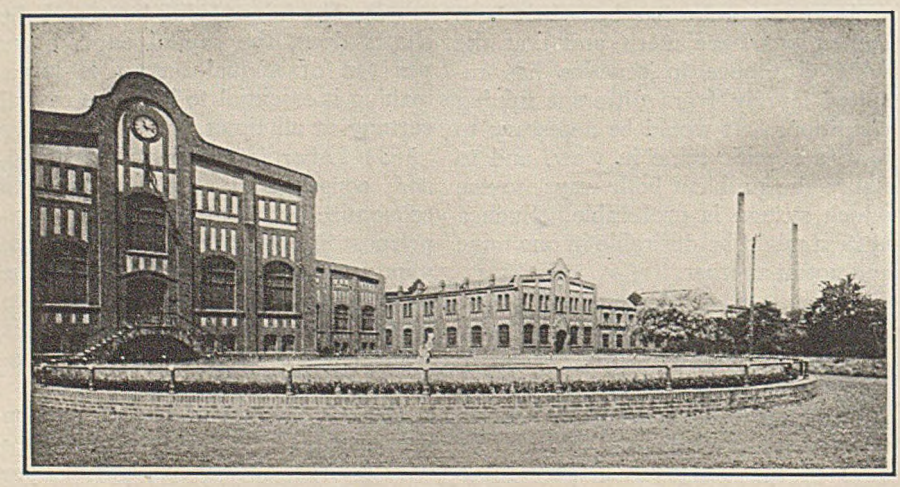
In America engineers believe in airways so large and numerous as to permit of the use of a low water gage. Many of the mines operate on a pressure of 1½ to 2 in. of water. Water gages of even 5 in. are quite exceptional.

A THIRD POINT of difference between European mines and ours is in the attitude toward coal recovery. In Europe the tendency is toward complete extraction, whereas in America the severe competition and the large areas yet unmined have forced the mine owner to adopt methods that will produce cheap coal, even though the method may not be the best from the point of view of complete extraction.

In many of the large mining states of America operators to stay in business must be able to mine and sell their coal at a price of $1.25 to $1.50 per ton. With the high-wage scale paid in those states, a mine owner would soon be bankrupt if he failed to extract his coal in the cheapest manner.

On the other hand, in the mines operating high-grade coals like those of the Pocahontas field, recovery is a vital consideration and some companies have claimed that they extract 90 per cent of the coal in any given area.

European coal is being mined almost exclusively by longwall or longface methods, whereas in America the room system is predominant. Many attempts at longface work have been and are still being made in America, and many claims are being advanced, but the room method is still the system that most operators prefer. It seems entirely possible that the perfection of loading machines and conveyors will shortly bring about a modified longface system that will differ radically from those in use in Europe.



Entrance to Mathias Stinnes Mine

ANOTHER NOTICEABLE difference is in the character of the surface buildings. In Europe, tipples, washeries, powerhouses and all sorts of surface buildings are of the most permanent construction, and much money is spent to give the top-works a pleasing architectural effect. Contrast this with American practice where the mine owner spends money freely for his mine, but keeps the investment on surface buildings down to a minimum. My personal conviction is that Europe spends too much and America too little on its surface structures.

Safety Congress Studies Mine Problems

THREE well-attended sessions were held by the Mining Section of the National Safety Council in the Stevens Hotel, Chicago, Ill., on Sept. 27, 28 and 29. The first dealt with statistics and their bearing on accident prevention. Discussion developed that they were the graphic meters of industry showing whether it is running safely and with due economy. On the second day papers and discussion were devoted to the training of foremen and its bearing on accident prevention, and Eugene McAuliffe made an earnest appeal for increased safety effort. Thursday's meeting discussed mine dust and health and was followed by a round table on ventilation and haulage. Clyde A. McDowell was elected chairman for the ensuing year.

Statistics—How to Prepare Them

By H. G. Hensel

Safety Director
The Youngstown Sheet & Tube Co.
Chicago, Ill.

STATISTICS alone will not prevent accidents and are a waste of time if not used to advantage. They show where effort should be directed. They can be made interesting if properly presented to the various groups who need them—the employees, the department heads and foremen and the mine management.

Short, snappy statements of the week's or month's record, the number of lost-time accidents and comparisons with the records of other mines in the same company or with last month's accident record, if placed on the bulletin board will reach the miners and other labor. A record of one of the accidents during the last month written in chalk, or still better with a photograph showing how it occurred, should accompany these statements. Stress should be laid on the unsafe practices back of the accident and show how the injury or fatality could have been avoided.

For superintendents and foremen a weekly report of accidents should be prepared accompanied by a comparison with a previous week. Brief histories of some of the most serious accidents and how they might have been prevented should form part of the bulletin.

For the mine management reports of various kinds may be made. Some managers want a report on a dollar basis giving total estimated cost of accidents during the past month by departments, especially where the company carries its own compensation risks. Some want the accident frequency and severity rates by departments; some, the number of accidents according to occupation and percentage in each occupation as compared to the total. Others want classifications as to the day of the week and the hour of the day on which accident occurred.

Some group married men and single, and divide the accidents according to age groups. One classification I have observed is according to length of time men have been in the employ of the company at the time of injury. In that group I noted that 43 per cent had been employed less than two months. Some desire graphic charts to show the trend of accident prevention. At one mine "pie charts" were made showing by colored sectors the causes of accidents during the preceding month. A monthly report is prepared also by the Youngstown Sheet & Tube Co. of the total and percentage attendance at safety meetings with the number of men employed. Department heads are asked by the management to see that each man attends two meetings a month and encourages other men to attend.

Foremen's Training Conferences—Do They Pay?

By McHenry Mosier

Mine Superintendent, Morenci Branch
Phelps Dodge Corporation
Morenci, Ariz.

SINCE 1924, at the Morenci Branch of the Phelps Dodge Corporation, the frequency of lost-time accidents has dropped from 1.059 per 1,000 shifts to a rate for five months in 1927 of 0.089, a reduction of 91.6 per cent. In 1925 at the same mines the percentage of man shifts lost was 7.58 and in 1926 was 1.36, a reduction of 82 per cent. In 1923 the mining department's annual labor turnover was 102.71, and in 1926 it was 61.05 per cent.

Much credit for this bettered record is due to the Arizona State Department of Vocational Education which conducted the first foremanship training conference in Arizona in January of 1923 for the Miami Copper Co. The next conference was a joint meeting held in January, 1924, when the Miami, Inspiration and Old Dominion Copper companies participated under the auspices of state and federal governments. Since that time conferences have been conducted in various mining camps in Arizona, including every Phelps Dodge Branch, by leaders furnished by the Arizona State Department of Vocational Education.

Nothing is given in the form of lectures. The ground work is discussion. The purpose is (1) To get group opinions of foremanship problems, (2) to encourage a habit of

analyzing these questions, (3) to promote a better understanding through discussion of the problems of fellow foremen.

At Morenci, weekly meetings are held by the manager for superintendents and by the mine superintendents for their foremen. A committee system of safety work was started in March, 1925, patterned somewhat after that of the U. S. Steel Corporation. The first intensive foremanship training conference at Morenci branch of three week's duration was held in March, 1924. The conferences were begun with a group of thirteen superintendents and other department heads participating. This was followed by a group of fifteen foremen and finally by one of fifteen shaft bosses. The subjects discussed are: (1) Duties and responsibilities of each group, (2) safety, (3) analysis of specific accidents, (4) leadership, (5) co-operation, (6) labor turnover, (7) giving orders, (8) instructing, (9) loyalty, (10) job analysis.

A second conference was held by mine foremen for one week in February, 1926. The topic was "Standardization of Mining Methods." Another conference of two weeks' duration was conducted in April for shaft bosses.

Some of the contingent factors allied with safety work which these conferences have assisted in promoting are: (1) Standardization and efficiency, (2) improved morale, (3) staff leadership, (4) better instruction of working force, (5) effective discipline, (6) reduced turnover, (7) increased plant pride, (8) better knowledge of plant policies.

Lagging in Safety— A Challenge from an Operator

By Eugene McAuliffe

President, Union Pacific Coal Co. Omaha, Neb.

MUCH as I regret the necessity for making the statement, I am in candor compelled to say that the bituminous coal industry is lagging in mine-accident prevention not only behind its European neighbors, but likewise in a relation to other great industries. Though classed as hazardous the latter have made startling and commendable progress in the reduction of accidents, whereas little, if any, advance is being made by coal companies.

What is our coal-mine accident record? Let us look at it calmly and dispassionately; it offers little that is flattering.

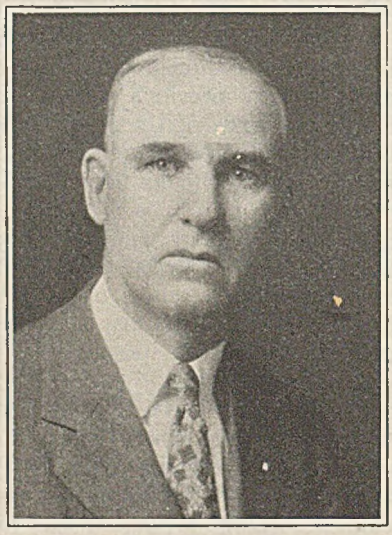
Death Rate, Anthracite and Bituminous Coal Mines

Per Thousand 300-day workers in all coal mines for four five-year periods.

Period	Men Killed	Killed per Thousand 300-Day Workers
1906-10	13,288	5.49
1911-15	12,583	4.65
1916-20	12,097	4.03
1921-25	11,077	4.58

This comparison suggests commendable progress through the first three five-year periods, with a sharp recession during the five years ending with 1925. The figures for the principal European coal-producing countries for the five-year period 1921 to 1925, inclusive, together with those shown for the United States, however, offer a further and more startling comparison.

To talk in terms of tons produced per fatal accident means little, if anything, and with the present trend toward mechanization and increased production per man-day, it will in the future mean even less. The best comparison possible is that based on million man-hours of exposure; such figures, however, are not as yet generally available; the 300-day year comparison is the next best.



Eugene McAuliffe

Death Rate, in Several Countries 1921-25 Inclusive

Country	Total Men Killed in Period	Killed per Thousand 300-day Workers	Relative Percentage
United States bituminous.	8,825	4.87	100
United States anthracite..	2,252	3.71	76
United States, total	11,077	4.58	94
Great Britain.	5,495	1.13	23
France	903*	0.97*	20
Belgium	812	1.00	21
Prussia	6,227	1.86*	38

*For four years 1921-24 only.

I have striven for years to find a valid explanation for the abnormally high death rate shown for our American mines, but with little success. It is a fact that the unit production of coal per man-day shown for our mine workers is far ahead of that reported for European workers, but that situation is largely explained by the difference in depth of cover, pitch and thickness of seams, and most of all by the fact that the workings abroad are backfilled with a greater extraction per acre-foot as the result.

Doubtless the greater percentage of men employed in European mines in "filling" work, which tends to remove them from the more active and dangerous zone of production, represents a saving factor, but surely no such secondary situation can be responsible for Great Britain, France and Belgium, when taken together, showing a loss of but 20.5 men to each 100 lost in our bituminous mines, or 21.8 men to each 100 lost in all American mines. We must go farther afield for an answer.

It is the mental attitude maintained by employers, employees and labor-union officials generally that is responsible not only for the unfortunate accident record of the coal-mining industry of America as compared with that of Europe, but also for the further fact that we are not even making negligible progress toward betterment.

Let us touch for a brief period on the much-discussed subject of rock dusting. Has rock dusting a preventive value? In the sixteen months' period, Jan. 1, 1926, to April 30, 1927, inclusive, we have experi-

enced in the bituminous mines of the United States fifteen major explosion disasters. By a major disaster is meant one in which five or more men are killed. In addition to the fifteen major disasters, two incipient explosions occurred during the same period, killing in one case one man, in another four men. In the seventeen explosions, 432 men were killed.

A summing up of the results presented by the seventeen mine explosions indicates that they occurred partly in rock-dusted mines and partly in those not thus treated, and that 555 out of 934 men who were exposed escaped with their lives, a salvage record of 59.4 per cent; in the rock-dusted mines a total of 2,135 men were exposed, of which 2,078, or 97.3 per cent, escaped. Rock dusting will not prevent local gas or dust explosions originating in dry and gaseous mines, but the evidence does show that rock dust, if properly applied and thereafter maintained in quantity, will prevent great, wide, sweeping, cataclysmal explosions that wreck mines, destroying all life within their path.

During the ten years ending with 1925 the deaths from coal mine accidents in our American mines totalled 23,147, the population of a good-sized city. The coal industry needs: (1) The formulation and adoption of a modern, scientifically prepared code of mine safety standards, written in such manner that they can be adopted by the several states.

(2) The establishment of the principle that men chosen for the inspection of coal mines and the enforcement of safety laws should be selected for their fitness expressed through engineering education, coupled with practical experience. Such men should be well paid and retained in office during competency and good behavior. They should be set apart and kept aloof from the influence alike of coal operators, labor unions and predatory politicians.

(3) The United States Bureau of Mines should be reinforced, numerically and financially, and the broadest opportunity should be afforded the Bureau to expand and make prompt publication of its mine safety research work. It is the only body in existence with a sufficient background to work effectively along scientific lines with the mining bureaus of Great Britain and the Continent, the exchange of knowledge thus made possible multiplying three-fold the value of the Bureau.

(4) The coal industry should be made to understand that the continued excessive loss of life so long experienced will no longer be tolerated, and if independent action is not taken, then and then only, repressive laws should be enacted.

Cost does not enter into improved mine safety; workmen's compensation costs have been going up at a tremendous pace; in certain instances compensation insurance is now being denied the industry, the growing rate of accidents invalidating every existing rate computation. It is high time courageous action be taken.

Safety in a Small Plant—The Manager's Job

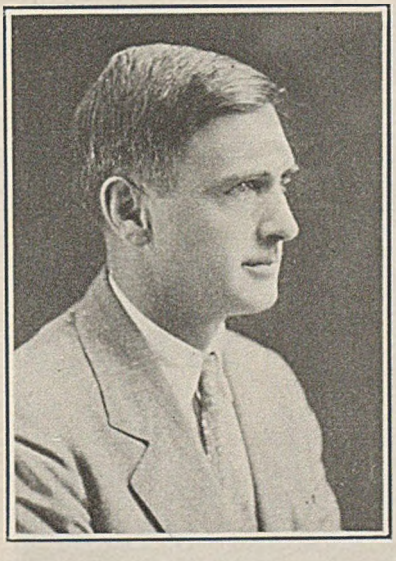
By J. S. Shaw

Assistant to General Manager
Hercules Powder Co.
Wilmington, Del.

AT a small plant the manager or his assistant has intimate contact with every workman and, as the number of his men runs only from 25 to 200 men, the manager cannot afford to engage a safety engineer; between them they must fill that office themselves. Much depends on the manager himself and, in these days of corporations with many units where much office work is required, some managers maintain close contact with 200 men only with difficulty. Some managers like to think they have that contact but such a manager is fooling only one person.

True it is that whether the plant is large or small the manager is responsible for safety, but the method of conducting safety work differs. In the large plant the work of keeping the plant safe is delegated to a safety engineer who may even have a corps of assistants or a safety committee depending on the size of the payroll.

In the small plant the manager on his daily round must "have an eye out" for unsafe practice and equipment. He must discuss hazards and their elimination directly with foremen and even with the workers.



John S. Shaw

Safety is an activity where this can be done without disorganizing the relation between foreman and workers. The wise manager can thus get in close touch with his men. Often the "safety approach" results in the development of ideas for greater production, better quality and improved methods and machinery because it develops friendship and confidence between manager and workers.

Whether in the large or small plant the manager must be convinced that safety is sound and economic as well as humanitarian. He must weave safety into his methods. Safety must be considered and weighed with its degree of importance in every job analysis.

A successful manager is known not only for production, low costs and high quality of product, but also for the goodwill his employees bear him, for the relative infrequency and inseverity of the accidents at his plant and for his low labor turnover. His men stay with him. If he has not the proper knack for making friendly contacts with his men a small competent safety committee whose members represent the various departments in the plant can accomplish good results for him.

Meetings of the National Safety Council and other bodies advancing the cause of safety serve to emphasize the necessity for concerted action. *Coal Age* invites discussion that will improve safety conditions for the industry.

Empire Mining Men Study Subsea Mines

In Sydney, N. S.

SYDNEY, N. S., welcomed forty of the delegates of the Second Empire Mining and Metallurgical Congress early on Sept. 10, the visitors being met at the station by the reception committee of the Cape Breton branch of the Canadian Institute of Mining and Metallurgical Engineers, headed by Walter Herd.

After breakfast, the guests took motor cars to Glace Bay where the workings of No. 1 B mine of the Dominion Coal Co., Ltd., were inspected. Returning to Sydney an official welcome was tendered by Mayor McConnell and Prof. F. H. Sexton, of the Nova Scotia Technical College. In the afternoon a visit was made to the steel plant. The two papers, which are briefed in this and the following pages, were presented at this meeting.

Mr. Gray presented at the close of his paper information as to other submarine coal areas in Great Britain (Cumberland, Northumberland, Durham, Firth of Forth and the Estuary of the Dee), Australia (New South Wales and Queensland), Chile, Japan and Spain. Major W. S. Nathan presented the paper by Docquier, Bataille and Bettlestone.

Sea Yields 14,000,000 Tons of Coal Yearly

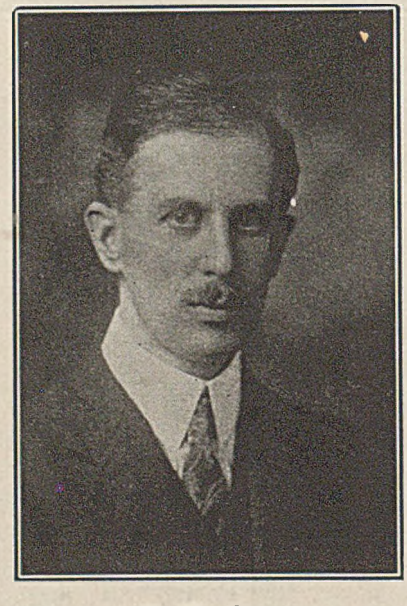
By F. W. Gray

Assistant to President
British Empire Steel Corporation
Montreal, Can.

EXTENSIVE UNDERSEA coal mines have been developed on both the east and west coasts of Canada and at this time some four million tons, or 25 per cent of the output of Canadian coal, representing a pit-mouth value of $14,000,000 per annum, comes from coal seams lying under the sea.

Of the coal being mined in Nova Scotia, 55 per cent comes from undersea workings, and this proportion is likely to increase. The Province of Nova Scotia is at this date receiving in royalties paid upon coal removed from undersea areas a sum exceeding $400,000 per annum.

The Sydney coal field dips at an average slope of 6 to 7 per cent along the axes of the synclines. An unusual feature of the beds is their regular uninterrupted seaward inclination and the general absence of disturbances. It is true that the contour lines are curved by the anticlinals and the shallow syncline folds lying in between them, but the axes of these folds travel seaward and so do not hamper the extension of the workings in that direction. No marked change in dip indicating the possibility of a flattening or rising tendency has to date been observed at the faces of the undersea workings which have extended seawards at various points to distances varying from



F. W. Gray

a mile up to a maximum of 2½ mi.

The sea floor has an average inclination of 2 per cent. The strata cover increases, therefore, at a rate of some 250 ft. per mile of travel of the workings. The main haulage road of Princess Colliery at Sydney mines extends further into the sea than any other working. At its greatest extremity it is 11,800 ft. from the shore and the strata between the sea bottom and the coal have a thickness of 1,500 ft., this being to date the maximum depth below the sea attained in the Sydney coal field.

AS THE MINES may continue in operation for as many as 200 years, the shafts and airways should be constructed with that long life in mind. With the notable exception of the Princess pit at Sydney mines, sunk 60 years ago, the No. 1 B colliery of the Dominion Coal Co. near Glace Bay is the only shaft near the shore which was deliberately designed to win undersea coal. It is also of a date sufficiently recent to include thoroughly up-to-date equipment.

I believe that the workings cannot be extended much further without becoming unprofitable. In my opinion the cost has reached the limit of successful operation largely because of the inadequacy of existing shore openings. Two other features of the mining practice to date account largely for the approach of a production-cost limit, namely, the rapid advance of undersea workings in areas where about 55 per cent has been left standing in pillars, and, in general, the infrequent construction of deep shafts and cross-measure tunneling to minimize long underground uphill hauls.

TWENTY years ago, George Blake Walker suggested that submarine coal in the Sydney field be won by a deep shaft and a cross-measure tunnel intersecting the coal seams in ascending order. I believe that had this system been used at an earlier date it would have more than justified the expenditure.

A shaft might be made 2,500 ft. deep extending to a level well below the Mullins bed and a tunnel might be constructed from the shaft crossing that seam, the Phalen, the Harbor, the Hub and the Aconi, the last being reached at a distance of 8 mi. A slightly descending grade toward the shaft would be desirable. The tunnel should be constructed of large cross-section; large-capacity cars should be used and a double track laid with heavy rails and good ballast should be provided.

The shafts and air-passages should be of sufficient area to circulate one million cubic feet of air per minute, and, to obviate impracticable water gages, a force fan at the downcast shaft, a booster fan inbye and an exhaust fan at the upcast shaft should eventually be installed. To distribute the cost of such expensive tunnels the coal should be drawn from a distance of 3 miles on either side.

COAL PRODUCTION FROM UNDERSEAS AREAS

Countries	Long Tons per Annum	
Great Britain		
East coast	4,100,000	
West coast	1,000,000	
Scotland	1,500,000	6,600,000
Canada		
Nova Scotia	3,600,000	
Vancouver Island	300,000	
		3,900,000
Australia		200,000
Total British Empire		10,700,000
Chile		1,200,000
Japan		1,500,000
		13,400,000

Because the old shore workings are uncertainly mapped and because active coast erosion is removing the cover above them, prudent mining would suggest leaving a wide barrier of coal between the seaward extension of existing collieries and the area designed to be won by cross-measure tunneling.

THE SYDNEY UNDERSEA workings are on the East shore of Cape Breton Island. On the western shore are the submarine areas of Port Hood, Mabou, Inverness and Chimney Corner. A mine at Port Hood had proceeded 2,500 ft. under the sea and was working by room methods in 1911 when the mine was flooded by sea water that at first ebbed and flowed with the tide, but only about a foot, whereas the tide rose and fell over three feet.

The water first made its appearance under a solid cover of 942 ft. The seam which was from 6 to 7 ft. thick dipped under the sea at an inclination of 21 deg. flattening to 12 deg. As a result of this incursion of sea water the mine was entirely abandoned, the provincial commissioners who investigated the flooding advising that unwatering should not be attempted, believing that in time the fissure through which the water made its way might fill with silt.

The Mabou area has a similar history. The coal dips at 40 deg. along the axis of the syncline and, at 500 ft. from the outcrop, flattens to 20 deg. One seam, 6 ft. 6 in. thick, was mined by a slope for a distance of 2,000 ft. from the outcrop where this seam and one of 7 ft. thickness

(Continued on page 210)

Flotation and Hindered Settlement Clean Coal

By Alex Docquier, L. Bataille, R. Bettlestone

Kailan Mining Administration
Linsi Mines
North China

Washability curves were made at Linsi by the use of a hand jig instead of by the usual float-and-sink test. In the flotation cells the coal is caused to float by the fact that coal repels water and coats readily with oil. The shales do not repel water and readily sink. By the system used, a good separation is made of an extremely dirty coal, which after cleaning is used for metallurgical purposes.

AT LINSI MINES, Kailan Mining Administration, North China, the coal is extremely dirty. The best, and there is little of that, runs 6 per cent ash and the worst 50 per cent. The mines had two Baum washing plants without sizing arrangements that cleaned all the coal but it was found necessary to build a third plant to treat the inferior material satisfactorily. For the coarser-grained coal a Draper washer was installed, but this plant cannot deal with the fine material owing to the clogging of the water in the pipes. So a flotation plant has been erected for that purpose.

It was found that in the dirtiest layers there was some low-ash material that it was desirable to save. To test the coal and construct washability curves, a large hand washer was built consisting of a 12-in. diameter tube, one leg of which was fitted with a plunger operated by handles. The other had a 2 ft. 6 in. length that could be removed. The removable part of the latter leg had a grid at its lower end, supporting a perforated plate having holes of 30-mesh per inch. This leg was filled with 50 lb. of coal that was to be used for the test. At the bottom of the U, a plug was placed for the evacuation of fine coal. The U-pipe was almost entirely filled with water, and the plunger was jigged up and down for an hour with a quick downward stroke followed by a slow upward stroke. This caused the stratification of the coal, the material grading from light to heavy in passing from the top to the bottom.

With a horizontal screw the movable part of the leg containing the coal was pushed over to a table, where the screws holding the grid were removed, and a blank plate fitting the tube and operated by a screw lifted the grid and coal an inch at a time. As each inch of coal became exposed it was swept off for testing, being

dried, weighed and analyzed. Thus the curves of washability could be determined.

WITH THE BAUM PLANTS, three qualities of coal were prepared. Thus raw Linsi No. 1 slack, which ran from 26 to 28 per cent ash, gave 22 per cent of first-quality coal with 11.4 per cent ash, 43 per cent of second-quality coal with 19.3 per cent ash, and 35 per cent of third-quality coal containing 48 per cent ash. Because of the low recovery of first-quality coal, this slack is usually reserved for straight washing to produce a second-quality coal.

For the Draper system the coal was treated on six screens, the largest size being over $\frac{5}{8}$ in. and the smallest being below 16 mesh. The finest coal was treated by the Minerals Separation type of flotation. The following features enter into the consideration: (a) Forces acting at the surface of a liquid, the resultant of which tends to produce rupture of the surface, (b) the natural tendency of some substances to resist wetting and of other substances to be wetted, (c) the natural tendency of some substances to take on their surfaces a film of oil and the natural resistance of other substances to receiving such a film. In general, coal repels water and coats readily with oil, whereas shales and refuse become wetted by water and repel oil. By mixing a small percentage of oil with the feed, the coaly portions rapidly assume an oily coat.

When, by a mixture of fine particles, oil and acid is agitated in the presence of air and then passed through a restricted outlet to a quiescent zone in the accompanying tanks, innumerable bubbles are formed; the coal floats off as part of the froth and the shaley matter sinks rapidly, being aided by the fact that the water is acid and thus favors coagulation.

Recent American opinion is that some oils are soluble in water and some insoluble. The one creates the froth and the other coats the particles, rendering them floatable. Theoretically, the quantity of froth-producing soluble oil might be calculated as proportional to the solids and the quantity of insoluble film-producing oil might be proportioned to the total surface area to be coated, but unfortunately both elements are found in a single oil. Besides, it is impossible to maintain any degree of uniformity in the proportion of solids in the feed.

AT LINSI No. 3 washer the eight-box type of flotation apparatus is used. It has a capacity of 7 to 8 tons of solids per hour. The first is the mixing chamber. Here some coal froth is removed. The rest is drawn off through a pipe with regulating valve into the next box, where more froth is removed, and so on through the other six boxes. The first three boxes give first quality coal; the other five, second quality. The remainder is third quality. From 0.1 to 0.8 lb. of paraffin and from 0.3 to 0.6 lb. of cresol are used per ton.

The No. 3 plant gives, with Linsi No. 1 slack, 25 per cent of coal of 11.7 per cent ash; 41 per cent of 17 per cent ash, and 34 per cent of 47 per cent. The flotation results are excellent; thus, 24.5 per cent has been obtained with 10.1 per cent ash, 48.5 per cent with 11.3 per cent and 53.3 per cent with 11.6 per cent ash in tests of over 100 tons each.

Sea Yields 14,000,000 Tons of Coal Yearly; Nova Scotia Shares In Production

(Continued from page 209)

came almost together. The slope, which had only 110 ft. of cover between it and the sea bottom, was completely flooded, but apparently the water entered at another part of the workings.

In contradistinction to these failures, the mines in the Inverness coal field have been successfully operated. The seams dip north under the sea at an angle of 20 deg., though in some parts of the field the dip is 70 deg. Though there is a 13-ft. seam, the Seven-Foot seam alone is worked. The face of the slope is 5,350 ft. seawards from the shore. At its shallowest point the cover is 240 ft., and at its deepest, 2,300 ft.

The inclination of the slope has increased to 55 deg., and the sea bottom is descending at a grade of only 3 deg. Pillars are being recovered at points where the solid cover is 725 ft., and there are no indications of flooding. The Chimney Corner deposit which dips at an angle of 35 deg. under the sea has not been developed.

ANOTHER SUBMARINE area in Nova Scotia is the Joggins field, an extension of the Cumberland County coal district. The coal has been worked 4,000 ft. into Chigneeto bay, a branch of the big bay of Fundy. The cover at that point was 1,500 ft. The coal seam was invaded by dirt partings showing that the termination of the field was approaching. For this reason the mine is now entirely on the retreat.

The coal in the Joggins Main Seam was 3 ft. 6 in. thick and had a lower bench of 1 ft. 6 in. separated by a band of clay of thickness varying from 6 in. to 24 ft. Only the upper section was worked under the sea, as the clay band became too thick. The seam had an inclination of 17 deg., and the sea floor was virtually level. Advancing longwall was adopted though not near the shore. Electric mining machines were used.

AT NANAIMO, B. C., coal has been mined for a distance of 2 miles under the sea, progress ultimately being stopped by deterioration of the seam, the coal being replaced by black slate. At the No. 1 shaft of the Western Fuel Co., the Douglas seam is found at a depth of 640 ft. and the Newcastle seam at 700. The upper seam has been mined by room workings, and the pillars have been extracted wherever they are of value. They have been left, however, wherever the overhead cover below the sea bottom is less than 375 to 400 ft. thick. The lower seam was worked exclusively by longwall, its thickness varying from 2 to 6 ft. and averaging 3 ft. The sea floor is covered with mud and clay which acts as a seal. Small feeders of water have at times invaded pillar areas, the heaviest being a leak of about 75 gal. per minute that ceased after running six months. In the Suquash district, at the northern end of Vancouver Island, is a coal field that runs under the sea but the opening made in it has not yet reached the submarine area. There are two seams, one 4 and one $6\frac{1}{2}$ ft. thick. The coal dips only about 1 deg. along the shore frontage. A large area has a solid cover below the sea floor of only 130 ft.

DEPRECIATION

Calculating Its Correct Value

By Thos. F. Kennedy
Scranton, Pa.

NEXT to the problem of depletion, which was discussed in the September issue of *Coal Age*, depreciation is one of the most vexatious and complicated questions in coal mining. Before the advent of the income tax laws, depreciation among most mining companies was a nonentity. Many such corporations considered that the money spent on such items as breakers, railroad tracks, buildings, shafts, slopes, tunnels and the like was nothing but pure "operating expense." Accordingly, their accounting records reflected little or no value in the way of plant, equipment and development.

Through the various income tax laws, the corporations were required to restate their accounts and build up their plant, equipment and development capital values for purposes of both invested capital and depreciation, so that the proper taxable net income could be determined.

It is interesting to consider how the U. S. Treasury Department views the question of depreciation for income purposes. Sections 214 (a) and (8) of the Revenue Act of 1926 define it as:—"A reasonable allowance for the exhaustion, wear and tear of property used in trade or business, including a reasonable allowance for obsolescence."

Article 161 in dealing with depreciation states:—"A reasonable allowance for the exhaustion, wear and tear, and obsolescence of property used in the trade or business may be deducted from gross income. For convenience such an allowance will be referred to as depreciation, excluding from the term any idea of a mere reduction in market value not resulting from exhaustion, wear and tear, or obsolescence."

Article 162, in speaking of depreciable property, uses the following language:—"The necessity for a depreciation allowance arises from the fact that certain property used in the business gradually approaches a point where its usefulness is exhausted. The allowance should be confined to property of this nature. In the case of tangible property, it applies to that which is subject to wear or tear, to decay or decline from natural causes, to exhaustion and to obsolescence due to the normal progress of the art, as where machinery or other property must be replaced by a new invention, or due to the inadequacy of the property to the growing needs of the business."

Article 164, in speaking of the capital sum recoverable through depreciation allowances, states:—"The capital sum to be replaced by depreciation allowances is the cost or other basis of the property in respect of which the allowance is made. To this amount should be added from time to time the cost of improvements, additions and betterments and from it should be deducted from time to time the amount of any definite loss or damage sustained by the property through casualty, as distinguished from the gradual exhaustion of its utility which is the basis of the depreciation allowance."

Article 165, under the method of computing depreciation allowance, says:—"The capital sum to be replaced should be charged off over the useful life of the property, either in equal annual installments or in accordance with any other recognized trade practice, such as an apportionment of the capital sum over units of production."

Article 166, in speaking of obsolescence, states:—"With respect to physical property the whole or any portion of which is clearly shown by the tax payer as being affected by economic conditions that will result in its being abandoned at a future date prior to the end of its normal useful life, so that depreciation deductions alone are insufficient to return the cost (or other basis) at the end of its economic term of usefulness, a reasonable deduction for obsolescence, in addition to depreciation, may be allowed in accordance with the facts obtaining with respect to each item of property concerning which a claim for obsolescence is made."

Article 169, in providing for charging off depreciation, says:—"A depreciation allowance in order to constitute an allowable deduction from gross income must be charged off. The particular manner in which it shall be charged off is not material, except that the amount measuring a reasonable allowance for depreciation must be either deducted directly from the book value of the assets or preferably credited to a depreciation reserve account, which must be reflected in the annual balance sheet. The allowances should be computed and charged off with express reference to specific items, units, or groups of property,

TABLE I—FIRST METHOD—COMPOSITE LIFE

	Present Value	Percentage Factor	Year				
			First	Second	Third	Fourth	Fifth
	$50,000	20.00	$10,000	$10,000	$10,000	$10,000	$10,000
Year	Annual Expenditure						
1	$2,000	22.22	222.22	444.44	444.44	444.44	444.46
2	2,000	28.57		285.80	571.40	571.40	571.40
3	2,000	40.00			400.00	800.00	800.00
4	2,000	66.67				666.60	1,333.40
5	2,000	100.00					2,000.00
Total Annual	$60,000 depreciation		$10,222.22	$10,730.24	$11,415.84	$12,482.44	$15,149.26

TABLE II—DEPRECIATION SCHEDULE, PRESENT VALUE OF PLANT, EQUIPMENT, ETC.

Life of Item, Years	Value	Depreciation Factor Per Cent	Annual Depreciation 1st Year	2nd Year	3rd Year	4th Year	5th Year
2	$10,000	50	$5,000	$5,000			
3	9,000	33⅓	3,000	3,000	$3,000		
4	12,000	25	3,000	3,000	3,000	$3,000	
5	20,000	20	4,000	4,000	4,000	4,000	$4,000
Totals...	$51,000		$15,000	$15,000	$10,000	$7,000	$4,000

each item or unit being considered separately or specifically included in a group with others to which the same factors apply. The tax payer should keep such records as to each item or unit of depreciable property as will permit the ready verification of the factors used in computing the allowance for each year for each item, unit, or group."

After the cost or value of the depreciable assets has been established, the above section of the income tax law and the articles of explanation clearly define in a general way how the question of depreciation should be handled as far as income tax purposes are concerned.

Because of its broad scope, it is difficult to give a clear-cut definition of the word "depreciation." According to a standard dictionary, it means "to lessen the worth of; lower the price or rate of." In general it can be said that "depreciation" covers all forms of deterioration of wealth. In mining, I have classified depreciation as ordinary and extraordinary, and further subdivided it as shown diagrammatically.

DEPRECIATION

- Ordinary
  - (A) Physical
    1. Wear and Tear
    2. Decrepitude
- Extraordinary
  - (A) Functional
    1. Obsolescence
    2. Inadequacy
  - (B) Terrestrial
    1. Squeeze
    2. Cave
  - (C) Elemental
    1. Fire
    2. Flood
    3. Wind
    4. Lightning

There are several methods of writing off or determining depreciation in coal mining but I will illustrate by examples two general practical ways, the percentage or life, and the tonnage methods. I will also mention briefly a third form called the sinking fund. The percentage or life basis is also known as the straight line method and is separated into two subdivisions, the composite and individual.

The percentage or life basis will first be considered. Given:—Present value of plant and equipment, $50,000; life of plant and equipment, 5 years; annual capital expenditures, $2,000; to determine the annual depreciation charge. This is shown in Table I.

The percentage factors used in Table I are determined by considering that one-half of each annual capital expenditure is made in the first six months of the year and the other half spent within the last six months. For instance, the expenditure of $2,000 in the third year should be written off on the basis of two and one half years or 40 per cent. The annual depreciation is shown by adding the vertical columns of the table.

The second method, or that of individual life, would be treated as follows: Given:—Present value of plant, equipment, etc., 2-year life items, $10,000; 3-year life items, $9,000; 4-year life items, $12,000; 5-year life items, $20,000; making a total of $51,000.

Capital expenditures are:—Third year, 3-year life items, $12,000; fourth year, 2-year life items, $10,000.

The individual method involves more accounting, but more accurate cost figures can be obtained from it, and any extraordinary functional depreciation arising from inadequacy or obsolescence of a certain particular item can be determined.

For taxation purposes, the composite treatment is simple and more to be preferred than the individual plan. After all, since the personal factor involving the judgment of the cost engineer enters into the determination of the life of a depreciable asset, the composite method because of its simplicity should be used for practical purposes, when the percentage or straight line basis is considered.

The following problems show how depreciation can be written off on the tonnage basis, by both composite and individual rates.

The first will be worked out on the tonnage basis according to the first method or composite rate. Given:—Tons marketable Jan. 1, 1917, 100,000; capital, Jan. 1, 1917, $10,000; 1917 capital expenditures, $1,000; 1918 capital expenditures, $1,000; tonnage mined out in 1917, 10,000 tons; in 1918, 10,000 tons; to determine depreciation for 1917 and 1918.

The plant and equipment includes:—January 1, 1917, tons recoverable, 100,000; January 1, 1917, capital, $10,000; 1917 capital expenditures, $1,000; average 1917 capital expenditure, $500. The depreciation rate for 1917 tonnage is: $10,500÷100,000=10.5c. per ton.

The 1917 output is 10,000 tons. Then the 1917 depreciation on this tonnage amounts to $1,050. The cost remaining January 1, 1918, is therefore $8,950 and the remaining cost in 1917, to be written off on tonnage remaining as of January 1, 1918. is $500.00. The 1918 capital expenditure is $1,000; the average capital expenditure being $500 each six months. Then the total cost to be written off on a tonnage of 90,000 is $8,950+$500+500 or $9,950. Then the depreciation rate for the 1918 tonnage is 11.056c. per ton and the depreciation for 1918 on 10,000 tons is $1,105.60.

By the second method or individual rate we have given:—Tons marketable Jan. 1, 1917, 100,000; capital, Jan. 1, 1917, $10,000; 1917 capital expenditures, $1,000; 1918 capital expenditures, $1,000; tonnage mined out, 1917, 10,000 tons; in 1918, 10,000 tons. Determine the depreciation for 1917 and 1918. The result is shown in Table V.

In the above method, the depreci-

TABLE III—CAPITAL EXPENDITURES

Year Expended	Life of Item Years	Expenditure	Depreciation Factor, Per Cent	Annual Depreciation 3rd Year	4th Year	5th Year
3	3	$12,000	33⅓	$4,000	$4,000	$4,000
4	2	10,000	50		5,000	5,000
Totals.....		$22,000		$4,000	$9,000	$9,000

TABLE IV—TOTAL DEPRECIATION

Year	1st	2nd	3rd	4th	5th	Total
Present plant.....	$15,000	$15,000	$10,000	$7,000	$4,000	$51,000
Capital expenditures.....	.....	.....	4,000	9,000	9,000	22,000
Total annual depreciation.....	$15,000	$15,000	$14,000	$16,000	$13,000	$73,000

TABLE V—DEPRECIATION FOR 1917 AND 1918

	Capital	Tons Remaining Average	Rate per Ton	Tonnage 1917, 10,000	Tonnage 1918, 10,000
Jan. 1, 1917	$10,000	100,000	$0.1000	$1,000	$1,000
1917	1,000	95,000	.0105	105	105
1918	1,000	85,000	.0117	.....	117
Annual depreciation				$1,105	$1,222

ation rate for each annual capital expenditure is determined on the remaining tonnage at the beginning of the year minus one-half of the annual production for that year, except for the capital value existing at the beginning of Jan. 1, 1917, which was spread over the recoverable tonnage as of that date.

In the third method of determining depreciation, a certain amount is placed into a sinking fund at a safe and reasonable rate of interest, so that when the depreciable item has outlived its usefulness, its capital value is redeemed.

Where the economic life of the plant and equipment is greater than the life of the mineral deposit, the tonnage basis of calculating depreciation is preferable, but where the life of the coal is greater than the life of the plant and equipment, the percentage basis is generally used. However, both methods are often employed in either case.

Where there is non-uniformity in annual productions, the writer personally prefers the tonnage basis of writing off depreciation.

In order to show what makes up mining investments, I have selected a typical coal valuation problem of a mineral property and worked out the various factors using Jan. 1, 1927, as the basis date.

The assumed data are as follows:—Tons marketable, 1,000,000; estimated average annual production, 100,000 tons; estimated life, 10 years; estimated average operating profit*, 50c. per ton; total estimated expected operating profit, $500,000; interest rates, investment, 6 per cent; redemption rate, 4 per cent. Initial investments are as follows:—Plant and equipment, $75,000; development, $25,000. The estimated average annual expenditures are:—Plant and equipment, $2,000; development, $1,000.

*Operating profit includes depreciation, depletion and development charges.

The problem is to determine: (a) Present value of the coal; (b) depletion rate per ton; (c) proportional operating profit for each investment; (d) annual return on each investment; (e) amount to be placed away annually at 4 per cent to redeem each investment.

Two funds must be created to meet the future annual expenditure for plant and equipment and for development, each at 4 per cent, so that present value of $2,000 for 10 years shall balance the account. These will be:—Plant and equipment = ($20,000) (.81109) = $16,221.80; and development = ($10,000) (.81109) = $8,110.90; making a total of $24,332.70.

The present value of expected operating profit, $500,000 at 6 per cent and 4 per cent for 10 years, is $348,940. Factor, sinking fund formula = .697880 (See September *Coal Age,* Depletion.)

The total initial investment, present and future, therefore is:—Plant and equipment, $75,000; future plant and equipment, $16,221.80; development, $25,000; future development, $8,110.90, making a total of $124,332.70.

(a) The present value of coal, 1,000,000 tons, is $224,607.30 and (b) the depletion is 22.46073c. per ton. The total expected average annual operating profit derived from the three investments, coal, plant and equipment, and development is, therefore, ($0.50) (100,000) = $50,000.

Allocated in proportion to their present and future investments, these become:—Coal, $224,607.30; plant and equipment, $91,221.80; development, $33,110.90, making a total of $348,940.

Their individual operating profits per ton would be:—(c) Coal, 32.2c.; plant and equipment, 13.1c.; and development, 4.7c.

On the annual tonnage basis the operating profit for each investment would be: Coal, (100,000) (32.2c.) = $32,200; plant and equipment, (100,000) (13.1c.) = $13,100; development, (100,000) (4.7c.) = $4,700.

(d) Interest return on coal investment is:—(.06) ($224,607.30) = $13,476.438; on plant and equipment, (.06) ($91,221.80) = $5,473.308; on development, (.06) ($33,110.90) = $1,986.654.

The amount to be placed annually in the sinking fund at 4 per cent to redeem each of these investments is:—(e) Coal, $32,200 — $13,476.440 = $18,723.56; plant and equipment, $13,100 — $5,473.31 = $7,626.69; development, $4,700 — $1,986.65 = $2,713.35, yielding a total of $29,063.60.

As a check, the total present and future investment being $348,940, the interest return at 6 per cent would be $20,936.40. The annual operating profit being $50,000, the total annual amount for the redemption of all three investments to be placed away annually into sinking funds at 4 per cent would be $29,063.60 as shown above.

The above ideal problem assumes that the life of the mineral deposits is equal to the life of plant equipment and development and is used primarily to determine the approximate value of the coal for depletion purposes.

For practical purposes, the sinking fund treatment of the redemption of the depreciable assets, the plant, equipment and development, is generally disregarded in mining and the depreciation costs are determined by the composite or individual life or tonnage methods. The development costs, which include rock work, such as shafts, tunnels, slopes, drifts, and the like, are generally written off on the tonnage basis.

Depreciation and depletion today are recognized as the two outstanding capital costs. Proper book values and reserves are necessary in any financial statement. At present, practically all mining corporations are engaged in trying to perfect their systems of cost accounting, but owing to the nature of mine costs, great difficulty is being experienced in ascertaining correct figures. As a rule, the accountant in charge does not understand mining sufficiently and the mining engineer is not acquainted with the general principles of cost accounting, so that the two must co-operate in order to develop proper cost figures.

On account of the necessity of obtaining correct cost figures in mining, there is being developed today a "hybrid" of the accountant and the engineer, known as the cost or valuation engineer. His primary duty is to ascertain depletion and depreciation accurately.

It is the writer's opinion that each engineer being trained at college should be given a course in accountancy. This is often more important to him in his daily work than differential or integral calculus.

COAL AGE

Published by McGraw-Hill Publishing Company, Inc.

JOHN M. CARMODY, *Editor*

NEW YORK, OCTOBER, 1927

Safety Day Only a Start—Follow Through Important

Coal-mining men throughout West Virginia have reason to be proud of the manner in which Safety Day, or Lambie Day, was celebrated in Morgantown. It was well organized, well attended and supported alike by operators, state officials, including Governor Gore, United States Bureau of Mines officials and coal miners. The setting was splendid. With the campus and buildings of West Virginia University as a background, Mountaineer Field represented a connecting link between the leading educational institution of the state and its principal industry.

From every coal-producing county in the state men came to participate in the first-aid contests. Many teams had been trained over a long period; others showed evidences of being hastily gotten together for this contest. As a matter of fact, many of them would not have been trained at all except for the enthusiasm aroused by this meet. Herein lies an opportunity for state inspectors to do further missionary work and an opportunity on the part of operators to reduce their accident rate. Trained men are safe men. The very fact that systematic training in first aid and mine rescue is being carried on stimulates men and officials to use greater care day by day.

Safety Day, with its charm and its appeal to the imagination, is a challenge to coal-mining men in West Virginia and elsewhere to put forth greater effort to make coal mining a genuinely safe occupation. Only continuous and intelligent co-operation will achieve this result.

Mechanization Requires Persistent Supervision

Lack of vigorous, whole-hearted managerial *drive* or *push* is the primary cause of many failures in the use of loading machines, conveyors and other comparatively new equipment that facilitates actual mining. Dogged determination and Yankee ingenuity will accomplish wonders in mechanization. But these traits are made available to management only when those possessing them wade in and force progress. Perseverance, coupled with ordinary effort, will lead finally to achievement, but many companies hesitate to risk what appears to them an uncertain proposition. A drawn-out expenditure of time and money precipitates doubt as to the final result and discourages the organization in no small degree.

Dynamic energy in management is as necessary at the outset of mechanization as at any other stage of its development. Initial results indicative of gain draw forth such confidence, enthusiasm and effort that difficult problems are made to appear easy of solution. A momentum is built up which carries the work progressively forward. Relative success should be achieved from the beginning for then the miners labor with unusual zeal. The work is novel and the machines function uninterruptedly because they are new. When troubles and resultant delays in the early stages of mechanization are looked lightly upon as necessary evils which will gradually disappear as the miners become more accustomed to their jobs, and no determined effort is made to eliminate them in the order of their occurrence, initiative is dealt a staggering blow. Difficulties of one kind create others and soon all is chaos.

Much depends upon the man chosen to head the work. No man in charge of mechanization can delegate responsibilities to others and between occasional inspections of the work issue orders from afar. The successful mechanization boss practically lives on the job and sees every phase of development, every difficulty. He interprets for himself the exact causes of delays and he acts punctually and positively in every emergency. Satisfactory results can be expected only when a competent man stays with the job.

What's on the Mind of The Man Who Quits?

Labor turnover constitutes one of the avoidable wastes of industry. Much has already been done to eliminate it. Better employment methods, more intelligent supervision by experienced and trained foremen, more attention to working conditions and more consideration for minor grievances have all played a part in keeping men on the job and satisfied. Much yet remains to be done. In altogether too many places the management has not enough conception of the importance of hiring men carefully and, once hired, keeping them happy with their work.

Of major importance is a definite employment or labor policy, understood by every official of the company. No man should be allowed to engage new men who does not have a thorough knowledge of this policy, patience to explain it, tact in dealing with men and keenness in appraising them for skill and personality. He should remember that the man is sizing him up and judging his company at the same time. Courtesy and good will is quite

likely to start them both off on a better basis. When engaged, new men should be properly introduced to their job and to their foremen and their immediate buddies. Many men do not survive the first day; many more leave before they have worked a week. Why? How many mine officials know the real reason? Was the job misrepresented? Did the man get a bad place? Was he just a floater? If so, why was he engaged at all? Is the fact of his leaving a reflection on himself or on the foreman or on the general policy of the management?

It is always difficult to tell definitely but an approach can be made through what is termed the "exit interview." No man should be finally paid off and permitted to leave the employ of a company without being given an opportunity to tell someone other than his immediate foreman why he is dissatisfied. Such an interview may be very revealing. More frequently than not conditions that should be corrected will be brought to light. Such interviews, coupled with intelligent labor turnover records, will do much not only to reduce turnover but to save money directly in production costs and indirectly through reduced accidents.

Is Anthracite Fully Awake Or Partly So?

That anthracite is deeply concerned about the recovery of markets lost during the past few years to other fuels is no longer a secret. A start has been made to re-establish hard coal through the efforts of the Anthracite Service Bureau. Combustion engineers, working with dealers and their salesmen, report the elimination of many complaints thought to have been inherent in the coal but really due to maladjustment of equipment or faulty firing. An advertising campaign, telling the merits of this splendid fuel, is part of the program.

There are other factors, however, that demand serious consideration on the part of responsible executives. While many dealers claim the margin of profit is too small, consumers say the price is too high. More to the point, consumers are prone to feel there has been a falling off in quality. These observations on the part of dealers and consumers may not be passed over lightly by an industry with a heavy capital investment, whose welfare affects not only thousands of workers but entire communities throughout the anthracite region.

A major industry faces new problems. Every device known to engineering skill should be used to improve quality and effect economies that will reflect themselves in the price to the consumer. For ordinary salesmanship there must be substituted genuine merchandising plans and procedure. Cooperation throughout the region is necessary but in the last analysis the men in the industry must face the facts squarely and work out the answer.

Continuity of Operation A Means of Safety

So far all the suggestions that have been made relative to continuous operation of mines have either overlooked the question of safety or else have condemned the triple shift as unsafe. The latter arguments have never sounded convincing. It has been urged that mines need a time to readjust themselves to the stresses imposed on them by mining. No one is ready to explain why, and having delivered themselves thus oracularly the declarants rest satisfied with their dictum. It is one of those statements that can be denied as oracularly as it can be stated.

But neglecting the theory that the mine like a human being needs rest, it is safe to assert that the stay in operation means a crushing of the face and a weakening of the floor. Speed in extraction has distinct advantages as everyone recognizes. Even those who argue that the mine should rest at night will deplore its idleness during a shutdown or a strike. They readily admit that longwall if left for several days is likely to cave up close to the face and is apt to be reopened with difficulty. They cannot explain why there is not the same kind of objection to a short shutdown as to a long one.

There is another advantage wherever the men in the night are not engaged in loading and hauling but in cutting, posting, cribbing, jacking, moving conveyors and shooting coal, roof and bottom in the working place. A mine that is thus worked day and night will not have as many men in it at one time as if it was running only during the day, for the men at night will be doing jobs that are now part of the work of the regular miner. This will reduce the catastrophe hazard.

Besides, it will not be necessary to spread the work so much, and fewer places will be needed. The mine, therefore, will be under closer and more continuous inspection and supervision. If there is gas, and three shifts are worked, there will be less chance that places will fill with gas unobserved. There will be more assurance that the fireboss will do his work honestly. Moreover, with safety lamps in every place there will be frequent inspection night and day. A door is not so likely to be left open for hours. A short circuit is not likely to continue so long unnoticed. A mine fire is not apt to gain headway or a fall of rock occur unnoticed blocking the air.

On the whole, continuity of operation appears to be favorable to safety, though doubtless not so conducive to the health of the men and the happiness of their homes. With men coming and going the night long, with meals packed at 6 p.m. to be eaten at 4 a.m. and with sleep to be snatched in the heat of the midday amid the noise of platters, the roar of machinery, and the shouts of school children, life loses much of its zest as those who have worked on the "graveyard shift" can attest.

The BOSSES *Talk it Over*

Are You Loading Dirty Coal?

"IT SEEMS to be gettin' worse all the time," said Jim, the super, as he reached over the side of the picking table and fished out a piece of slate. "This chunk of rock, Charley, is a good example of what I'm driving at," he continued to the tipple boss while he lowered to the floor the object of their attention, which was too big to put through the refuse pocket. "It's a whopper, you see, and couldn't possibly have missed the eye or the shovel-feel of the guy who loaded it. Maybe he did it deliberately, trying to put something over on us; maybe he's sore about something. My third guess is carelessness. Anyway, it all amounts to the same thing."

"That's not the worst of it, Jim. Big slate like that can be picked out at this point. Our big problem is the small stuff—dribbles of slate and sluff. I've been making my inspections at the big feeder. You can get an eyeful there. Many of our loaders aren't separating the bands. A face-preparation inspector might help the situation."

"Personally, I don't like that inspector idea much, Charley, but to clinch the matter let's ask Mac what he thinks of it."

They later found Mac at the lamp house and put the question to him. "Not so good," answered Mac.

"The first half of that suggestion is O.K., Charley. Inspections of that kind help you to find out the loaders who shovel the bad with the good. I fired a man just a few minutes ago for loading dirty coal. The only way is to give them three or four warnings and then fire them if they won't mend their bad habits. If you penalize them they come right back at you when your back is turned. Firing is the only satisfactory scheme all around. You won't often make a mistake, either, for a good man will tell you when he can't load clean coal and show you why. About the bonus—why give it when we pay our men for clean coal?

"An inspector would be a good alibi for my assistants in laying the blame on him. They are in a better position than he is to watch out for dirty coal. They see more of the men and get closer to 'em. Besides, they can make an inspection without letting the men know what it's all about. Logically, the assistants should shoulder that responsibility. By that arrangement we also save a man."

"I guess you're right there," said Charley, "but how about a scheme of inspecting coal in individual mine cars at random, and a penalty and bonus system."

Do you agree with Mac?

If you have tried a bonus or a penalty system, what success did you meet?

Is a face-preparation inspector any help?

Perhaps you have a better scheme.

All mining men are urged to discuss these questions
Letters accepted will be paid for

What Other Mining Men Think

Good Light Is Necessary

THE only method to prevent the loading of dirty coal is to provide the miners with good light, and impose a just penalty for the unscrupulous loading of impurities. There must be no favoritism shown to any employee, such as remittance of the penalty, except when an employee has an abnormally dirty place to load from. In such a case, even in the face of justice, leniency ought to be shown.

The system employed in identifying the loaders car from which the dirt is obtained, ought to be such as to leave no doubt that the penalty could be wrongly placed. Separate picking tables are about the only just method. It is important to give the loaders every confidence that you are docking them rightly from every angle, and also create confidence in your views as per dirty coal; that it is not conscientious business to sell any kind of impurity as coal, not because of the inefficiency of such work, but because you wish to be fair to those who patronize you with their orders and because you simply desire to be honest. You will then get their confidence and co-operation, not only as it affects dirty coal but in other matters as well.

When a coal mine is opened up it is for the purpose of mining coal and delivering it to the consumer. To transport impurities is costly. Furthermore, the impurities have a reactionary effect on the good coal and decrease its calorific value. The first cleaning only can be done in the mine. Secondary cleaning may be performed by various means at tipple.

Each section boss can play an important part by noticing which loaders are trying to pick out the impurities from the coal. This is evidenced by the amount and nature of the material thrown back into the gob. It is highly important that the section bosses do this.

As to a face coal inspector it is better to give a little aid to the section boss at times, if this is really necessary, than have the duties of several officials overlap. All officials as well as every employee ought to be interested in the production of clean coal. If for no other reason this should arise from a desire to stimulate an efficient and economical method of caring for their business. And the marketing of clean coal is the business of operators and employees alike.

W. H. LUXTON.

Linton, Ind.

Push the West Mains

THE conversation between Jim, the superintendent and Mac, the mine foreman, relative to development brings up a problem that is difficult to solve without knowing the exact physical condition of the mine they have in charge. From the tone of their conversation, however, one is led to believe that they are up against the same typical condition that many operating executives are facing today. The general manager of this company must not know anything about the inside conditions of this mine or the operating end as a whole or he would not have permitted his company to sign a contract that would require 2,500 tons of coal a day during the winter months. If he was thoroughly acquainted with the development and conditions as they exist at this mine he would not have stopped the West Main Entries and concentrated production in the Hill section, which evidently is on the retreat. Rather he would have continued the West Mains in order to have enough room-producing entries to handle the desired tonnage.

The situation Jim and Mac are up against is a bad one and should be carefully worked out by the chief engineer, superintendent and mine foreman. In the first place I would say that the West Main and other territory should be started at once, working day and night if necessary, to get sufficient development to deliver the tonnage desired while the Hill section is being finished up.

Topic for November

Standardization vs. Variation in Mine Layout

Should the layout be standardized?

Should it be varied to meet changing conditions?

Mac has another problem on his hands

This is the only solution other than starting the old "hog system" which may enable them to produce the 2,500 tons per day or more for an indefinite time. The reckoning day will be sure to come, however, and Jim and Mac will be looking for a new job as this method of mining may ruin the entire mine. In any case, the production will drop in time and the operating cost will go up, which usually means a new job for all who take advantage of this system for large production and low operating cost. Coal plant equipment is usually designed and installed to produce a certain daily tonnage, therefore, why should the underground development be neglected through periods of depression in order to economize? This is really a good time to bring the mine to a good condition in order to produce a large tonnage on peak markets.

Labor conditions are usually good during low market periods and better efficiency is then obtained. If the company that Jim and Mac represents had practiced this system, no one would have been embarrassed during the time this contract was in force, but everything would have gone along in a normal way. In all probability they would have shown a low operating cost during this period and the company would have enjoyed a profit on the low-priced contract due to work every day and the large tonnage produced. There is nothing that will lower a fixed cost more than every day work and a large tonnage.

Efficiency and economy are the two words that go hand in hand today around all coal-producing plants, but I am led to believe that Jim's and Mac's company has practiced economy to the extent where it becomes false. This firm and its executive staff will have to do a lot of scheming in order to show a profit on this low-priced contract.

C. T. GRIMM,
General Superintendent,
Buckhannon River Coal Co.,
Adrian, W. Va.

The Foreman Sometimes Must Work Alone

THE superintendent should have the last word in any controversy, as the engineer from Ohio put it, providing he is a mining man, knows the mine and what is going on.

A few years ago I accepted a position as mine foreman with a company that had a superintendent who did not know the mine or what was being done inside. When he hired me he told me about an overcast he had made and said that I would have to split the air. This overcast was not quite completed and he expected me to finish it. I took the anemometer with me every day for about 6 months. I found that the fan was producing 60,000 cu.ft.; at face of No. 1 split entry, 2,500 cu.ft. of air was flowing; at face of No. 2 split entry, 4,000 cu.ft.; in front of the overcast, where the air was to be split, 7,500 cu.ft.

After getting a little acquainted with one of the assistants, I said to him one day, "What did you fellows do when the mine inspector and insurance inspector came around?" I assured him that he may have fooled them but he could not fool me and make me believe that any of the inspectors were satisfied. What he told me I will leave to the reader's imagination.

When the mine inspector came around about 6 weeks later, I had the ventilation restored in splits Nos. 1 and 2 but the instrument would not register in the main heading or No. 3 split. He said to me, "I will have to shut this section down." I replied, "No, I would not do it just yet." Then I told him the condition I found the mine in, what I had done and what I intended to do. I explained that I would have to go slow, as the price of coal was low and I did not like to boost it too much. But I guaranteed him that there would be enough air in No. 3 when he came down on his next trip.

When he came the second time he pulled right for No. 3 heading. After measuring the air he asked, "John, how did you do it?"

When I found out the condition of the mine I told the superintendent about it. The answer he gave me was the mine inspector had all information on his report, so the necessary air ought to be there. I realized immediately that I could expect no co-operation from the superintendent, and that I would have to go on by myself

and work out my own salvation without his assistance.

Thus it often happens that the superintendent has the last word in all important matters, even to the foreman's salary, yet the mine foreman has to work his own salvation alone and unaided.

JOHN BOHN.

Bosswell, Pa.

Leaders Are Needed Most of All

HOPELESSLY deadlocked in a conflict of human wills is the grim spectacle confronting us in the Central Competitive field. Intractible, fiercely stubborn, the opposing forces face each other, while economic wolves snap at the heels of both. When will this medieval display of savagery be displaced by constructive unity towards seeking a worthwhile solution? As one gazes at this amazing spectacle, Eugene McAuliffe injects the soothing balm of his disconcerting philosophy by showing us our crying need of leaders—leaders of men.

Blazing a trail, is this far-seeing executive, into virgin country infested with the cockleburs and bitterweed of bitterness and hate. Yet, his is the solution, the application of which will sweep away in time the cancers of distrust, the sores of disillusionment.

In my contacts with the methods obtaining in mining practice, nothing has struck me with such force as the brutal method of pairing the buddies—the shortsightedness of the policy of utter disregard for the individuality that appears in the placing of the men together in a coal mine.

From the cradle up we have been urged to realize the tremendous part that harmony plays in the smooth functioning of every utility; of how pleased is contentment in pointing to the realization and creation of our fondest hopes. What do we find in practice?

"Bill, are you ready to move No. 15 machine into the new rooms?" asks the superintendent.

"Yes, by tomorrow we'll have the switches laid and the roomnecks cut ready to make the change," replies the pitboss.

A couple of days later the pitboss will tell Pete and Tony to move their tools to No. 1 and No. 2 rooms on this new section, Andy and Batiste to rooms No. 3 and No. 4, and so on until, by the speediest method possible, the change is effected. Out of these men placed thus, at least 25 per cent of them are utterly unsuited to each other, and with the passing days of personal contact, the incompatibility becomes dissatisfaction, the dissatisfaction becomes open hostility, and this hostility will end in bitter, blistering hate that only tremendous self-control and running away from the awful contact, prevents fearful consequences.

Pitboss and assistants find a strange zest in the game of settling grudges by compelling ill-assorted pairs to spend a major portion of their lives in close proximity with each other, wholly blind to the crippling effect this will have on any operation.

Just how many miners have suffered hardship, and just how many promising operations have been ruined, by such abominable tactics will never be known. How many miners have suffered hardship and misery through discharge because large slabs of rock and clod have somehow been found among his coal when his car was dumped on top—placed there, no doubt, by a buddy seeking an avenue of escape from an association that has become unbearable —will also remain unsolved. And nobody cares.

"Wanted, Leaders of Men," says Eugene McAuliffe. Yes, men to lead who are MEN, big enough to think of the things they build and of that which comprises the building, in terms of humanity and justice.

Like the potter who lovingly molds the clay with the touch of understanding and skill into a thing of beauty as well as usefulness, so in time will the successful coal mine operate, and instead of the disturbing knowledge that men are running at breakneck speed to the outlet, feigning sickness, to escape a loathsome partnership before madness overtakes them, a new day will dawn and success crown the humane, farseeing and resourceful leader of men.

ALEXANDER BENNETT.

Panama, Ill.

Co-operation Is Needed

BY THE very nature of the conversation between Mac and Shorty in the July issue, there is no doubt but that they can get along together if they have the proper leader. The superintendent should call all his foremen together for the purpose of discussing their work. Where the interests of one overlap those of the other, he should explain the duties of each, somewhat as follows:

"Mac, as mine foreman, is responsible to the superintendent for the safe handling of the mine, its production, system of mining, use of supplies and such other responsibilities as we may discuss from time to time; every other foreman must assist him in every way possible so as to maintain a maximum output at a minimum cost. The coal we get out is what makes the pay roll.

"Shorty is the electrician. He is the best judge as to how to do his work in a satisfactory manner. I expect you and him to get along. When there are certain sections of the mine in need of wire I want you to let him know ahead of that need so that he can salvage material from any abandoned sections or get in such new material as may be required. I want Shorty to leave word on the bottom every day where he and his helpers can be found; if any troubles develop with the mining machines, haulage motors, pumps or other electrical or mechanical equipment, I want you to tell Shorty and I expect him to make the necessary repairs.

"Shorty, having just heard my remarks to Mac, you know what your duties are. I expect you to help Mac all you can, the principal way being by keeping all equipment in the best possible condition for the service expected of it. When Mac tells you of wiring he needs I want you to so direct your men that they will have it ready when needed for service. I will take this opportunity to tell you that you are responsible to me for your work and good behavior. If you were to receive all your orders from Mac, it would detract from his duty of getting coal, which I do not desire to be interfered with in any way, because that is his responsibility. But I do expect you to do the things in your line that he tells you of in a workmanlike manner and as quickly as the importance of the job indicates.

"Now here are my duties—I am responsible for each of you to the company, for the proper management of their property, to see that the best system suited to our mine is used in extracting the coal, that the cost of the coal can be such that after all expenses are paid there is a reasonable margin of profit for those who take the risk of investing their money in these properties. For if it were not for their investment or the investment of men like them there would be no need for us here because it takes money to develop coal land.

"The best organizations work in harmony, for each other and for the best interests of their employers, and they are working with the superintendent in getting the desired results. The superintendent has responsibilities far greater than those of any foreman but the average foreman will never appreciate this fact till he has some day fully assumed them."

My candid opinion is that in this particular mine the superintendent is at fault. He is expecting more from his men than he is giving (co-operation). He seems to lack "guts," but he may not know his business (mining). At any rate he is not making a good superintendent.

C. R. WEIHE.

Connellsville, Pa.

The Super Must Act

TO determine upon a plan of development requires co-ordination between the sales and the operating departments. A chart of the production in the past with a forecast of future demand from the sales department should enable the operating forces to formulate a plan of development that will make it possible for them to comply with the demand.

After taking into consideration conditions in the mine, which govern the methods of mining, a rate of development progress can be determined that will give the required amount of coal when needed. A ratio can be struck between the development and extraction processes that will have a tendency to balance the two.

Of course, any plan that depends upon a forecast of demand is subject to error, but it should within certain limits err on the side of overdevelopment. A condition of underdevelopment is a source of loss at all times. Overdevelopment is also a source of loss because it is not immediately productive and means an increased cost of equipment and maintenance.

Of the two evils we would rather accept overdevelopment, provided it is not carried too far. There are mines with exceptional physical conditions where development can be spread without loss, but in the average mine it does not pay.

In the case in point it seems that the general manager is in a jam, and it is up to Jim and Mac to help him out. They should have a heart to heart talk with him and impress upon him the necessity of planning for the future. In the meantime, they should push the West Main Entries for all they are worth and balance the production from the Hill so as to supply the demand and maintain the cost so that the Old Man may have a margin.

The Hill coal represents an investment that can probably be made profitable if its production is utilized to balance the underdeveloped condition of the West Main.

I do not blame Mac for his "I told you so" attitude, but it is up to him to see what he can do under the circumstances and it is up to Jim, the chief engineer and the sales manager to impress upon the Old Man that to have an under-developed mine is not a desirable condition from either a sales or an operating point of view, and cannot be profitable for the company.

CYMRO.

Bear River, Colo.

Why Are Not Conditions Made Safe?

FROM all appearances Jim and Mac and their staff have brought this safety shake-up from the Old Man on their own heads. Why should there be a tight place in a room entry or haulage road that a trip rider would get caught in? Either the machine runner had the entry off the sight line and it was let go at that because it was only for a cut or two, or a timber crew set timber too close on the clearance side. Where was the section foreman? If the entry was off the sight line, he should have had the machine runner take a skip off the next cut and make it lawful. If timber was set too close, the timber crew should have been taken back on the section foreman's next round, been shown their mistake and been made to correct it. Had this been done they would not have been careless on the next job. Why should a timberman get caught under a stretch of bad roof in the first place? The roof should not have been let go as long as it would hang, or until a motor crew refused to haul under it any longer. But if that stretch of roof did get bad in a short period, why did Mac not go with his timber crew and start them right by beginning at the end of the bad stretch and taking the loose roof down with bars so work could be done under solid roof at all times? Explosives might be used if necessary.

Now why don't Jim and Mac try and live up to the mine law of their state and keep their mine in lawful shape? By having it in that condition, workmen will not need to be looking for tight places or motor trips creeping through dangerous places. The increase in production will pay for this work, the state inspectors will give the officials a clean report and the difference in insurance charges will be quite an item. Everyone around the mine will feel safe at his work and there will be no need for safety meetings. The Old Man will then come around with a smile instead of giving everybody a jacking-up and will have good reason for sticking out his chest when speaking of his mine.

MAL SEESE.

Cairnbrook, Pa.

Safety Always Pays

THE question "Does Safety Pay" must be answered in the affirmative. This assertion can be proved on almost any case in question and as a rule safety also improves efficiency.

To cite a practical instance: It takes money to rockdust a coal mine, but if the rockdust barrier smothers an explosion before it leaves the section in which it originated, instead of propagating throughout the entire mine, the money spent for rockdust and labor in laying it, is cheap insurance for the saving effected.

As to its efficiency, the greater visibility due to the reflection from white walls or roof, is bound to facilitate the movement of men and animals, thereby increasing their efficiency, by adding a sureness to their touch and footing which is lacking when the only light available is that of the miner's cap lamp dulled by the unreflecting black ribs of coal.

Of course I am aware that some readers will say that an explosion shows a lack of safety in the first place or it never would occur. This is correct, but as long as human nature is what it is, these things will happen, and the only way to prevent them is to use all methods at hand, and omit none. Other dangerous conditions include badly bonded tracks setting fire to the coal dust around the rails, causing what may result in a bad fire. The motor may become insulated from the track because of dirt on the rails, and the motorman or triprider or a passing miner in touching the machine may receive a severe shock. This may result in a serious accident, arising either directly from the shock itself or causing him to jump or fall onto a passing track in front of an on-coming locomotive or cut of cars.

An insulated locomotive cannot operate satisfactorily, so good bonds or clean road, as aids to efficiency are obvious. Bare wires passing through wooden brattices are equally dangerous and so on *ad infinitum*.

Safety always improves efficiency. I think the next three questions can be answered by answering one of them.

The company ought to employ an efficient safety engineer whose sole duty is safety, and whose word is law on this subject. But he should accept the responsibility for results and costs together with the authority. The degree to which he wants the co-operation of the different divisions should be left to his judgment. I believe it would be wise for him to budget his work.

THOMAS JONES.

Bicknell, Ind.

Safety Talk Helps

THE best way to keep the safety movement continuously alive is for the mine foreman to have something to say regarding safety in every place he visits. If the man's place is O.K. tell him so, let him know you appreciate his co-operation in promoting safety. If he needs timbers have him set them according to instructions at once. If his place is going to the dip have him keep a good stop on the end of the track as it is dangerous to load in front of car with only the brake to depend on. A lump of coal may hit the brake lever and release it at any time, or the weight of a heavy loaded car may cause it to slide on into the face and catch the workman. And see also that explosives are properly taken care of; as well as bad conditions in general.

Then continue with your other most important points, such as taking centers and seeing that the track is properly laid. Then comes the most important safety work of all—regulating the haulage so that it will be safe. As to conditions governing haulage at each mine, I think this is a problem to be worked out by the superintendent, the safety engineer and the mine foreman.

If a rule is once adopted see that it is carried out. Then at your next safety meeting, when the chairman asks you to explain the cause of your last accident, it will be much easier.

The fatalities on haulage in July were 27—on falls of roof 61—according to the Bureau of Mines reports. This goes to show that haulage is about ten times as hazardous as other mining in general, and should be looked after more closely.

Coal mining machines constitute a source of danger that has to be taken care of carefully. My experience has been that it is unwise to get in such a hurry for coal to be cut that you have to put inexperienced men at work on mining machines. Most accidents that occur around machines are caused by workmen unfamiliar with the job making the wrong move.

We should give this matter all the consideration it deserves as safety pays big dividends. And I believe if you lose a friend by enforcing safety rules that you will make two new ones, because it will make them take the right interest in their own welfare, stop a big percentage of your accidents, make your work easier, and avoid loss of time and unhappiness.

JOHN H. CROWLEY.

Pruden, Tenn.

Properly Administered—Safety Pays

SAFETY pays good interest on the investment in any industrial organization. I don't believe that money spent on safety devices, on safety work or to promote safety work is a bad investment. Although many companies and corporations spend lots of money on safety work that they shouldn't have to spend—that is, they spend money to prevent men from using careless practices and endangering both themselves and others as well as the property—this is money well spent and pays good dividends rather than being a costly expenditure. I am sure that if the Old Man is shown where and how his dollars spent on safety will be returned, there will be money and encouragement for the safety campaign. But on the other hand, if the Old Man invests money and gives encouragement and then when he checks up results after a reasonable time finds that he is losing money, he will call a halt to this kind of activity. In such a case he is losing not because of the expense of safety but because he is paying one or more employees for services that he is not receiving.

I don't believe there ever was or ever will be an operation that operates at maximum efficiency if safety is not given careful consideration. Safety is one of the great factors in efficiency and a boost to either steps up the other.

Safety should be practiced and encouraged from the highest officials down if the best results are to be expected. Its practice is especially important on the part of those who are in charge and in contact with the men. If the bosses and assistant bosses allow all kinds of careless practices to be followed, and set a bad example to their men, the company will not receive satisfactory results from money expended on safety work. But in cases of the kind just mentioned, in large operations or those having hazardous conditions, I would recommend a safety engineer rather than the safety committee. While the committee policy may be good, I believe a safety engineer is better and if he needs help another good man should be secured to work under him or to give him what help he needs.

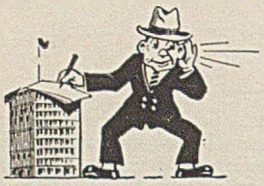
A safety engineer should be a man of good moral character, of sobriety, and one who sets a good example before others. He should exercise good judgment and have enough experience to readily detect careless practices in the different classes of labor from foreman down. He should give careful consideration and inspection to all the major and minor accidents as to their extent and cause, giving each a careful study so that, if possible, ways and means may be devised to prevent similar occurrences.

Safety engineering is like all other branches of the profession. Checks, made periodically, will show careless practices being followed by workmen who are purely ignorant of the danger inherent to the work they are doing. When a safety engineer is employed those really know how to work safely are made more careful, for they know that he is watching their work.

H. T. WALTON.

Wolfpit, Ky.

WORD *from the* FIELD



Compensation Insurance Outlook Uncertain

The fate of coal-mine workmen's compensation loomed large and menacing at the annual National Convention of Insurance Commissioners held at Cincinnati, Sept. 27-29. At the committee meeting on coal-mining compensation insurance under the chairmanship of State Insurance Commissioner Button of Virginia, Clarence W. Hobbs, special representative National Council on Compensation Insurance, stated that several companies, among which was the Metropolitan Casualty Co., were leaving the coal field, the Metropolitan on Oct. 1. This, in his opinion, constituted an emergency that should be called to the attention of insurance carriers.

R. J. Sullivan, vice-president, Travelers Indemnity Co., said his company desired to write coal-mine workmen's compensation and stood ready to do it on three weeks' notice wherever a definite emergency existed as in Tennessee —contingent, however, on the adoption of the rating program. It must further be understood, he added that the insurance company would demand of every coal company whose business was accepted: (1) Such financial stability as would insure the power of that company to co-operate in a safety program, and (2) such co-operation as would tend to reduce hazard. All other risk the Travelers would regard as undesirable, Mr. Mr. Sullivan stated.

The difference between the projected programs of the Travelers and the United States Fidelity & Guaranty Insurance companies, continued Mr. Sullivan, were not great. The latter wanted a larger expense loading for better protection, to wit, 40½ instead of 34 per cent. The former wants a safety margin. These were two different ways of expressing the solution of the same problem. There was nothing irreconcilable in their attitudes.

Mr. Hobbs was instructed by the committee to prepare a resolution stating the emergency and urging the stock companies to undertake the writing of coal-mining workman's compensation insurance.

Discussing the present situation in coal-mine compensation insurance, Mr. Hobbs, in a special report, said: "In a number of states the coal-mine business is in the hands of a single carrier and that carrier is in the position to pick and choose his business."

Mr. Hobbs also submitted a plan prepared as the result of a consultation between a special committee of the National Convention of Insurance Commissioners and the carriers' committee representing stock and non-stock companies. This plan is outlined in a general way in the article by R. Dawson Hall, on "Compensation Insurance," appearing in this issue.

Mr. Hobbs remarked in his report that "The cause of the condition has been charged to the failure of carriers to obtain rate approvals in the so-called regulated states. This, of course, had its effect; but as a matter of fact, if all rate approvals asked for by the Council had been promptly and punctually allowed, the carriers would still have incurred substantial losses."

Colorado Wage Advance Blocks I. W. W.

DECISION of the Colorado Fuel & Iron Co. and a number of other companies to increase wages Oct. 1 appears to have upset plans of the I.W.W. to call a strike in Colorado on Oct. 18. The I.W.W. plans were framed at a meeting at Aguilar on Sept. 4.

The demands, which are many, include chiefly a six-hour day, a five-day week and a minimum wage of $7.75 a day. For pick mining $1.02 per ton is asked; 77c. a ton for machine loading; entries, $2.58 a yard; slate, 6 to 12 in., $1.36 per linear yard, and 13c. per inch for each additional inch; dry entries, $3.50 per yard; wet entries, $4.98.

The increases posted by the operators apply to both tonnage and day rates. The latter will be increased to $6.20—an advance of 68c. per day over the present rate.

I. W.W. organizers have been quietly at work in the Colorado coal fields for almost two years but have been especially active during the last few months. Officials of the United Mine Workers, which has maintained only a skeleton organization, have openly condemned the organization work of the I.W.W. and denied rumors that they even tacitly approve their efforts to organize the miners.

Opinion among operators is divided as to the relationship of the two organizations. Some assert that the I.W.W. is acting alone, while others charge the very collusion that has been publicly denied by O. F. Nigro, president, and Felix Pogliano, secretary of district 15, United Mine Workers.

Thomas Annear, chairman of the State Industrial Commission, declared Sept. 16 that the proposed strike is

illegal and that the I.W.W. has no authority to call a strike. He intimated that the Commission would appeal to Governor Adams to outlaw the proposed walkout.

Obituary

FRANK C. WIGHT, editor of *Engineering News-Record,* one of the McGraw-Hill publications, who had served that journal and its predecessor, *Engineering News,* in an editorial capacity for 21 years, died at his home in Summit, N. J., Sept. 18, at the age of 45. He had been ill for a week with an infected throat, which followed shortly after his return to his desk after a nervous breakdown. Mr. Wight, who received the degree of civil engineer at Cornell in 1904, entered the field of technical journalism in 1906, when he became associate editor of *Engineering News.* For six years his main assignments were in the fields of concrete, general construction and river and harbor work. In 1913 he was promoted to the managing editorship of *Engineering News,* a position he held until that paper was consolidated with *Engineering Record* in 1917. Four years later he became managing editor of the consolidated journal, and on Jan. 1, 1924, upon E. J. Mehren's withdrawal from editorial service to devote his time to the executive management of the engineering unit of the McGraw-Hill publications, Mr. Wight was made editor of *Engineering News-Record.* This position he held at the time of his death.

ROYAL L. MELENDY, who recently had resigned as general manager of operations of the Consolidation Coal Co., died at his home in Fairmont, W. Va., Sept. 10, after a two weeks' illness. Before joining the Consolidation company, about a year ago, he was an officer of the Colorado Fuel & Iron Co., Denver, Colo. He also had served on the U. S. Coal Commission in connection with its studies of labor relations in bituminous coal mining.

CHARLES W. CRAWFORD, 92, a pioneer manufacturer at Brazil, Ind., died of a stroke of paralysis at his home in that city Sept. 1. In the early days of the Brazil block coal fields he manufactured the first ventilating fan used west of the Alleghenies. He also developed the lead-lined pump.

Washington Letter

By Paul Wooton
Special Correspondent

BECAUSE of the important bearing which the efficient use of coal has on the producing industry operators, it is pointed out in Washington, have a great interest in the National Fuels Conference which is about to be staged by the American Society of Mechanical Engineers in St. Louis. The great interest which was taken at a similar conference in Pittsburgh last year, and the interest being manifested in the forthcoming meeting, indicates that there is no waning of the enthusiasm in the quest for thermal efficiency.

At Pittsburgh last year, a score of lines were revealed along which keen engineers are working to effect still further fuel economies. Research has become organized. The fuel engineer has been called into existence. Nationally-known engineering firms are specializing in fuel utility. The profits from the sale of improved equipment have attracted many millions of capital into the manufacture of such machinery.

Before 1916 most wastes in the burning of coal passed without notice. The high prices and the shortages of the war period made efficiencies in the use of fuel an absolute necessity. The lead in that direction was taken by the electric utilities. They were pinched between the rising cost of coal and the practically stationary price of their product. Other industries were quick to follow.

Employees soon found that the best road to promotion was through the boiler room. Papers on fuel economy crowded the pages of the technical journals. The American Society of Mechanical Engineers recognized the trend by organizing a fuels section. Local and sectional meetings of the war period have grown into national gatherings for the discussion of fuel technology.

PRODUCERS and wholesalers of coal have been invited to attend the St. Louis meeting. Fuel specialists in Washington think it is most essential that these factors in the coal trade should attend, since the future trend of fuel efficiency is expected to have more to do with their market than any other factor. In fact, it is regarded as the most significant factor that exists today in the world's coal market. It is considered the chief contributing cause to the depression which has gripped the coal industry for a series of years.

The demand for bituminous coal grew with remarkable regularity up to 1917. Since that year there has been no increase in consumption. It is true some years show larger production for extraordinary exports, but the old increase at the rate of 17,000,000 tons a year came to an end. Had it continued our producers today would be selling 150,000,000 tons more coal each year.

This change from a growing to a stationary demand was not felt so keenly prior to 1923 because a series of strikes and frequent periods of car shortages kept it from showing itself. Now that car shortages are no more, the greatest strike the United Mine Workers is capable of waging produces only a feeble effect on prices, despite its six months' duration.

As efficiencies in the use of coal are likely to continue to be a great factor in market, it is felt that all branches of the coal business should familiarize themselves with such an important underlying factor in demand. Some think the limit of fuel saving has about been reached, but in that connection it is pointed out that the best brains in many activities are being concentrated on fuel economies. The average consumption per kilowatt hour of all electric utility plants is 1.94 lb. The best plant uses only 0.9 lb. Such a figure is not a hypothetical objective to be obtained in the future. It is a demonstrable fact that the electric utilities have reduced their consumption of coal by one-half. Such results are certain to have an important relationship to the coal requirements of industry.

No complaint has been heard from the coal industry in this connection. It is recognized as a great social benefit. The producer of coal is contributing his part toward greater national efficiency through cheaper power by reducing mining costs. Nevertheless, he must keep in mind that this trend is shaping the economic environment of his business.

James H. Pierce

To his training as a mining engineer in the United States, Mr. Pierce now adds a valuable European experience. In Russia his primary responsibility recently has been the application of American methods to Russian coal mining properties. Not content to confine his knowledge of mining to methods used in America and Russia, Mr. Pierce made an intensive study of practices in the older fields of Germany where many engineering and economic handicaps have been overcome. On pages 203 and 204 he asks "Is Europe Wrong or Are We?"

Will Cover Coal Mine Accident Hazard

AMONG the many companies restricting their coal-mine workmen's compensation lines has been the Metropolitan Casualty Insurance Co. which, beginning to write in 1925 with $380,431 of business, in 1926 wrote $816,381 worth. It is said that the Metropolitan had, in the present year, the largest coal-mine workmen's compensation premium writing. To meet the situation caused by the restriction of the Metropolitan business, the American Mine Owners' Casualty Corporation, a stock company with immedite capital of $200,000 and $100,000 surplus, has been formed to write workmen's compensation for mines.

Evan L. Reese will be president and H. M. Rose, vice-president. Both have been associated with Carl M. Hansen, general manager of the General Reinsurance Corporation for many years. The company will be organized under the laws of Pennsylvania and will operate with Huntingdon, Pa., as headquarters. It has made application to do business in Illinois, Indiana, Kentucky, Tennessee, Alabama and Virginia. The new company will reinsure its catastropic losses with the General Reinsurance Corporation of New York. That company will assume all liability in excess of the first loss of $25,000 on account of any one accident.

Personnel Changes

Carl Hayden resigned Sept. 15 as chief engineer of the Crosgrove-Meehan Coal Co.'s five Illinois mines to become assistant general manager of the O'Gara Coal Co., with offices in Chicago. For the last four years he was stationed in Marion, Ill., having previously been with the Madison Coal Corporation.

John J. Mantell, formerly vice-president of the Erie R.R., has been elected chairman of the board of the Public Service Coal Co., Scranton, Pa., an independent anthracite producing company which recently built a breaker near Jessup, Pa.

J. M. Miller, formerly manager of the Cincinnati office of the Raleigh Smokeless Fuel Co., has been transferred temporarily to the company's Norfolk (Va.) office.

G. W. Harris, for fourteen years one of the leading operators in the Rocky Mountain region, has resigned as president of the Colorado & Utah Coal Co., Colony Coal Co. and the Harris Coal Co., Denver, Col. The presidency of the Colorado & Utah and the Colony companies goes to Charles Shuler, of Davenport, Iowa, and A. M. Fancher, formerly sales manager of the three companies, heads the Harris Coal Co.

R. H. Magraw succeeds George T. Peart as vice-president and general manager of the Rocky Mountain Fuel Co., Denver, Col. Mr. Peart, who was affiliated with the Rocky Mountain Co. for 30 years, will take a trip to Europe to visit relatives.

West Virginia Safety Day Celebration Thrills 20,000; 140 Teams Compete; Lambie Honored

WEST Virginia's second annual Safety Day meet, held at Morgantown on Saturday, Sept. 17, provided one thrill after another for 20,000 people who participated actively or as auditors and spectators. Coal-mining men and their families, gathered from all parts of the state to prove their interest in the safety movement and to pledge their devotion to Chief Lambie. Members of the mining fraternity from Virginia, Kentucky and Pennsylvania, as well as Governor Gore, Bureau of Mines officials, and others, were deeply impressed by the inspiring celebration.

The festivities began with a parade through the principal streets of the city and included a first-aid meet in which 140 teams took part. In the evening hero medals were awarded for bravery in face of great danger, medals and cups for safe mine and quarry, trophies for the victorious first-aid teams, cash prizes for best safety creeds and the climax was the presentation of a handsome bronze plaque to "Bob" the state mine chief. The celebration wound up with a fireworks display.

The Governor's cup, put up for the best first-aid team, was won by the team of the Consolidation Coal Co. representing Mine No. 63, at Monongah. The same outfit also captured the cup offered by the Fairmont *Times* for the best team in Marion County.

It was a stirring sight when the parade swung into action soon after noon and traversed the business section of the city. From the reviewing stand at the court house Governor Gore, the reception committee and other noted visitors watched the procession. When the cavalcade reached the West Virginia University Stadium, the teams took their places for the meet in good order. The stadium was resplendent with the national colors.

The Monongah team won chief honors in the first-aid contest after it had been tied at 100 per cent with the C. H. Mead Coal Co.'s team of East Gulf on the first three problems. On the work-off of the tie the Monongah team won first place. The Mead company's crew was awarded second prize.

THIRD place went to the Kelley's Creek Collieries Co., of Ward, and fourth prize was won by the Continental Coal Co., of Cassville, Monongalia County. These two teams also had tied for fourth place, but on the work-off the local outfit was successful. Fifth prize went to the New River Coal Co. team from Skelton when it won a work-off of still another tie at 94.6 per cent with the Kingston Pocahontas Coal Co. team of Kingston.

The Continental Coal Co. team won the silver loving cups offered by the Monongahela Coal Operators' Association for the most proficient team in Monongalia County. A second prize, also offered by the association, likewise went to a team from the Continental company. Both of these teams had been organized but a few weeks before the meet was held, and had been trained by safety directors for the West Virginia Department of Mines sent here for that purpose.

To the No. 6 mine at Gary of the United States Coal & Coke Co. went the "Sentinels of Safety" trophy for winning the national safety contest among bituminous coal mines, while to the same mine went also the certificate of honor of the Joseph A. Holmes Safety Association. The Berkeley plant of the North American Cement Corporation also received the "Sentinel of Safety" trophy for winning the competition among quarries in 1926.

The Joseph A. Holmes safety medal and certificate were presented to Grover Wilson for his heroic effort to save L. C. Blair, a fellow worker, when both were overcome by "afterdamp" while exploring the Eccles mine after they with other miners had been trapped in the working by an explosion.

The honors were presented by William W. Adams, supervising statistician of the accident statistics section of the U. S. Bureau of Mines. Edward O'Toole, general superintendent of the United States Coal & Coke Co., received the trophy for that company and A. P. Couchman, safety director for the Berkeley plant of the North American Cement Corporation, received its trophy. Wilson received his medal in person.

Prizes also were awarded to winners of a competition in submitting safety creeds, first prize going to B. V. Williams, an employee of the Boone County Coal Corporation at Sharples, second prize to M. M. Spadden, of Sun, and third to Harold R. Thomas, of Farmington.

AN UNEXPECTED honor came to Robert M. Lambie, chief of the State Department of Mines and founder of the safety day idea, when he was presented with a plaque as the gift of miners, operators and others interested in the coal industry.

The plaque, with Chief Lambie's profile in relief, carried the inscription: "Robert M. Lambie, West Virginia Department of Mines; presented by an appreciative industry in recognition of constant devotion to the cause of safety." It was presented by Walter H. Cunningham, secretary of the West Virginia Coal Association, and the reproductions of it were given to each of the district inspectors in Chief Lambie's department.

Bluefield, Mercer County, in the extreme southern end of West Virginia, has been selected as the location for the staging of the third annual observance of State Safety Day, Mr. Lambie, announced. The Bluefield meet will be held on Sept. 8, 1928, and will be staged in Beaver Stadium, scene of the Bluefield High School football games. This stadium will be of ample size to accommodate all visitors.

Skill Makes Them Champions of West Virginia

Coming Meetings

National Fuels Meeting, under the auspices of the Fuels Division of the American Society of Mechanical Engineers, will be held at St. Louis, Mo., Oct. 10-13. Chairman Publicity Committee, Edwin C. Moody, 1932 No. Broadway, St. Louis, Mo.

Illinois Mining Institute. Nov. 18 and 19, at Urbana, Ill. Secretary, Frank F. Tirre, St. Louis, Mo.

Illinois Interests to Resume Joint Wage Conferences; Court Battles Rage in Ohio and Pennsylvania

CLOSE on the heels of the collapse of a second attempt to negotiate a new contract in Illinois, which ended in a deadlock Sept. 14, decision has been reached to again go into joint conference. At a meeting of operators in Chicago Sept. 28 a suggestion of John L. Lewis, international president, and Harry Fishwick, district president, United Mine Workers, for another meeting was acted upon favorably and the union was invited to name the time and place.

There were hopes for a time after the earlier conference began, on Sept. 7, that peace might come out of the parley, as it was understood that the miners were willing to discuss the wage problem on a basis other than the Jacksonville agreement. The question of attempting to reach an agreement on a new contract was left to a subcommittee of two operators and two miners. George B. Harrington, president of the Chicago, Wilmington & Franklin Coal Co., and Herman C. Perry, general superintendent of the Indiana & Illinois Coal Corporation, were named to represent the producers on the subcommittee. The miners' representatives were Harry Fishwick, president, and Walter Nesbit, secretary-treasurer, of district 12.

After deliberating for a week, however, the miners proposed a continuance of the Jacksonville scale for the rest of the coal year ending March 31 next, with the proviso that a commission of operators and miners meanwhile would investigate wages in the union and non-union fields for the purpose of establishing a competitive scale in Illinois to become effective April 1 next. The operators, having declared that they must have a wage scale that would enable them to compete with non-union mines paying between $5 and $6 a day, were unable to agree on the miners proposal. Members of the Coal Operators' Association of Illinois later agreed among themselves not to sign individual and separate agreements with the union.

BATTLES in the courts are in the front line of events in the Ohio and Pennsylvania labor situation. Picketing was placed within strict limits in five eastern Ohio counties by a preliminary injunction issued by Judge Benson W. Hough in U. S. District Court at Steubenville on Sept. 10. Five companies were affected by the order.

Since the promulgation of Judge Hough's ruling the strikers have resorted to the radio to make their appeals to the non-union workers. Seventy mines are now reported to be actually producing coal in the Buckeye State under open-shop conditions. In the southern Ohio field there have been minor disturbances, but production for the state as a whole is slowly increasing according to figures compiled by the U. S. Bureau of Mines.

The injunction and damage suit for $1,500,000 of the Pittsburgh Terminal Coal Corporation against the United Mine Workers passed into the hands of Judge F. P. Schoonmaker in U. S. District Court at Pittsburgh Sept. 13. The court took the case under advisement, after hearing a counter charge by John L. Lewis, international president of the union, to the effect that Frank M. Taplin, dominant figure in the Terminal corporation, had sought the moral and financial support of the United Mine Workers in an attempt to win control of the Pittsburgh Coal Co. This Mr. Taplin denied.

Meantime the Terminal corporation is reported to have increased its output to 50 per cent of normal. Announcement also was made that the Vesta Coal Co. would start its third non-union operation during the latter part of September. This is mine No. 4, at Richeyville, which normally employs 1,350 men, with an output of 7,000 tons daily. The Hillman interests likewise have made a start at open-shop operation in the union part of the district.

A gradual swing into the non-union column is taking place in the Broad Top region too.

Tell How to Win and Hold Users of Hard Coal

PROGRESS made by the Anthracite Coal Service in its program to broaden the market for hard coal was the keynote at the first fall meeting of the Engineers' Society of Northeastern Pennsylvania, held in Scranton, Pa., Sept. 15. Nearly 200 members and guests of the society, gathered in the Chamber of Commerce Club, heard addresses by C. W. Hare, manager, Anthracite Coal Service, Philadelphia, Pa., and C. A. Connell, assistant manager.

Mr. Hare emphasized the advantages of personal contact and service in selling the fuel and overcoming difficulties in reclaiming lost markets. In selling anthracite in the Middle West and other points where the consumption has fallen to a negligible quantity, he stated that he found honest and favorable reaction in response to his efforts.

The dealer must be shown that he can make a better profit with anthracite than with a competing product. This can be done through service and truth, for "anthracite stands for itself as the best home fuel for a century."

Mr. Connell described the methods used to eliminate sources of complaint through the application of knowledge possessed by combustion engineers.

Schools were started with dealers in several centers and textbooks issued with remedies for heat trouble, which were primarily draft and leaks. By this educational method, the dealer could forestall consumers' complaints by correcting faults himself and not allow the trouble to be laid at the door of hard coal. Educational work of this type has been completed in twenty cities.

Favors Smaller Classes And Broad Training

COL. J. A. S. Ritson, professor of mining, Leeds University, Leeds, England, who has been visiting the United States and Canada, made a call at the *Coal Age* offices Sept. 15. He left New York City the following day on the Str. "Samaria," for Liverpool.

Colonel Ritson was in attendance at the Empire Mining & Metallurgical Congress. At the conclusion of the tour he visited several universities to obtain suggestions for the equipment to be installed at Leeds University in the new mining laboratory, already constructed at a cost of $200,000, of which $125,000 was presented by the West Yorkshire Coal Owners' Association and $50,000 came from the Miners' Central Welfare Fund.

Mr. Ritson expresses great appreciation of the interest shown in technical education in England, especially in the West Yorkshire coal field. He is not an advocate of large numbers in universities, certainly not in mining. All the production is hand made. He favors intensive training, especially in those departments of education where work must be done by the students in the laboratory or field. Where many students work under a demonstrator, one man often will be found doing the greater part of the labor and getting an undue proportion of the experience. The rest are looking on and learning little from the demonstration. Care must be taken to rotate the work and give every man an opportunity. That cannot be done with a large class.

COLONEL Ritson explained that the university training that his department supplied was for managers and "agents." An "agent" in Great Britain represents the owner of the property. Under the law he need not be a technical man, but usually he is, and he must be one if he undertakes to control in any way the technical details of operation and to usurp managerial functions.

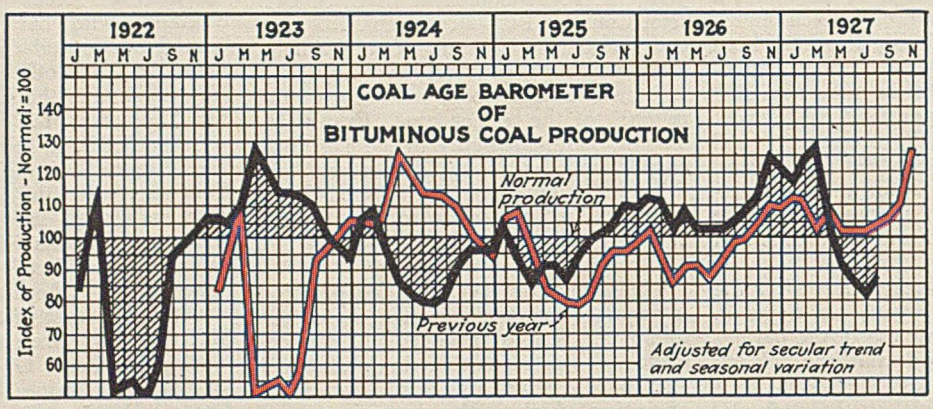
It is understood that the technical schools provide the necessary training for all those seeking positions under that of manager. The technical schools have a definite and important place in the scheme of things, but do not attempt to approach university standards.

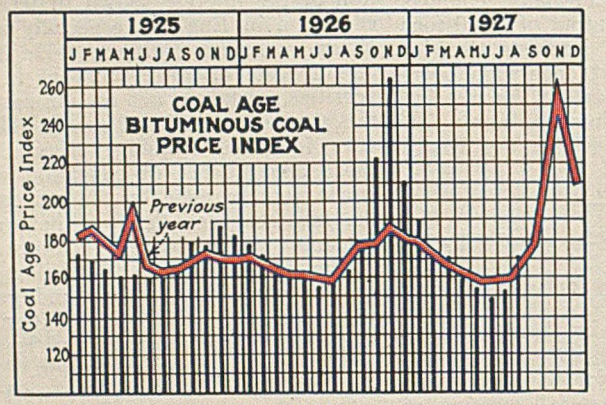
Edwards on Photography

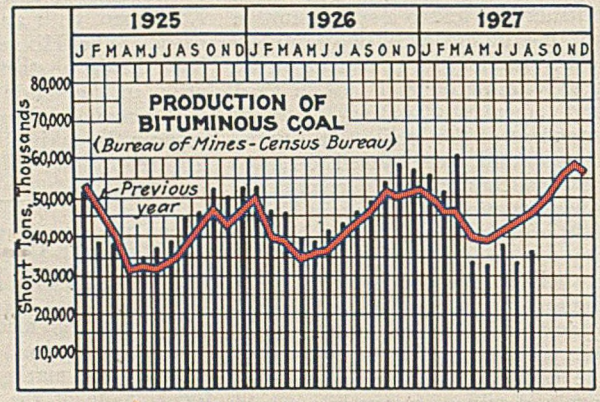
When the Huntington, W. Va., chapter, American Association of Engineers, meets in that city Oct. 8, their speaker will be J. H. Edwards, Associate Editor of *Coal Age*. Mr. Edwards, who is an electrical engineer, will discuss "Photography as Adapted by the Engineer," stressing difficulties that must be overcome by the engineer who uses photography in his work.

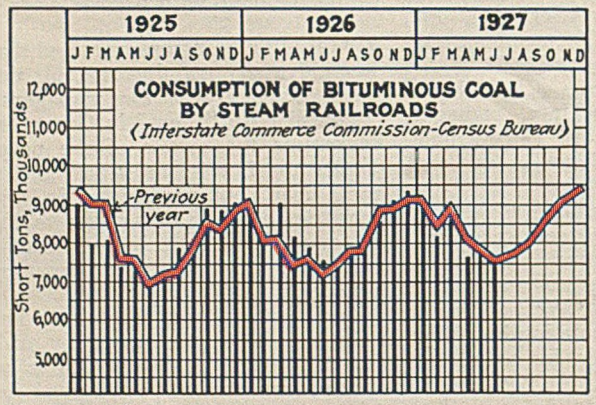
Mr. Edwards, whose editorial work has taken him into almost every coal mining field in the United States, will illustrate his talk.

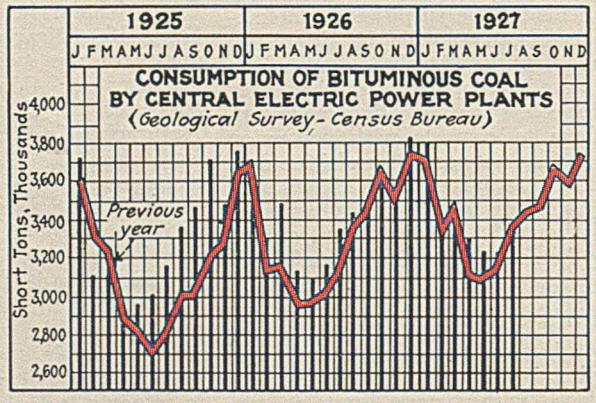
Indicators of Activities in the Coal Industry

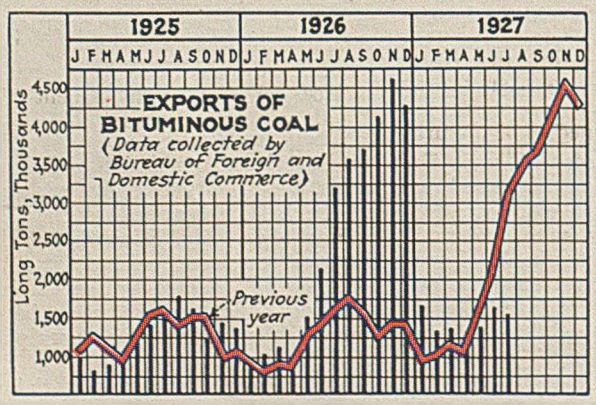


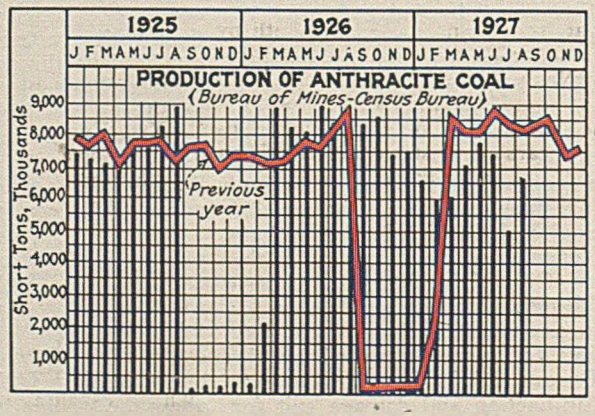












MARKETS *in Review*

SUDDEN resumption of wage negotiations in Illinois early last month upset the course of the bituminous coal markets of the country in their most sensitive area—the Middle West. The influence of the parleys also was felt as far east as New York and as far south as Birmingham. Recovery following the collapse of the negotiations was retarded by the hot wave which swept over the country. The high rate of production which has been maintained consistently for several weeks likewise operated to check any quick or sharp upturn in prices.

Cumulative output of bituminous coal to the middle of September was less than 10,000,000 tons behind the cumulative record for the corresponding period a year ago. The draft from industrial stockpiles, according to the latest data available, has not been beyond expectations and industry as a whole is still in a comfortable position.

UNION labor has been fighting a losing fight during the past month. The failure to effect an agreement in Illinois was a deep disappointment to the rank and file of the workers and apparently a shock to some of the leaders. Operators in that state too were grieved at the outcome. In central Pennsylvania the drive to reopen mines closed down July 1 on a non-union basis continues.

Although operators are inclined to belittle the activities of the I.W.W. in Colorado, other observers see the germ of a serious upheaval in the recent demands filed with the State Industrial Commission by the representatives of the I.W.W. in southern Colorado. In the Southwest the endurance contest between the operators and the union miners continues.

MIDWESTERN markets were hit at the beginning of the month by the withdrawal of railroad buying support. News that joint conferences had been resumed in Illinois was followed by the cancellation of orders for hundreds of cars of Eastern and Southern coal and sharp breaks in prices in the Chicago market. The reaction was slower in reaching Kentucky trade, but when it did prices slipped 50 to 75c. per ton and the subsequent revival in demand still found the market groggy.

At the Head of the Lakes, weather more than wage negotiations in Illinois, exercised an influence, but only a slight one, upon buying. August shipments from the Head of the Lakes were the largest for that month since 1923; September movement has been heavy. Southern Minnesota was less active and farther south and east the weather was the dominant factor. Shipments via the Great Lakes have broken all records. Up to Sept. 18 the total dumpings were 25,494,641 net tons.

SOUTHWESTERN markets enjoyed a gradual improvement in demand during the early part of September, but there was a falling off after the middle of the month, for which weather and the Illinois negotiations were responsible. Colorado and Wyoming trade expanded the forepart of the month and hit the weather check later. The situation in Utah was uneven; at no time was there any life to the market in slack coal. At one time a cool wave helped domestic buying, but the increase was not heavy.

Cincinnati escaped most of the depression chargeable to the Illinois negotiations. Those parleys did little more than take the edge off demand and check an upswing in prices which had started several days before Illinois operators and miners went into conference. In other parts of Ohio the markets were without striking development; in Columbus, domestic trade led and therefore suffered most when demand weakened under the hot wave; at Cleveland, domestic demand was slow and industrial buying only moderately active.

DOMESTIC demand for a time threatened to be the undoing of the Pittsburgh market, where steam coals were a drug. Increasing production and decreasing "no bills" told the story in central Pennsylvania; prices were not spectacular. Some sentimental gain was made in Buffalo during the first half of the month, but the familiar indifference returned later. Birmingham started off well, but the Illinois negotiations and the weather brought listlessness.

New England declined to be disturbed by developments in the Middle West or by threats of trouble in the Southeast. Prices weakened as the month advanced. The fact that receipts of bituminous coal for the first seven months of the year totaled 14,061,159 tons, as against 11,866,710 last year and 14,565,000 tons in 1923 helps explain the calmness of the Boston buyers. There is a steady movement through normal channels which discourages spot activity.

NEITHER New York nor Philadelphia found the trade developments of the month to their liking. After predicting an upturn by Sept. 15, New York optimists moved the date back a month. Volume increased at Philadelphia, but spot prices did not reflect the greater demand. Baltimore, on the other hand, was conscious of an uplift that shattered the long indifference of some of the canny industrial purchasing agents. About the middle of the month, however, the market struck a dead center.

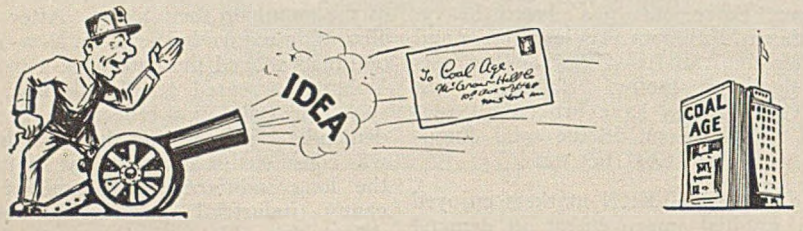
The general movement of average spot prices was downward. *Coal Age News* Index of spot bituminous prices was 174 on Aug. 31 and the corresponding weighted average was $2.11. On Sept. 7 the index number was 173; on Sept. 14 it had dropped to 169, rising to 172 on Sept. 21. The corresponding weighted average prices were $2.09, $2.05 and $2.08 respectively. The sharp fluctuations in prices on Kentucky coals marked the biggest changes.

ANTHRACITE started strong at the beginning of the month, but as the first buying, much of it a carry-over from ordering placed the preceding month, receded, the volume of new business proved disappointing. For the week ended Sept. 17, for example, output was 1,593,000 net tons, as compared with 2,003,000 tons during the corresponding week in 1926. Steam sizes, too, lost some of their unusual strength, but there was a fairly healthy demand for the juniors, with barley leading.

Lake shipments of hard coal have declined sharply this year. For the season to Sept. 18 the total movement was 1,315,109 net tons, as compared with 2,075,040 tons in 1926 and 1,794,367 tons in 1925. Movement to New England also has declined. Total receipts to July 1 were 4,687,451 tons, as compared with 5,569,563 tons a year ago. The 1927 shipments, in fact, were the smallest since 1922. In the last few weeks, however, there has been an increase in weekly movement via the Hudson River gateways.

BEEHIVE COKE in the Connellsville region has made little gain upon the metallurgical side of the market during the past month. Doubt is now expressed in some quarters as to whether it will be possible to renew fourth-quarter contracts at the $3.25 base ruling third-quarter business. Demand for heating coke is growing, but the total volume is small when compared with the metallurgical consumption.

OPERATING IDEAS *from* Production, Electrical *and* Mechanical Men



PROGRESS is made step by step through the exchange of ideas. Every man learns from others. Production men, electrical men and mechanical men are constantly trying out new methods for increasing efficiency and reducing costs. One idea suggests another.

COAL AGE has been for years the medium through which operating men have traded ideas. Underground methods, shop kinks, haulage devices, tipple arrangements, electrical and mechanical pointers and safety methods all have a place in this picture.

IDEAS are worth money. *Coal Age* will pay from $5 up for those that are accepted and published in these columns. Here's your opportunity to win recognition for yourself and get paid for it. Can you use a few extra dollars? Everybody can.

LET'S GO. Short stories are best. We'll help you edit them. Simple sketches will do, too, or good snapshots. Our drafting room and illustration department will do the rest. Some of the very devices or methods that you think too simple to write about are the very things some other fellow is looking for.

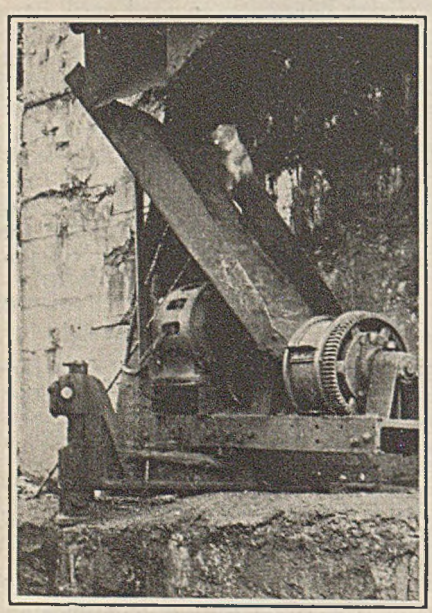
Box-Car Loader Throws Coal Into Place

Although coal is usually shipped in hopper-cars or gondolas, it not infrequently happens that car shortage makes necessary the use of box cars.

Then too, coals for certain processes and industries must be kept dry and, occasionally, the purchaser of fuel for ordinary purposes demands that the coal be shipped in closed cars. For loading coal into box cars rapidly and conveniently, some form of car-loading equipment is necessary.

The Raleigh Coal & Coke Co. met this need by installing, at each of its mines, the home-made loader shown in the illustration. All the castings were made in its own foundry and all other parts were fabricated in its shops. The rotor of the centrifugal throwing-device is made of bronze and the remainder of the apparatus of steel or cast iron.

The shell can be rotated so as to change the opening to any position necessary to throw the coal to either end of the car. When in use, the machine is swung into the car door on the cast-iron arm and then adjusted as previously indicated. This machine is somewhat peculiar as most box-car loaders comprise a rubber belt or apron to carry the coal, whereas this one throws it.



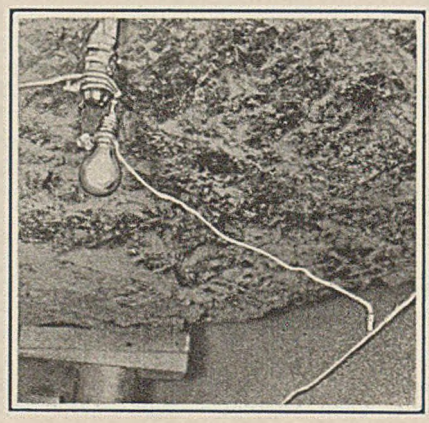
An Unusual Loader

Spring-Clip Connectors Reduce Accidents

Severe burns to hands and eyes have resulted from short-circuits in weatherproof sockets that are connected between trolley and rail without fuse. The short-circuits which cause injury are usually occasioned by an attempt to remove the base of a broken lamp. Because the short length of No. 14 wire commonly used may allow the passage of several hundred amperes until the socket is burned or the wire heated to the extent that the circuit is broken, the arcing may "stir up a tremendous fuss."

To provide a convenient means of disconnecting the lamp socket and positive wire from the 250-volt trolley line, the Union Pacific Coal Co. utilizes battery-charging clips of the ordinary spring type. These are placed vertically, with the jaws in the groove of the trolley wire, so that the locomotive trolley wheels will not touch them. The connection is made to the trolley wire at any desired point irrespective of hanger location. The ground wire from the lamp is carried across the roof and down the rib on knob insulators, thence on the bottom to the rail.

But D. C. McKeehan, electrical engineer of the company, is not fully satisfied with the arrangement. He concurs with the idea of many electrical men that there should be available a special fused weatherproof socket for temporary and semi-temporary lighting from mine trolleys.



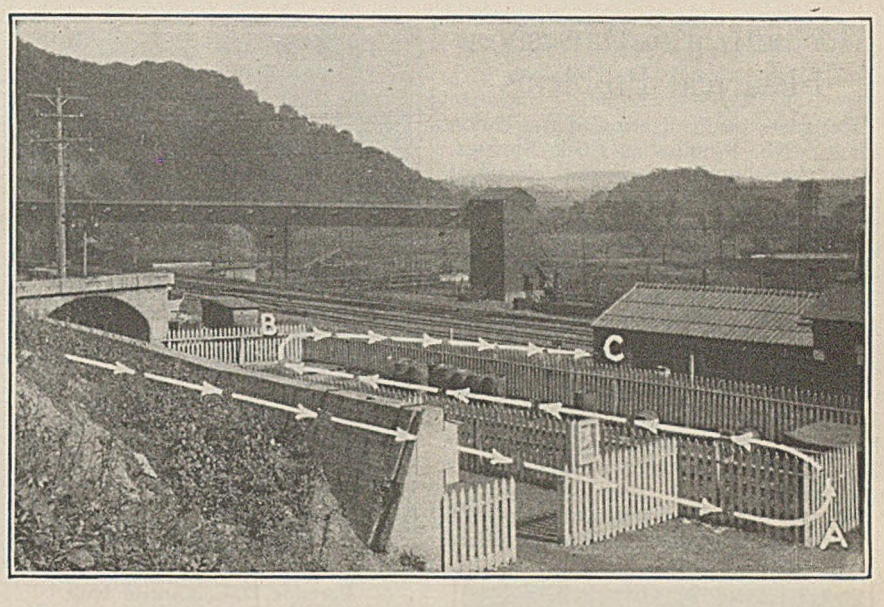
Saves Hands and Eyes

Watchwords in Safety Of Wire Rope

No definite rules can be given as to when a wire rope should be discarded as worn out, as too much depends upon the local application of the rope and the maintenance attention it has received while in service, says C. D. Meals, rope engineer, New York City. The metallic area that is apparently unharmed cannot alone be taken as a criterion as two ropes from the same reel, showing the same degree of wear and having the same number of broken wires, may have reserve strengths that vary by 25 per cent. There are several reasons for this variation, excessive acceleration stresses probably being the principal one.

When employed in hoisting skips or cages, a wire rope should be discarded under the following conditions: When there are more than three adjacent wires broken in any one strand; when the outer wires have become worn to two-thirds their original diameter; or when marked corrosion appears.

In Technical Paper No. 237, the U. S. Bureau of Mines advocates that after shaft ropes have been in service for a period of three years, even though idle, they shall not be used unless tested for ultimate breaking strength. As a matter of safety, any rope that has remained idle for some time should be cut and the interior wires examined for possible corrosion and wear. A minimum factor of safety of four should be maintained on a deteriorated rope in this class of service.

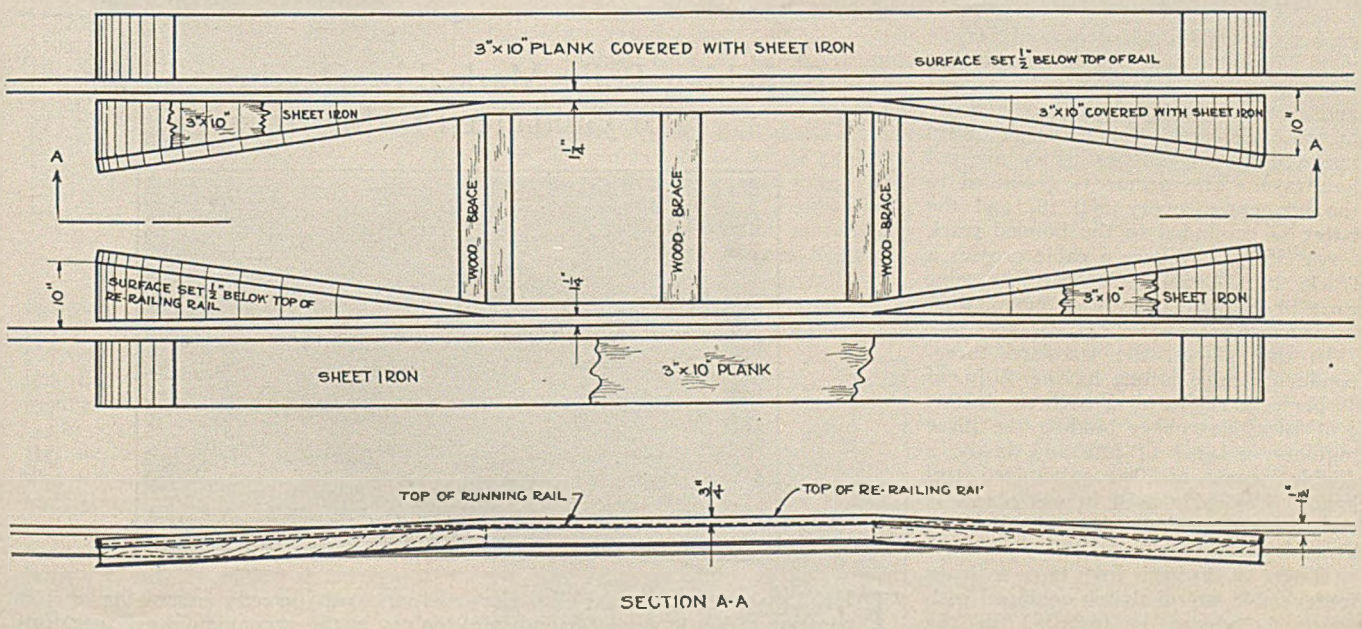


Clever Sheave Rigging Expedites Hoisting

AT THE Harmar mine of the Consumers Mining Co., supplies and machines are lowered over a 14-deg. slope which is 585 ft. long. Because of the length and grade of the slope, and also because this opening is the only means of transporting heavy equipment and supplies to and from the mine, a 200-hp. hoist equipped with a $\frac{7}{8}$-in. rope has been installed. The accompanying illustration shows the surface arrangement in the vicinity of the slope.

In order not to block the approach to the mouth of the slope; to maintain a straight roadway between the slope enclosure on one side and a row of buildings on the other; and also to keep the slope hoist house in line with the other surface structures, the hoist is located far to one side of the center line of the slope.

The rope is passed halfway around a 5-ft. ground sheave at *A*, from which it is reversed to a similar sheave at *B*. The latter sheave in turn changes, by 90 deg., the direction of the rope and puts it in line with the winding direction of the hoist drum at *C*. In its travel from *B* to *C* the rope passes through an 18-in. round conduit under the road.



SECTION A-A

A Re-Railer for Sidetrack Use

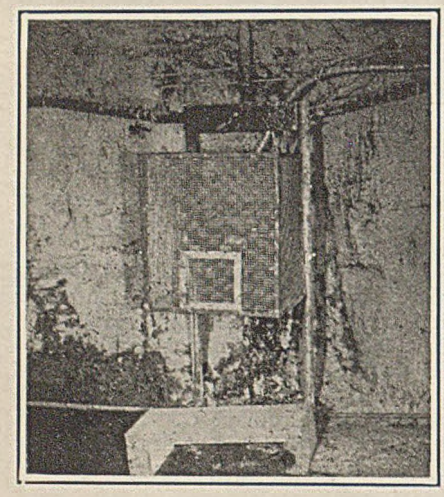
This type of re-railer is in use at the mines of the Pennsylvania Coal & Coke Corporation. It is installed at each end of the main sidetracks, where cars are often derailed by splitting of switches, excessive bumping, pushing, etc. Since all details are shown in the accompanying drawing, further explanation is unnecessary.

MechanizationRaisesNew Electrical Problems

Complete mechanization of the Union Pacific No. 8 mine at Rock Springs, Wyo., has introduced several electrical problems. One of these is the extent to which 2,300 volts should be used for inside motors. Another is the proper safeguarding of this wiring and of the 2,300-volt semi-portable equipment.

Twenty-three hundred volts has been adopted as standard for the 125-hp. motors on large scraper hoists, and all of these motors are now of that voltage. For driving small portable hoists, Eickhoff conveyors and mining machines in No. 8 mine, 250-volt direct-current is still used.

The 2,300-volt wiring is completely protected at all points. Band-armored

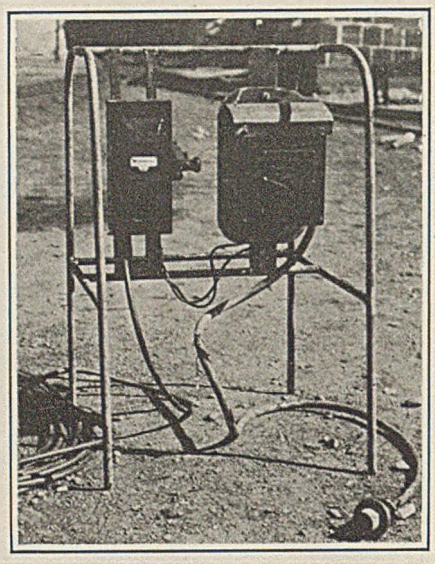


Oil Switch on Branch Feeder

cables are used for feeders, and flexible metallic conduit is employed for covering the wiring from oil switches to starters and from starters to motors. The armored cables are suspended from a steel messenger along entries which are not haulways. The armor is grounded to the messenger every 500 ft., and the latter is grounded to the bonded track every 350 ft. Where a cable crosses a track, it is taken underneath in some form of conduit, usually of metal, fiber or concrete.

In dry places, the standard three-conductor cable is one having $\frac{3}{32}$-in. of 30-per cent rubber over each conductor, $\frac{1}{8}$-in. of Code rubber binding the three together, a layer of jute and, lastly, a double armor of .040 galvanized-steel band. The cable used in wet places is the same except that it has a lead sheath beneath the armor.

Where a branch line taps a main feeder cable, an oil switch equipped with overload release is installed in the branch, close to the main feeder. The switch is housed by a screen and an insulating platform is provided upon which the electrician stands when



Portable D.-C. Control Unit

engaged in making repairs or adjustments.

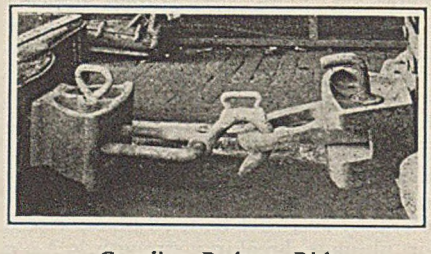
Safety and light weight have been incorporated in a "self-standing" control unit for portable direct-current equipment such as the small hoists adapted to general work and prop pulling.

The unit consists of a fused quick-action safety switch and an enclosed starting rheostat. The stand, which has a broad foot-spread, is electrically welded from $\frac{1}{2}$-in. galvanized pipe. Both the long and short cables are of the rubber-sheath type. The use of this arrangement has also served to further the efforts of mine officials toward decreasing electrical accidents.

Hook Hitching Promotes Coupling Safety

Occasionally haulage men find difficulty in joining two cars, or a locomotive and a car, whose couplings are far out of line, as on a curve of relatively short radius. True enough, the swing of the coupling when joined should be wide enough to meet the requirement of any track curve used, but at this point enters the question of the danger involved in making the actual coupling.

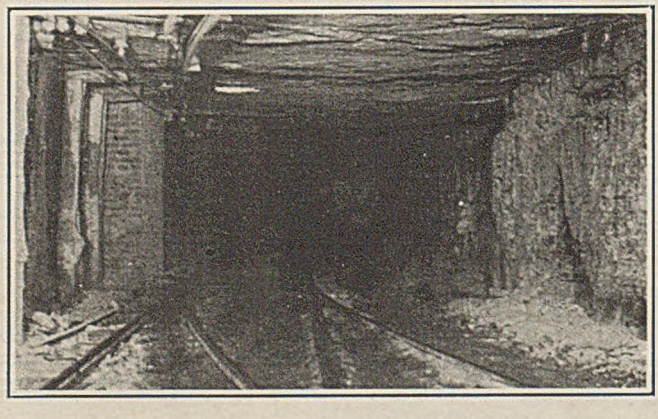
A hook hitching for this purpose, which can be attached with safety, has been devised at the mine of the Buckeye Coal Co., Nemacolin, Pa. It consists of a link and a swivel hook provided with a handle, which allows the coupling to be made without danger of injury to the hand of the operator. The limitation in use of this device is recognized. It serves its intended purpose only when



Coupling Reduces Risk

it is in tension and is applied only to pulling on straight track where a standard coupling is made. This hitching can also be used sometimes in the process of rerailing cars that have merely dropped from the rails.

Switching Point Marked by Overhead Light For Guidance of Motormen



THE Pittsburgh Terminal Coal Corporation makes it a point to indicate the exact location of each switch on its main haulways by an electric lamp, which in this case is installed in a pocket in the roof, as indicated by the white spot directly over the switch points in the accompanying illustration. A motorman on a trip traveling on the straight thereby can gage his distance from the junction and regulate his speed to approach it at a reasonable rate.

Badges Identify Experts In First-Aid Work

To stimulate interest in first-aid work, to encourage advanced study in that field and to plainly identify the most competent men, the Phelps-Dodge Corporation, Stag Canon branch, Dawson, N. M., offer distinctive badges to their employees. According to W. C. Holman, chief engineer of the company, all employees (both underground and surface) serving on any safety committee for a period of three months are presented with a watch fob. The diameter of this fob is about 1⅜ in., it is made of bronze and is fitted with a leather strap and bronze buckle.

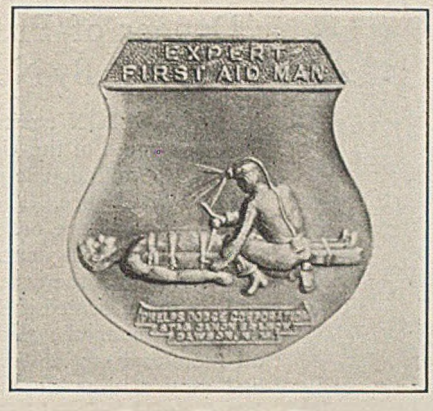
In addition to the regular course of first-aid instruction, a special course of advanced work is given to those first-aid men who have participated in contests as members of teams and who already have become highly proficient in the ordinary course of training. Those men taking this additional course, and satisfactorily passing an examination (comprising about 150 questions) with an average of 95 per cent, are classed as "expert first-aid men" and are given special recognition.

To distinguish these experts from the ordinary first-aid men, and to invest them with some higher degree of authority, they are given specially-

Safety Watch Fob

designed pins. These pins are worn during working hours so that all employees may know that these men are qualified experts and, in event of a serious injury, should be called upon at once.

On first thought it might appear that this action constitutes bad practice in that the men who have taken the ordinary course only, might lose time trying to locate an expert. However, experience has shown that some degree of initiative and leadership is necessary in a good first-aid man. It frequently occurs that men who have taken the prescribed courses and hold certificates, become confused in the presence of a serious injury and fail to take charge of the situation in an efficient manner.



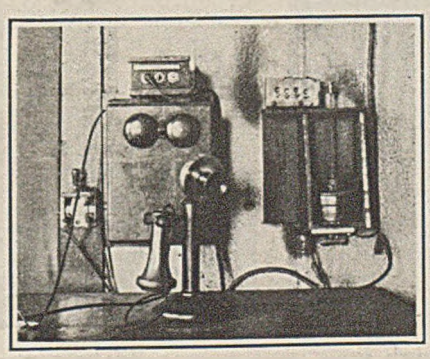
Expert First-Aid Pin

With the exception of roller bandages, the examination for expert first-aid men covers the entire Bureau of Mines first-air manual and the work must be done in exact accordance with it. The questions are outlined on a checking form which is used when an applicant is being examined. The examination is based on demonstrations and oral questions and discussions.

Long-Distance Counter Keeps Hoist Tally

It is sometimes highly desirable for the superintendent to know at any time of the day just how many cars or skips of coal have been hoisted. He may also wish to know whether or not hoisting is progressing at a normal speed. Some hoistmen or cagers keep a tally of the work done but the probabilities are that the superintendent will not have ready access to the tally at the time that he wishes most to know how things are progressing.

The management at the No. 2 mine of Bell & Zoller near Zeigler, Ill., has devised an apparatus, located in the superintendent's office, that shows at any time the number of hoists of coal that have been made up to that time. This device is shown in the accompanying illustration and consists of an ordinary mechanical counter actuated by a solenoid. This latter is electrically connected to a contact switch attached to the throttle of the hoist engine. The



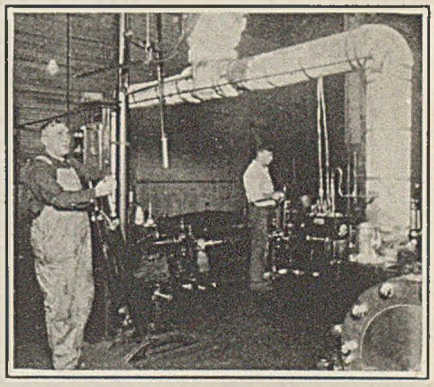
Records Hoisting Operations

arrangement is such that when the throttle is opened wide, as when hoisting coal, contact is made, the solenoid energized and the lever of the counter depressed. If the throttle is only partly opened, as when hoisting men or material, contact is not made at this point and nothing happens at the counter.

The counter is installed on the wall in the superintendent's office almost at his elbow. Subtracting the reading of the instrument at the close of the previous day from its reading at any particular time gives the number of coal cars hoisted during the day on which the reading is made. In like manner the number of hoists made in any particular period of time can be ascertained. Even the regularity of operation is an indication of the speed of hoisting. Except for the counter the equipment is entirely home-made and the cost small.

Mental Attitude of Men Cuts Repair Costs

Why is it that in five years the cost of repair parts for one main-haulage locomotive totaled $3,500, while this cost for a similar locomotive, on the same duty in the same mine and over the same period, was $200? In this particular instance, solely because the second locomotive was operated during



On the Job for 30 Years

the entire time by a motorman who took pride in his mount while the first was operated by several average motormen.

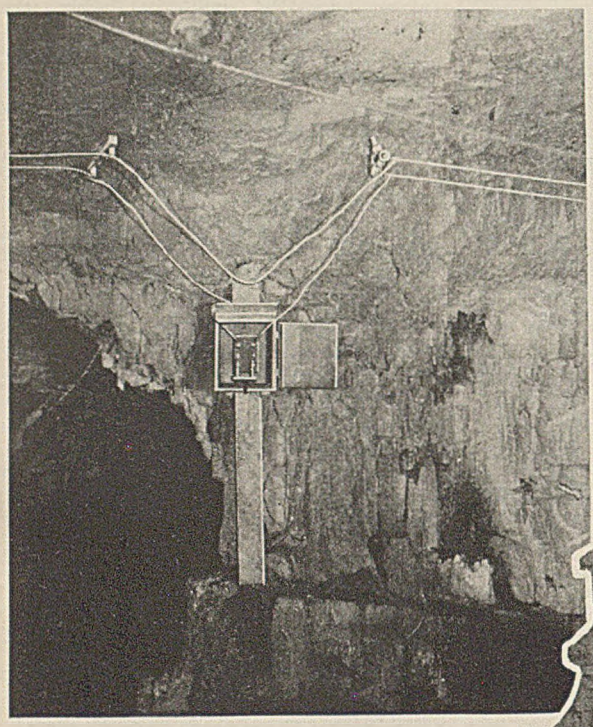
It is safe to assert that the shiny brand-new appearance, and low maintenance record, of the steam hoist at the Chandler mine of the Victor-American Fuel Co., Chandler, Colo., is also largely attributable to the attitude of the engineer. The hoist was installed in 1890 and for the last thirty years has been operated only by the present engineer, I. Williams, who stands at the controls.

The hoist, 22 x 36 in., was built by Stearns & Rogers and is equipped with a conical drum. Although the machine is still in wonderful condition, considering its years of service, its days as a steam hoist are probably numbered.

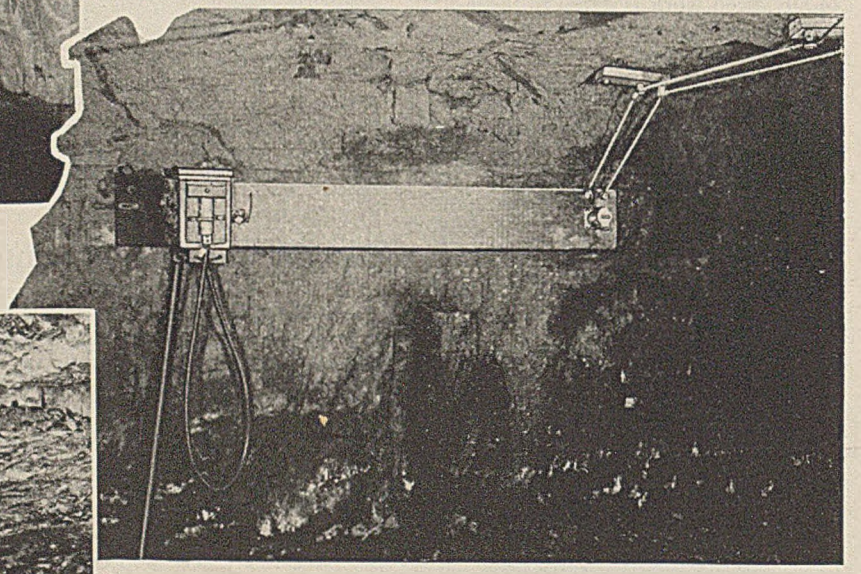
Danger of Premature Shotfiring Averted By New Control System

PROTECTION against premature firing of shots in the King No. 1 mine of the United States Fuel Co., Hiawatha, Utah, is assured by four double-pole breaks in the special circuit of No. 6 weather-proof wire. The practice is to fire all shots simultaneously (when all men are out of the mine) by one short application of 440-volt alternating current to the circuit.

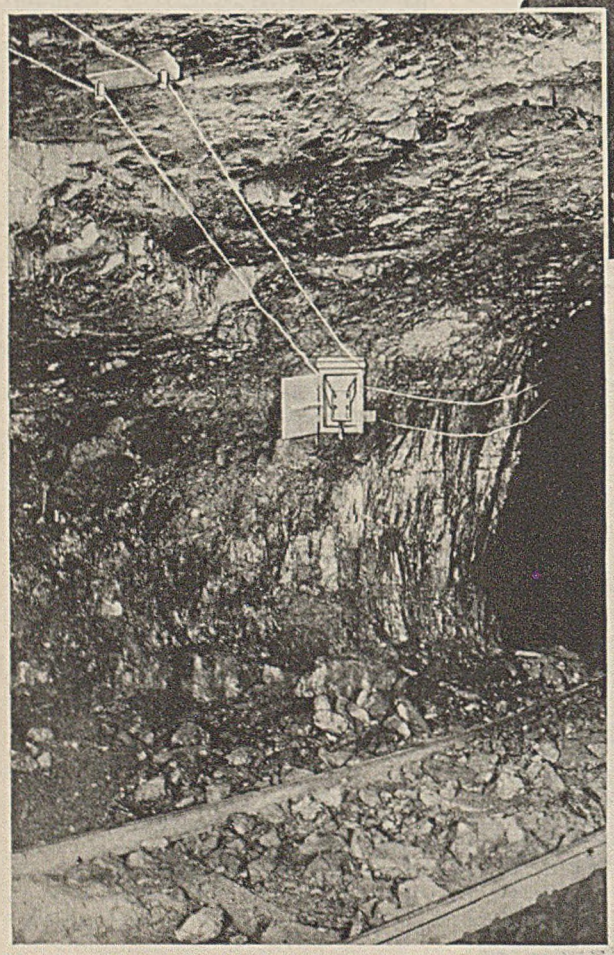
At the end of the day when all men have turned in their checks, or have been located if they neglected to do so on coming out, two shotfirers enter the mine. As they make the rounds they close all room and section switches. The two leave the mine together and at that time close the 6-ft. lightning gap which is located 100 ft. inside of main air course. The final act is to unlock and close for an instant the master switch which is located in the check house near the mine portal.



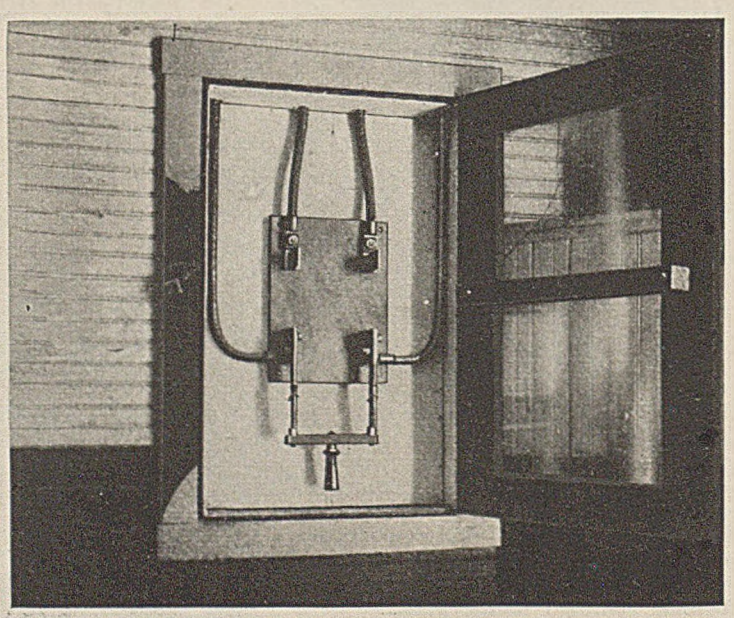
The section switch is usually locked in the open position by shotfirers



Normally the plug switch lighting gap is kept open



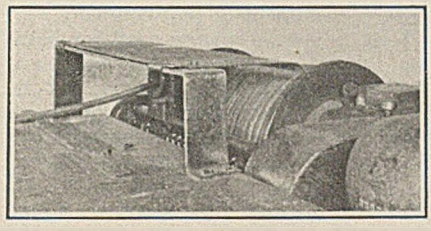
The miner sees that the room switch is open to protect against stray current



The master switch prevents closing and locking except when a switch is open

Steel Canopy Protects Spooling Device

Canvas checks or curtains are used for some purpose in almost every mine. Where cable-reel locomotives are used for gathering, the frayed ends or streamers of the canvas are apt to be drawn by the cable into the porcelain eye of the power-driven spooling device. Furthermore, lint, threads and small pieces detached from the canvas during the passage of the locomotive through the curtains tend to settle on,



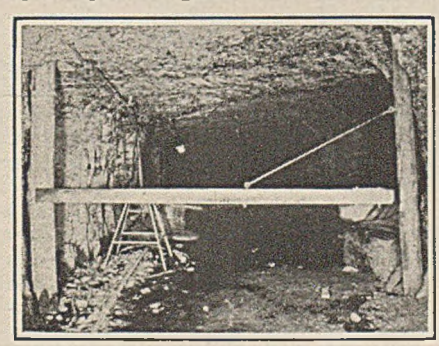
Steel Protector in Place

and subsequently be packed into, the threads of the feed screw of the spooling device. In the Nemacolin mine of the Buckeye Coal Co., Nemacolin, Pa., these troubles have been eliminated by attaching, to each cable-reel locomotive, a steel plate disposed as a canopy over the spooling device. Being hinged, this plate can be turned back for convenience in reaching for repairs those parts that are sheltered. This detail and others are clearly shown in the accompanying photograph.

Hinged Gates Reduce Slope Accidents

Some kind of warning is highly necessary at points where man-ways cross rope-haulage slopes. A sign is the cheapest and easiest warning to erect, but it compels no definite action on the part of the observer. Gates do compel such action, and therefore are used by the Union Pacific Coal Co.

These gates are placed about 20 ft. from the slope, are arranged to open only by swinging away from the slope and have a leaning hinge-post so that closing is by gravity. The direction of swing compels a man to stop and back up to open the gate.

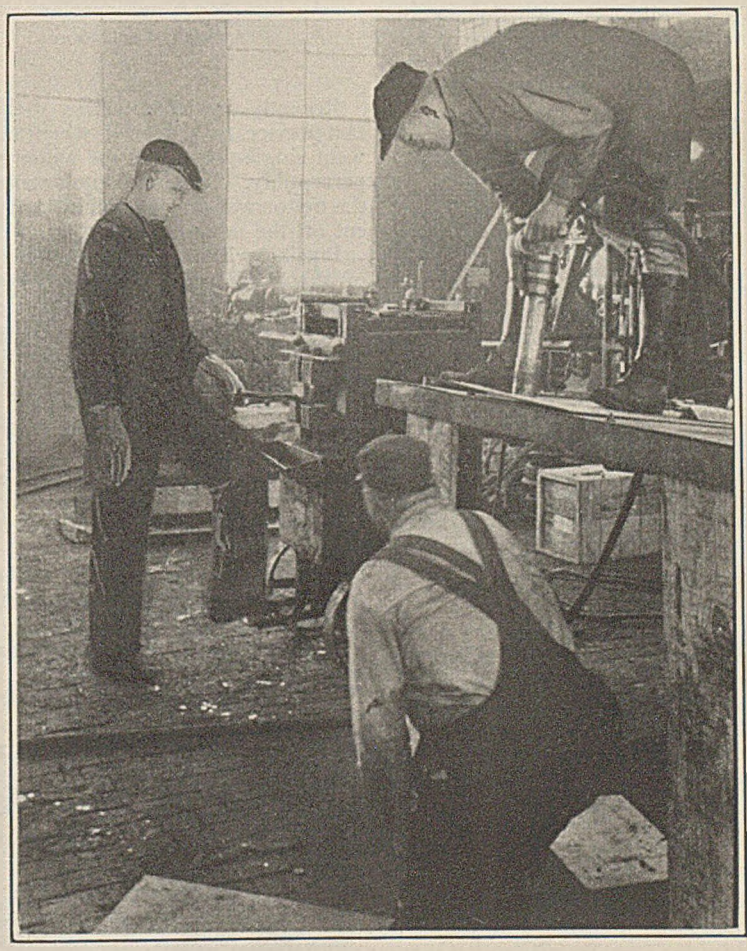


Makes Them Stop

Electric Rivet Heater and Pneumatic Hammer Used Jointly Have Great Value

EVERY mine plant of any size has use for an electric rivet heater and a device complementary to it, namely, a pneumatic hammer. Rivets are rapidly taking the place of bolts for the securing of fixtures and the holding together of parts on mine cars, cutters and other machines—for all purposes except, perhaps, where adjustments are required. The convenience and economy derived from the joint use of electric rivet heater and the pneumatic hammer are entirely responsible for this change in practice and policy at many mines.

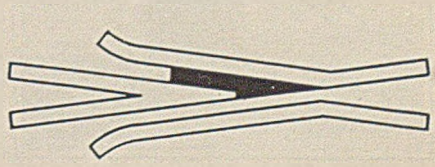
The heater brings the rivets to the proper heat, without danger of burning the stock, at a rate equal to any with which the hammer or "bucking-up" crew can handle them. In a given time these three men, who work in the mine shop of the Buckeye Coal Co., Nemacolin, Pa., can apply two or three times as many rivets as they can bolts and at the same time do a much better job. The heater handles rivets ranging in size from $\frac{1}{4}$ to 1 in. and is portable.



Rivets Replace Bolts at Modern Mine

Wrecks Are Prevented By Iron Frog-Filler

Mine cars tend to sway when in motion with the result that, in passing over frogs, the flanges of the wheels are apt to hit or pick the frog point and cause a wreck. To prevent this from happening at main sidetracks and planes where attendants are employed, the Pennsylvania Coal & Coke Corp. uses a filler which shields the frog point in the manner indicated in the accompanying illustration. This filler is of iron and fits the frog snugly. It is made in the company shops.



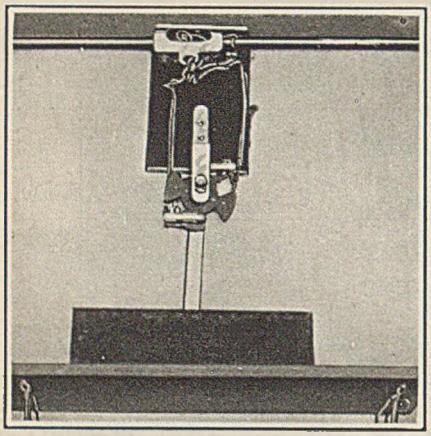
Home-Made Shield

Feeder-Opening Device and Good Lighting Stamp Modern Fan Installation

PROVISION for automatically opening all direct- and alternating-current mine feeders before the air fails completely in case of ventilation trouble, and a design of fan house which provides natural light for interior inspection, are features of a new fan installation at the Chandler mine of the Victor-American Fuel Co., Chandler, Colo.

The location is at a 900-ft. air shaft about two miles from the tipple. This air shaft is equipped with a small hoist for emergency use. The fan, 90x90 in. and of the double inlet type, is driven through a long belt by a 100-hp. 2,300-volt, 30-cycle slip-ring induction motor.

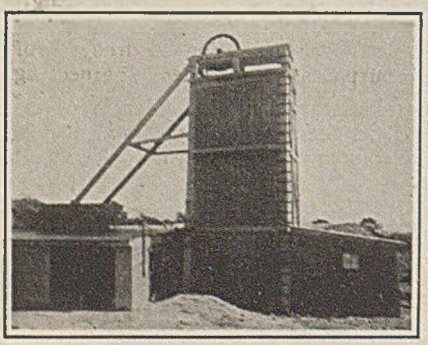
Contacts arranged in the control circuits extending to the fan motor, to the d.-c. breakers in the outside substations



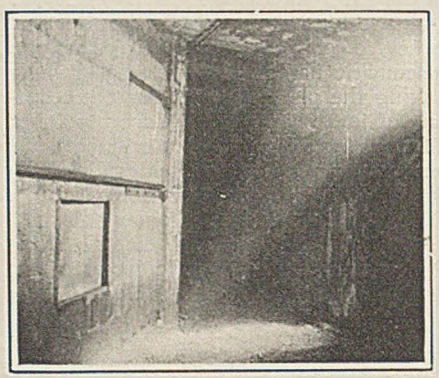
Mercury-Tube Contactor

and to oil switches at the top of the a.-c. borehole cables, are located in the fan motor room. These contacts, of the tilting mercury-tube type, are mounted on a fiber disc which in turn is keyed to a shaft that can rotate through an angle of 30 deg. by action of a 12x18-in. vane in the air passage.

An oil damper prevents undesirably sudden tipping of the mercury tubes. This damper consists of a rod and paddle extending down into a small oil tank mounted on a shelf below the contact disk.



Built for Permanence



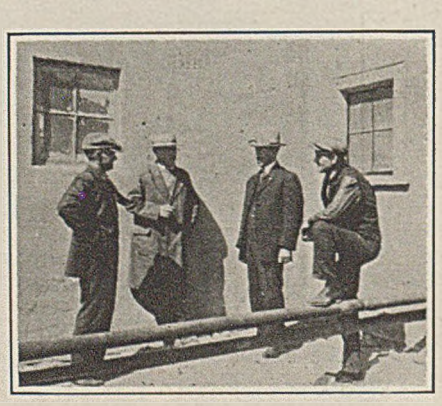
A Sunlit Fan-House

Recently the sensitiveness of the contact device was proved when the line went single-phase and the motor slowed perceptibly. The line switch controlling the motor was opened and all power was cut off the mine circuits.

Putting windows in the outside walls of the fan-house air-passages was the happy idea which permits of daylight inspection of the inside-fan bearings, reversing doors and other equipment. The window panes are of heavy glass reinforced with wire, and the sash is set in stucco to prevent air leakage.

Those who have experienced the trouble of trying to keep a carbide lamp lighted in a fan air-passage, or who have been prevented from making an inspection of an exhaust fan at a gassy mine because of having forgotten to bring a permissible lamp, will appreciate the advantage of the windows.

The men shown in the accompanying photograph are, from left to right: F. B. Thomas, electrical engineer;



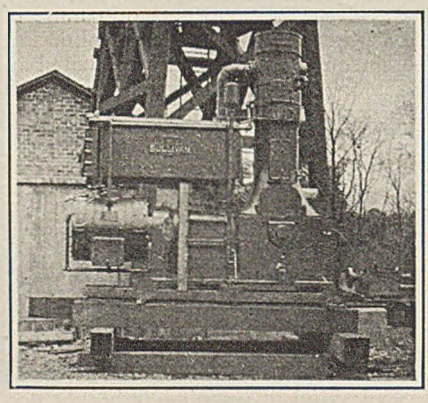
Pleased with the Job

F. W. Whiteside, chief electrical engineer; E. H. Binford, assistant auditor; and George Horn, designing engineer—all of the Victor-American Fuel Co. In the background are shown the airtight windows of the fan house.

Heavy Compressor Moved Without Mishap

Recently two 1,000-cu.ft., compound air-compressors, arranged for electric drive, were installed in one of the outlying substations of the Pennsylvania Coal & Coke Corporation, Cresson, Pa., to furnish compressed air for use inside the mine. These compressors were shipped assembled and, therefore, much difficulty in moving them from the siding to the substation was anticipated, says F. Fraser MacWilliams of the power department of that company.

First, a special wagon used for hauling heavy machinery was borrowed from a nearby power company and the machine loaded on this with jacks and chain blocks. Because the heavy high-pressure cylinder was vertical, the compressor was extremely top-heavy and guys, to prevent tipping were found necessary at every point during the loading. After being placed on the wagon, steel guy wires were run from the compressor top to each side of it.

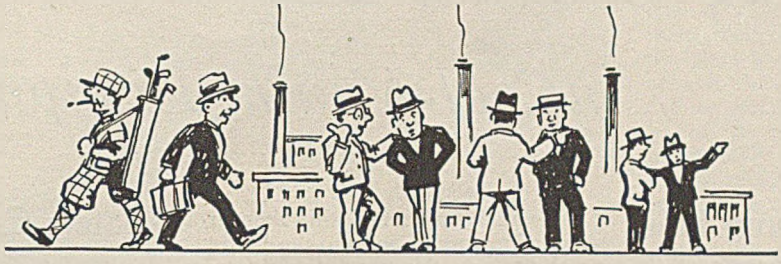


After a Perilous Journey

The loaded wagon, which weighed over 34,000 lb., had to be hauled over a field to the road. Then it was drawn over about two miles of clay road and, finally, on a road through a woods to the substation. To add to the difficulties, it rained every day during the job. To cross the field from the siding, a corduroy road was made of railroad ties on which were placed 3-in. planks. The wagon was then hauled over this to the road with rope blocks. On the level, one 5- and two 3-ton trucks combined could haul it nicely but up each grade recourse was had to the rope blocks. To negotiate the turns in the woods, bumping blocks of plank were nailed to the trees at the two worst turns. When the wagon was pulled in, these planks slewed it around.

The accompanying photograph shows the compressor as unloaded at the substation. From this position it was pulled to its foundation on the other side of the air shaft shown in the background. For this work, the large emergency-shaft hoist was used because it was more convenient.

Among the Manufacturers



THE LO-HED HOIST DIVISION of the American Engineering Co., Philadelphia, Pa., has appointed factory representatives in Pittsburgh, Pa., and Cleveland, Ohio. The Pittsburgh office, which will include the territory of western Pennsylvania, West Virginia and counties along the eastern border of Ohio, is located in the Oliver Building, with D. A. Polhemus in charge and John Kaiser assisting. W. C. Minier will direct sales in northern Ohio, except for territory surrounding Toledo, with offices at 2195 Bellfield Ave., Cleveland. R. H. McGredy has been appointed sales manager of the division, with offices in Philadelphia.

* * *

JOHN REINER & CO., INC., 309 Church St., New York City, has been appointed service representative of the Climax Engineering Co., Clinton, Iowa, for the states of Connecticut, New York and New Jersey.

* * *

THE AMERICAN ROLLING MILL CO., Middletown, Ohio, has taken over the sale of all products made by the Columbia Steel Co., Butler, Pa., and Elyria, Ohio, of which it recently obtained control. This gives the Armco a yearly capacity of more than 1,000,000 tons of sheets and strips.

* * *

THE GENERAL WHEELBARROW CO. is the new name of the company formerly known as the Akron Barrow Co., 3140 East 65th St., Cleveland, Ohio. The change became effective Sept. 1. The Akron company has a history dating back to 1840.

* * *

SIX WELL KNOWN paint companies were merged recently under the name of the Arco Co. They are the Arco Co., Eclipse Paint & Mfg. Co., Crescent Paint & Mfg. Co., Iroquis Mfg. Co. and Sterling Mfg. Co., and the Argus Mfg. Co. The consolidated company will have branch distributing plants in Cleveland, Toronto, Kansas City, New York, Houston, Minneapolis, Los Angeles and Pittsburgh.

* * *

THE EAGLE-PICHER LEAD CO. announces the removal of its New York offices to suite 1708 Graybar Building, 420 Lexington Ave.

THE HAYS CORPORATION, Michigan City, Ind., manufacturer of combustion instruments (draft gages, flue gas analyzers and automatic CO_2 and draft recorders for reducing fuel bills), announces the addition of several new representatives to their U. S. sales organization. The following appointments have been made: S. Thomas Engineering Co., 6625 Delmar Blvd., St. Louis, Mo., for eastern Missouri and southern Illinois; Jos. H. Spurgeon, 3-224 General Motors Building, Detroit, Mich., for eastern Michigan and northwestern Ohio; H. R. N. Johnson, 621 New York Life Building, Minneapolis, Minn., for Minnesota and the Dakotas; Louis Towner Construction Co., 551 Valley Ave., N.W., Grand Rapids, Mich., for Grand Rapids and contiguous territory.

* * *

THE STEPHENS-ADAMSON MFG. CO., manufacturer of coal and ash handling equipment, Aurora, Ill., has purchased the plant and business of the Marsh Engineering Works, Ltd., Belleville, Ontario, which it will operate as the Stephens-Adamson Mfg. Co. of Canada, Ltd.

* * *

THE MINE SAFETY APPLIANCES CO., Pittsburgh, Pa., announces the following appointments and changes in sales personnel: M. B. Orfald has been appointed district representative at Duluth, Minn., with headquarters at 1928 E. Superior St., and John B. Jones as district representative at Fairmont, W. Va., with headquarters at 624 Fairmont Ave. George L. Seth, former district representative at Buffalo, N. Y., has been transferred to Pittsburgh as assistant sales manager. Mr. Seth has been succeeded at Buffalo by C. M. Donahue, 292 W. North St.

* * *

THE WADE ENGINEERING CO., of Los Angeles, Calif., which handles products of the Lincoln Electric Co., Cleveland, Ohio, announces that its northern office has been moved from 69 Webster Street, Oakland, to 533-539 Market Street, San Francisco.

* * *

STOCKHOLDERS of the Illinois Wire & Cable Co. have approved the plan for consolidation of the company with the Chicago Insulated Wire & Manufacturing Co. and the formation of a new company, to be known as the Inland Wire & Cable Co., with a capitalization of 102,500 shares. Application will be made to list the shares on the Chicago Stock Exchange.

* * *

THE FALK CORPORATION, of Milwaukee, Wis., manufacturer of herringbone gears, speed reducers, flexible couplings, oil engines and steel castings, announces the opening of an office in Portland, Ore., at 720 Terminal Sales Building, 12th and Morrison Streets. This office will be in charge of John Jurgensen, who has been in the company's New York office for seven years.

* * *

THE GARDNER-GOVERNOR CO., Quincy, Ill., manufacturer of air compressors and pumps, has been merged with the Denver Drill Co., of Denver, Colo., under the name of the Gardner-Denver Co., with factories at Quincy and Denver. J. W. Gardner will be chairman of the board. W. H. Leonard has been elected president of the company, which has more than 1,000 employees.

* * *

THE CHICAGO PNEUMATIC TOOL CO. announces the removal of its Seattle branch office, service department and warehouse from 119 Jackson Street to 1743-47 First Ave., South.

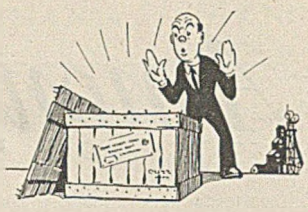
* * *

H. G. PEAKE announces the dissolution of the co-partnership known as the Union Construction Co. and his removal to the Alexander Building, 155 Montgomery St., San Francisco, Calif. The new firm name is H. G. Peake Engineering Co. The firm will engage in the design and building of dredges for all purposes and other engineering work. A. P. Van Deinse is in charge of the engineering department.

* * *

R. L. WILSON, works manager of the East Pittsburgh works of the Westinghouse Electric & Mfg. Co., has been promoted to assistant to the vice-president and general manager, and J. M. Hipple, manager of the company's motor engineering department, has been elevated to the position of works manager, it has been announced by F. A. Merrick, vice-president and general manager.

WHAT'S NEW



in Coal-Mining Equipment

Rolling Car Dump Has Unique Features

At the new plant of the Florida Portland Cement Co., Tampa, Fla., there has been installed for the handling of cement rock from railroad cars to the e y. . the crusher plant, a car dumper said to have a number of unique features. The dumper was designed and constructed by the Wellman-Seaver-Morgan Co., Cleveland, and the Cowham Engineering Co., Chicago, built the plant.

The view at the left of the accompanying illustration shows the dumper in normal position to receive a car. To the right of the dumper are the inclined runways upon which the dumper is rolled into the dumping position. The photograph at the right shows the dumper in the dumping position at the top of the incline.

Peculiar conditions surrounding this installation required an equipment which would unload the cars without providing the usual storage bins under the dumper. The general level of the ground is only a few feet above water level, and it was desired to provide storage for a day's consumption at the crusher plant without rehandling. By rolling the dumper up an incline, necessity for a bin was eliminated and sufficient storage was provided to meet the requirements.

As will be observed, this dumper is similar in many respects to the Wellman revolving car dumper. However, instead of being "revolved" upon the equalizing rollers carried in structural steel bases secured to the foundation, it is "rolled" into the dumping position upon steel girder runways. These are inclined at approximately 35 deg.

The machinery for "rolling" the dumper up the incline is mounted on foundations at the ground level under the crusher tower. It consists of two drums spaced 50 ft. center to center, each being driven by a double reduction of cut gearing. The second intermediate shaft is extended the full distance between the drums and geared at the center to the driving motor. This shaft is provided with a manually-operated brake used only in an emergency. The service brake is electrically operated and attached directly to the motor.

The dumper is driven by one 115-hp. motor provided with a full-torque magnetic brake, and a controller of the magnetic switch type. The machine is fitted with a geared limit switch to slow down and stop the rolling of the dumper in either direction.

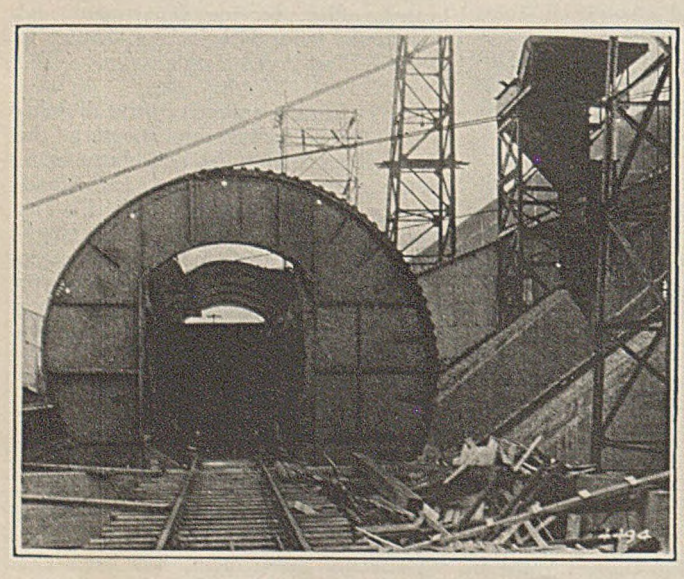
This equipment will handle open-top railway cars from 7 ft. to 12 ft. 6 in. high, 9 ft. to 10 ft. 6 in. wide, and having over-all lengths of 50 ft. inside of cars. It is claimed that loaded cars having a total weight of 220,000 lb. can be dumped at the rate of 20 per hour.

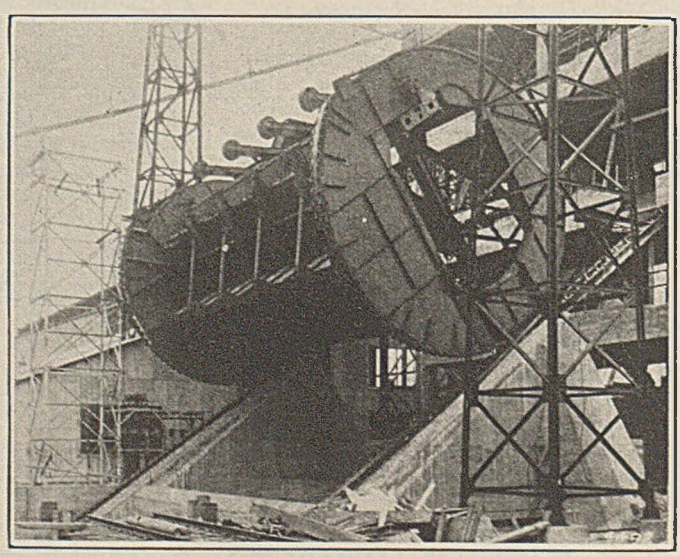
Safety Carbide Container Is Aid to Miners

An unusual type of carbide container recently has been patented and is now being manufactured by the Universal Metal Manufacturing Co., Birmingham, Ala. It is designed to aid underground workers in keeping a supply of carbide convenient at all times. It also facilitates the filling of their lamps. The container, known as the Fies-Lawley safety carbide can, was invented by Thomas J. Lawley, of Sipsey, Ala., and Milton H. Fies, vice-president in charge of operations, DeBardeleben Coal Corporation, Birmingham, Ala.

One of the features of this container is the swinging arms which fit snugly on each side of the can. These are affixed to the top. At the base of one of the arms is a small spring which, after the cap has been pushed back to obtain a supply of carbide, returns it to place. A catch on the cap engages the body of the can.

Under the cap is a renewable gasket which is claimed to make the can airtight and to prevent the slacking of carbide. On one of the arms there is a belt holder. This permits the container to swing forward when it is desired to remove the carbide without taking the can from the belt. The inventors claim the advantages of safety, economy and convenience.

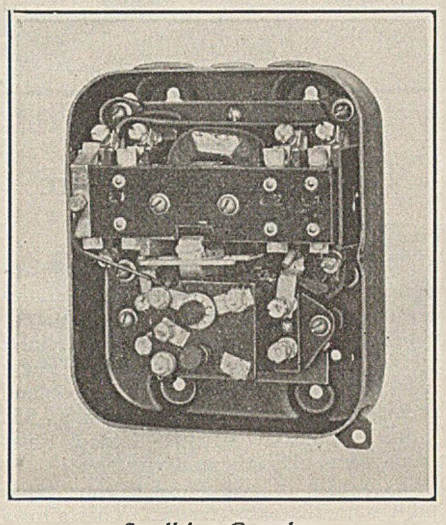




Showing Car Dumper at Rest on Rail Level and in Dumping Position on the Runway

Push-Button Starter Is Compact

"No larger than a telephone box" is the description of the starter recently announced by the Cutler-Hammer Manufacturing Co., Milwaukee, Wis. This starter handles motors of 5 hp. and smaller, gives push-button control of starting and stopping, and provides thermal overload and no-voltage protection.



Small but Complete

The starter is equipped with push buttons in the front cover of the case. The small size in most instances permits mounting of the starter where the control station would ordinarily be placed. Extra wiring and cost of a push-button station is thus saved. However, one or more push-button stations may be used if desired.

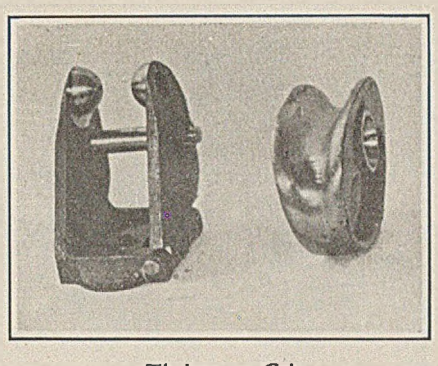
A novel feature is said to be the type of contactor developed for use in this starter. A roller is forced between two fingers to complete the circuit. Thus a double break, and a wiping contact, is secured. This arrangement, it is claimed, reduces arcing to a minimum.

To adapt the starter for any horsepower within rating, it is only necessary to insert the proper size heater coils in the thermal overload relay. The starter will be furnished to machinery builders without the case for incorporation in machinery as standard equipment.

Trolley Shoe Made for Heavy Locomotives

The new trolley shoe for mine work on heavy-capacity locomotives, recently announced by the Ohio Brass Co., Mansfield, Ohio, is made of either durable chrome steel or of highly conductive alloy bronze. Its design is such that the axis of the pivot (ball and socket type) is at the middle point of the shoe's line of friction. This is said to result in a perfectly even pressure and complete contact throughout the line of friction at all speeds, which insures slow, uniform wear. Such balance of design also decreases tendency to rotate.

It is also claimed that dust and moisture only serve as a lubricant for this shoe rather than as a detriment. In addition, construction of the shoe, according to its makers, is such that arcing which serves to shorten the life of the wire as well as that of the current collector is practically absent. The shoe is equipped underneath with a balance ring designed to give desirable protection to the bottom of the shoe, and it is also mounted on a harp which fits any standard pole bracket.



Thrives on Grit

Pinion Puller Serves Two Purposes

All mining motor pinions should be shrunk on the taper fit on the armature shaft and are best removed by the use of a pinion puller. The bearings in the ball-bearing type mining motor are put on the shaft with a tight fit so that the best method of removing them is by using a puller.

Combination pinion-and-bearing pullers have been developed by the Westinghouse Manufacturing Co. for their mining motors. The pullers consist of a headpiece which has eight holes drilled in it, so that the same plate is used with the pinion or bearing puller. Four holes are used for the stud bolts that are fastened with the plate used for the pinion puller. Four other holes are used for the stud bolts used to remove the housing and bearing. The plate has a brass button or insert fastened in the center of it so as not to damage the end of the shaft when pulling a pinion or bearing for replacement or repairs.

The pinion puller consists of a heavy steel plate that is machined to fit in between the pinion and housing, and then split in halves so that it can easily be put in place. After the halves or jaws are in place back of the pinion, a steel ring is slipped over them so as to hold them securely in place. In this way, the plate makes contact the whole way around the pinion and a straight pull can be obtained.

The illustration shows a pinion puller in place on an armature. The pinion is removed by tightening the nuts on the four studs. This photograph also shows the tapped holes in the housing which are used to fasten the stud bolts to pull the bearing.

All that is necessary to make a bearing puller if you have a pinion puller is two sets of steel bolts, one long set to use on the pinion end and a short set to use on the commutator end. Due to the construction of some of the housings, it is sometimes necessary to add another set of holes to the head plate to take care of the pinion and commutator end-bearings with the one plate.

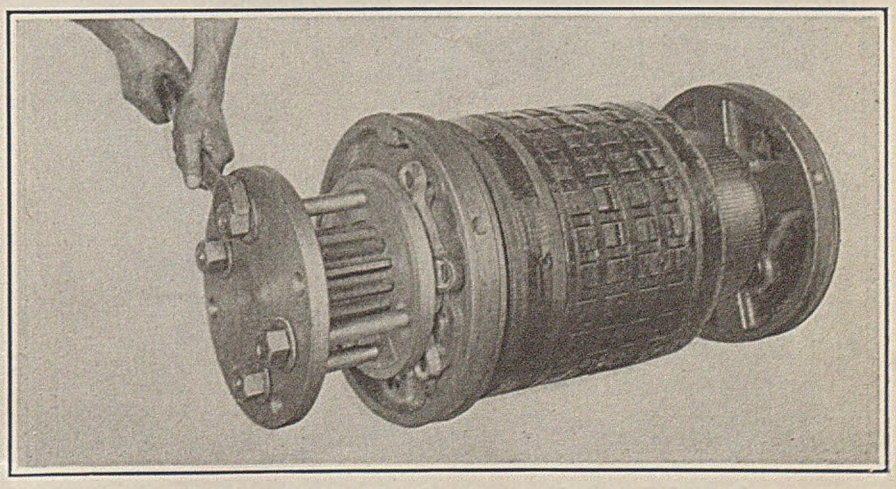
Safe Powder Bags Made Of Special Fabric

At the suggestion of, and in cooperation with, several leading mine operators, the E. I. duPont Company has developed a powder bag for the economical, safe and practical carrying of high explosives.

The material used in making the bags is a specially treated fabric which is claimed to be waterproof and resistant to fungus, dry rot, acid waters, vitiated air and all similar underground conditions. It is also said to be a nonconductor of electricity.

Experience has shown the risk run by the use of untreated canvas bags. There is also the ever-present danger of bags tearing or coming apart.

The material used in making these powder bags is the same as that from which duPont "Ventube" is made. Two types—pouch and knapsack—are made, and the capacity of the bags varies from 50 to 125 sticks of dynamite.



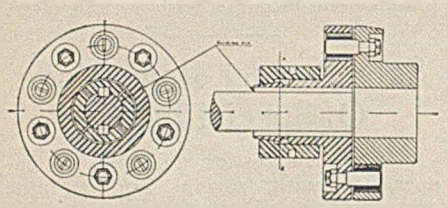
Simplicity, Strength and Efficiency at Work

Tension-Sleeve Couplings Save Time and Labor

Many kinds of present-day equipment require a flexible coupling on the driving shaft that can be quickly disconnected. These couplings facilitate quick changes in hook-up, or allow one motor to drive different machines at different times. Therefore, the Ajax Flexible Coupling Co., Westfield, N. Y., has developed such a device.

This flexible coupling, a modification of the standard Ajax rubber bumper coupling, is so made that the flange attached to the driven shaft is removable. The removable half is made with an extended split hub on the driving flange. This hub is tapered on the outside and half its length, nearest the flange, is threaded. A collar, made to fit over the threaded hub, screws up to a tension fit and thus tightens the hub to the shaft. The collar is further held in place by set screws fitted over two sliding keys.

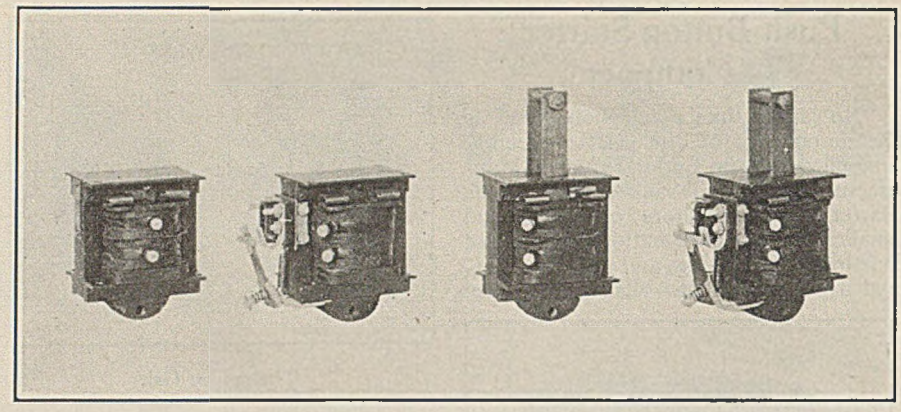
It is said that this type of coupling can be connected or disconnected in a



Permits Quick Changes

few minutes, the only tools required being a pipe- and setscrew-wrench. The removable flange and collar are made of steel and all other parts are identical with the standard Ajax couplings. Therefore, in event of accidental breakage, they are interchangeable.

Ajax tension-sleeve flexible couplings are claimed to have many applications. They are said to be time and labor savers, to absorb shock and overload, to allow free end-float to motor shafts, and are claimed to be insurance against undue wear on bearings, motor armatures and other revolving parts.



Economy of Space, Power and Cost Are Typified Here

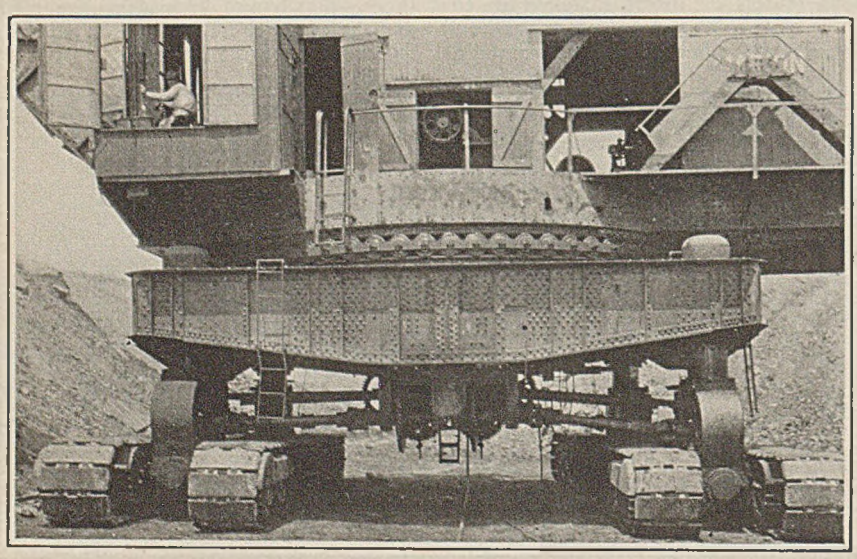
Electric Stripping Shovel Has Large Capacity

The Northern Illinois Coal Corporation, Chicago, Ill., is soon to place in operation on their property near Verona, a Marion type 5480 electric stripping shovel. This shovel, claimed to be the largest ever built, is to be mounted on crawling traction trucks equipped with Marion hydraulic equalizing jacks. These jacks are claimed automatically to hold the machine level while traveling or working on rough or uneven ground. The shovel carries a 90-ft. boom, a 60-ft. dipper handle, has a 12 cu.yd. dipper and will strip overburden approximately 50 ft. deep.

Although much heavier, the design of this shovel is said to closely follow that of type 350 which is used in the coal-stripping and ore-mining fields.

The electrical equipment is manufactured by the General Electric Co., and consists of two 255 hp. motors on the hoist, two 75 hp. motors on the swing and one 150 hp. motor on the crowd. All motors are rated on a 60 minute basis. The motor-generator set which furnishes power to the individual motors has a continuous rating of 700 kva.

The range of the machine is approximately the same as that of type 350 and, with the increased dipper capacity, is designed for 50 per cent greater tonnage.



Rugged Construction Characterizes This 12 Cu.Yd. Shovel

Uniformity Is Feature Of Solenoid Line

The General Electric Co. has announced a line of solenoids that includes both alternating- and direct-current types and has been designed especially for uniformity and flexibility. These solenoids are made in all voltages and frequencies up to and including 550 volts, and nearly all the different types vary from each other only in size.

Each size of solenoid has four types built with the same frame. This allows any solenoid to be adapted to a variety of applications. An a.c. solenoid can be adapted for d.c. operation by simply changing coils and adding a cutout switch for which all frames are drilled. A pulling solenoid may be changed to a pushing solenoid by adding two standard pusher bars. The pole face of the plunger is cylindrical and fits into a cylindrical seat on the frame. This insures quiet operation in any position.

Among the advantages claimed for these solenoids are:

Low cost; adaptability for either push or pull operation; unusually long uniform pull; low power consumption; economy of space; compact construction; ease of mounting; quiet operation in any position; except in a few sizes, no external resistance is needed for the d.c. type; and, with few exceptions, the standard solenoid can be used on shunt-wound solenoid brakes.

Renewable Fuse Has Only Three Loose Parts

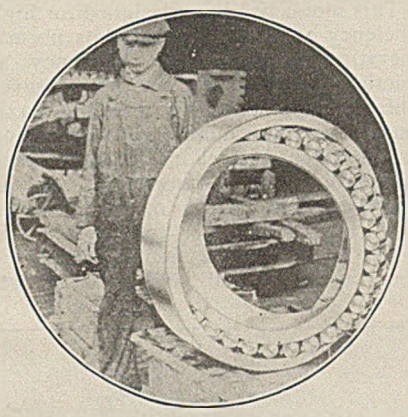
The Trico Fuse Mfg. Co., Milwaukee, Wis., has recently announced an important improvement in their ferrule-type renewable fuses.

The improvement is said to reduce the time heretofore spent in renewing fuses and also to eliminate all small loose parts. This is accomplished by using spring retainers on the end caps to hold the end screws. As now constructed, there are only two parts (in addition to the renewal element) to the Trico fuse. The general design of the fuse requires the removal of only one cap when renewing the replaceable element of the ferrule type fuse.

Largest Roller Bearings Carry Heavy Loads

Two SKF spherical bearings, of the type shown in the illustration and said to be the largest of their kind in actual service, have been successfully operating for more than three years at the plant of the Dexter Portland Cement Co., Nazareth, Pa. These bearings, nearly 3 ft. in diameter, are carrying the load of a 5½ x 26-ft. pulverizing tube mill. The mill is driven by a 250-hp. motor at 26 r.p.m. The load is 50 tons, or 25 tons per bearing.

Since they were installed, these bearings have been in continuous service.



Rugged and Self-Aligning

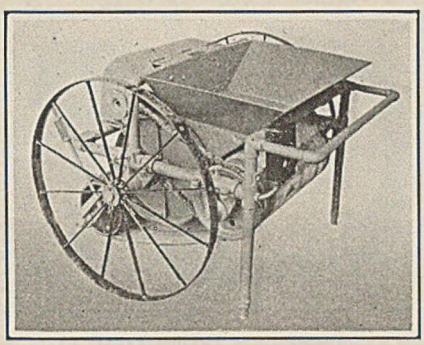
It is said that the only attention required has been lubrication several times a year. In addition to carrying heavy thrust and radial loads, an important feature of these bearings has been their self-aligning characteristics. Any inaccuracies in setting up and settling of foundations are claimed to be compensated within the bearings. Therefore, there is no need of any external aligning devices and no internal strains or stresses are developed.

Applications of these bearings are said to include those carrying loads of over 50,000 lb. per bearing. They are built in the largest sizes and today are used on large steel-mill motors, rolling mills, rock crushers, coal crushers, crushing rolls in flour mills, dredge pumps and on over 9,000 standard railway cars throughout the world. These bearings are manufactured by the SKF Industries, Inc., 40 East 34th St., New York City.

Centrifugal Loader Has High Capacity

A novel departure in machines for loading bulk materials into box cars has been made by the Stephens-Adamson Manufacturing Co., Aurora, Ill., in the Sinden centrifugal box car loader recently developed by them. It is claimed that this device satisfactorily does the work which has hitherto been done by machines of several times its weight and size. In addition, it is said to possess other important advantages.

In but one particular does the machine differ from an ordinary belt running



Light and Compact

around two pulleys. The difference is that a shaft with a flat disc at each end is lowered onto the top run of the belt, thus causing it to run in a curved path. The loader consists, therefore, of a motor, a conveyor belt less than 3 ft. long, two pulleys, the disc shaft and a loading hopper, all mounted on a steel frame with truck wheels and handles.

Falling from the hopper to the belt, the material is projected in a steady stream or jet which forms a pile beginning at the far end of the car and automatically builds itself toward the car door. The loader is so made that the angle of discharge may be adjusted and the height to which the material is piled may be varied at will.

In addition to lightness and compactness, and consequent ease of handling, another feature of the centrifugal loader is its low loading point. The top of the hopper is but 2 ft. 10 in. above the floor. Because of the high speed at which material travels on the curved belt, there appears to be no practical limit to the capacity of the machine. The machine, entirely self-contained, is but little larger than an ordinary wheelbarrow.

Protective Paint Used On D.-C. Motors

Coal mines, steel mills and industrial plants in the Pittsburgh district are said to be adopting the red protective paint recently developed by the General Electric Co. for use with direct-current motors which are subject to acids, alkalies, oil or dust.

This paint is used effectively on the ends of the commutators and between the ends of the commutator bars and comb, to prevent the entrance of oil, moisture, carbon and copper dust. In the Pittsburgh territory it is stated that there are some companies which, upon installing a new commutator, apply a coat of this new paint to the section where the V rings fit in. The new comb rings are then installed and paint is applied to the insulated parts of the commutator.

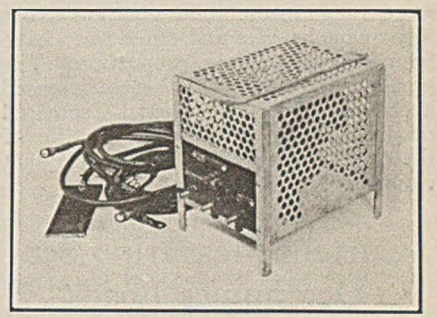
A number of mining companies in the central Pennsylvania field are using the paint on storage battery locomotives when a new battery is installed. The battery box, container, and top of the cells and terminals are given a liberal coat. This prevents corrosion.

The field coils on direct-current pump motors, exposed to oil and moisture, and the stators of induction motors are also being painted by several users. One coal mining company in Windber has also used the material for protecting the motors of the mine locomotives. The paint can be applied by brushing or dipping, requires no priming, and is said to produce a hard, smooth film.

Controlled Arc Improves Metallic Welding

Mines which use resistance welders of 200 amperes or more capacity should be interested in the "Shuntweld" arc control, a device recently patented by the Ohio Brass Co., Mansfield, Ohio. This equipment, designed for use where electrode polarity is negative, is claimed to be a good substitute for the heavy and expensive M-C type of welder.

Several reasons are said to make it desirable in shop welding-work: It reduces striking and maximum operating arc voltages; eliminates spattering of steel globules, which affects a saving in electrodes; avoids brittle and oxidized metal and results in better mechanical and electrical characteristics of deposited metal; there is less difficulty with electrodes "freezing" to the work; and it can be used with any 250-volt, 200-ampere (or larger) resistance type welder. This machine consists of a magnetic switch, automatically controlled, with a small shunt resistance mounted in a small frame.



Desirable for Shop Work

This forms an individual unit which, when connected to the standard O-B 250-volt welder, will produce the equivalent of the old shunt welder or a motor-generator type welder.

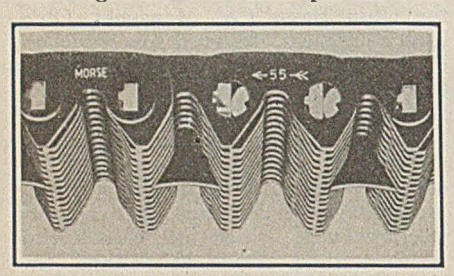
Two maximum values of arc voltage or arc length, high and low, are indicated on the panel board and are controlled by a small switch. The maximum arc length for which provision is made is about ⅜ in., since anything higher results in a brittle, porous weld and high electrical resistance.

The size of the welder is 9x12x12 in. An instruction sheet and a simplified electrical diagram of connections are said to facilitate connections. Necessary cables are furnished to make quick connections to the O-B standard 250-volt, 200-ampere welder. It is stated that only one or two minor changes are necessary to hook up this machine to any other welder.

Chain Drive Is Improved By Several Changes

A better silent-chain drive has been announced by the Morse Chain Company, Ithaca, N. Y. The improvements are principally due to changes in the design of the rocker joint. As the new link is the same length and height as the old, the present chain, known as type 55, will run on all sprockets.

The joint of the type 55 chain operates on the same principle as the original Morse rocker joint. The seat pin has been enlarged to give greater bearing surface and also to make it a stronger transverse member to hold the chain together. The rocker pin has been



Redesigned and Strengthened

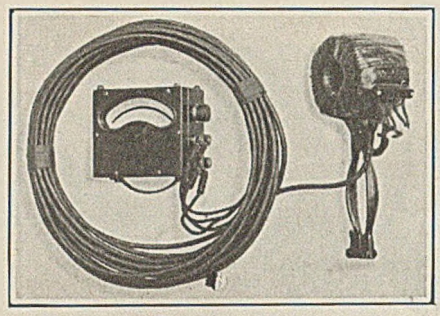
changed in contour, thereby giving a better surface of contact with the links.

The combined joint members give a more nearly round hole with reduced clearance, thus holding the links more securely on the pins. A better balanced joint, heavier that the old, produces a smoother running chain. The chain is more rugged—the joint pins are about 8 per cent heavier and other parts have been strengthened in proportion. The breaking strength has been increased approximately 50 per cent. Increased tension without shortening the life of the drive is claimed to be possible as a result of the changes made.

Current-Measuring Set Determines Loads

A split-core current-measuring set that is especially valuable in determining the load on feeders or distribution net works has recently been announced by the General Electric Co. The set is intended for use in determining the alternating current flowing in a conductor without opening the conductor to insert an ammeter or a current transformer to operate the ammeter. Each set consists of a transformer with a hinged magnetic circuit, leads and one or more ammeters. It can be used to advantage when the results required need not be as accurate as those that can be obtained with self-contained ammeters or portable current transformers and ammeters.

A distinctive feature of the set is said to be the ease with which the transformer can be clamped about the conductor. It operates like a pair of pliers —with one hand—thus insuring safety for the lineman. With overhead lines, it is claimed that transformer can be



Determines Feeder Load

clamped from below, thus avoiding the necessity of reaching over high-voltage lines. Flexible multi-conductor leads, 50 ft. in length, are supplied with each set.

A small size indicating ammeter is furnished. It has a cylindrical switch by means of which the various ratings of the set can be readily obtained without the necessity of changing connections at either the transformer or the ammeter. As each indicating instrument is calibrated with the transformer with which it is to be used, the scale reads directly in primary amperes.

The recording ammeters do not have the ratio-changing switches as do the indicating instruments. Changes in ratio are made by changing connections of the multi-conductor cable.

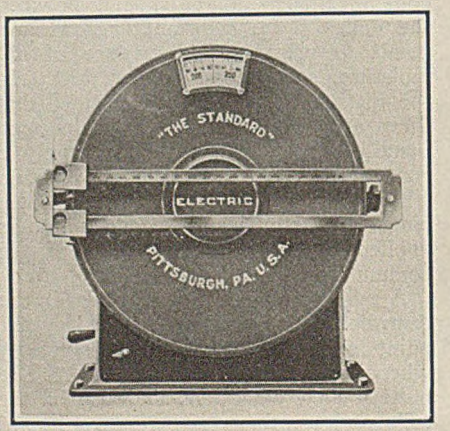
Electric Scale Designed On New Principle

A type of electric dial scale, said to be an improvement over dial scales now in use, has recently been announced by the Standard Scale and Supply Corporation, Pittsburgh, Pa.

This electric scale incorporates the principle of a chemist's laboratory balance, long known for its extreme accuracy, with an electrically-operated poise shift which automatically strikes a perfect balance. An accuracy within 0.015 per cent is claimed.

That the load on the platform does not turn the mechanism as in ordinary scales is said to be one reason for its remarkable accuracy.

It is claimed that this scale is adaptable to any type of heavy-duty beam scale and that it makes possible the weighing of nearly 20 loads an hour.

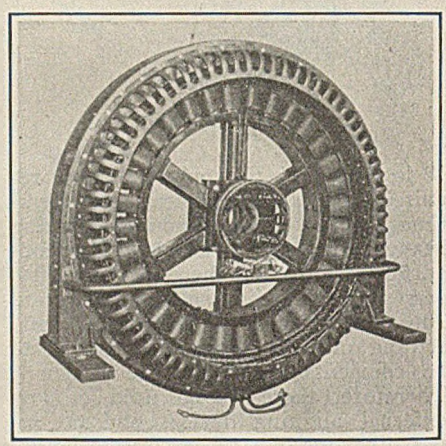


Rapid and Accurate

Synchronous Motor Has Novel Features

A low-speed synchronous motor, known as the type HR, has been announced by the Westinghouse Electric & Manufacturing Co. This motor is claimed to be the most modern and highly developed drive yet devised for slow speed machinery where direct connection is applicable. Although arc-welding has been used to some extent in Westinghouse motors for fifteen years, it is said to reach its greatest application in this machine. Its parts have been specially designed for ease in handling and assembling in the field.

This motor has been designed for high efficiency at all loads within its normal operating range. High efficiency at fractional loads is a great power saver since few applications require the maximum output of a motor. The excitation of this machine is claimed to have been materially reduced, thus increasing the efficiency and cutting operating costs. A difference of 1 per cent in the efficiency of a 200 hp. motor running 24 hours a day for 250 days a year, repre-



Efficient at All Loads

sents a difference of $250 with power at 3 cents a kilowatt.

A starting torque of 50 per cent and a pull-in torque of 40 per cent are said to be other features of this motor. The higher the starting torque, the quicker the motor will come up to normal running synchronous speed. Also, the line disturbance is correspondingly reduced. This high torque is also of value under unusual conditions, for example, when starting a machine that is still new and stiff or after it has been idle for some time.

Low-speed motors naturally have little windage effect. Therefore, cooling is effected largely by radiation. As heat has a deteriorating effect on insulation, a cool running motor will have a long life under ordinary operating conditions. The shape of the rotor arms in this new motor is claimed to be such that a large amount of air is set in motion. This cooling air is so directed that it not only passes through the stator coils but also over a large area of the stator laminations.