COAL AGE

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

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Editor

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A NEW ERA

In the Coal Industry

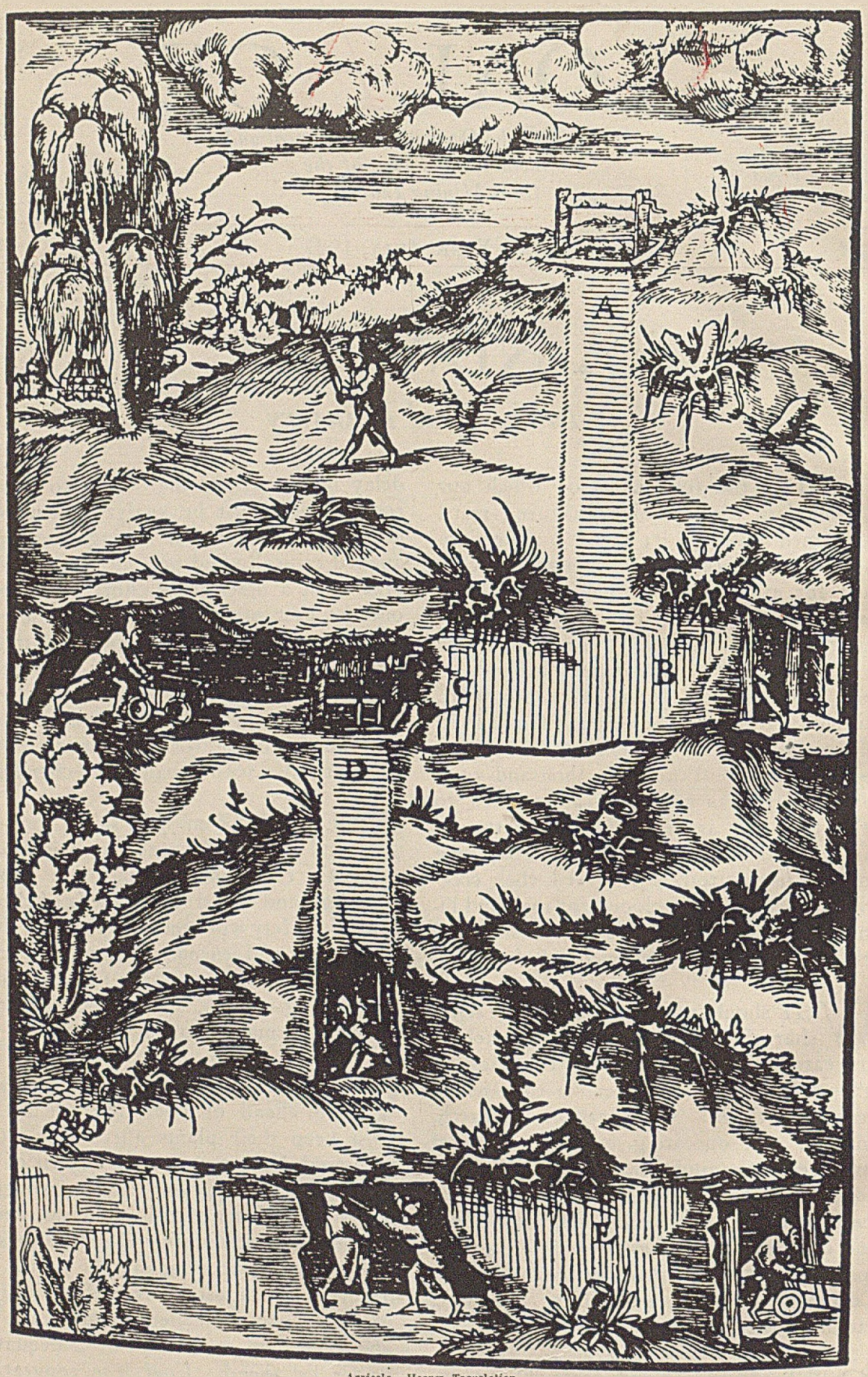
COAL is the foundation on which our modern industrial structure rests. Many men have said it; how few appreciate its full significance. If our thoughts be confined for a moment to America alone, we realize how completely our present complex civilization rests on coal. Our entire scheme of life with its work and its play depends on coal. Our homes, our factories, schools, churches, theatres, hospitals, require it. Whence our transportation? Whence our lighted streets? Whence a thousand comforts society has grown so accustomed to enjoy that they are accepted as a matter of fact? Coal has freed millions from long hours of useless toil. Thus freed, their creative instincts have developed for mankind industrial prosperity heretofore impossible and creature comforts not dreamed of before coal.

WHY should not the coal industry itself share in the prosperity it has helped to create? As coal men discuss this question among themselves they realize the answer lies with them. Co-operation, research, financial and operating budgets, technical improvement, application of mechanical power, all play a part. They realize the waste that results from opening new mines and developing old ones beyond the current consumption requirements of their markets. Lower production costs will be a leading factor in stabilization.

OPERATING officials must apply themselves more keenly than ever before to weed out every wasteful practice and every delay in operations that tends to increase costs. Jobs must be analyzed; equipment kept busy. Systems of mining must be examined critically and not one man's opinion taken, but a determined effort made to sift out the best practice known anywhere for similar conditions. Haulage methods must be readjusted in the light of new information. It must be recognized that haulage represents an underground transportation system that admits of railroad treatment with attendant order, with signaling and dispatching.

EQUIPMENT must be suited to the job and every effort made to maintain it in first-class condition. Preparation must be thorough and suited to the needs of the consumer. Safety work must be planned, closely supervised and encouraged by chief executives. Such a program calls for a new order of thinking—sharp, serious and definite on the part of managers and men.

COAL AGE realizes these problems that lie ahead of operating officials who must keep their plants abreast of modern industrial developments. In a spirit of helpfulness we shall present to you through the pages of this new monthly journal, devoted to your interests, ideas and suggestions that you can apply to your specific needs. We believe in the industry. We believe its future is assured once its leaders co-operate to bring about genuine stalibization. Adequate rewards lie ahead. *Coal Age* congratulates the industry on its new spirit and offers assistance to further its cause.



Agricola—Hoover Translation

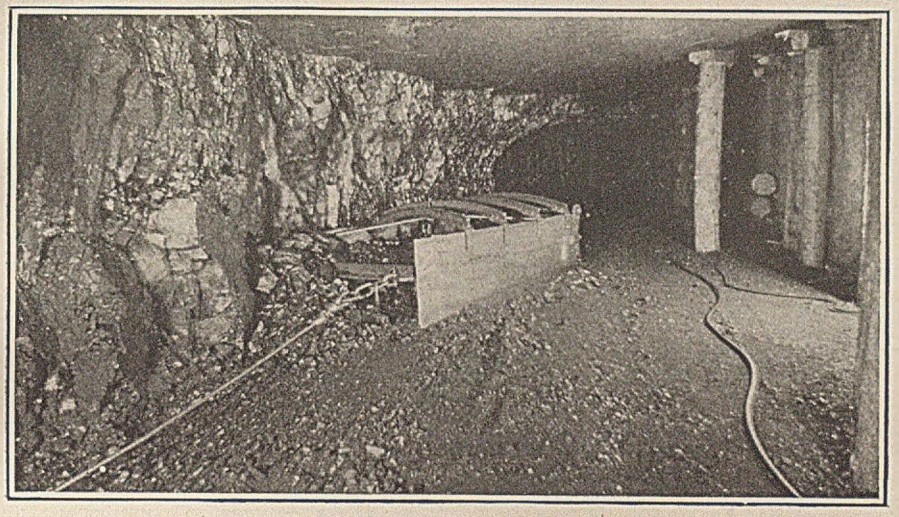
Sometimes when men become discouraged with the progress that has been made over this world of ours they are grateful to those recording geniuses of old—the artists—who captured, each in his own time, and held for future generations, something of the flavor of the many handicaps overcome by mankind in its conflict with nature.

MECHANIZE *First*

Change Layout Later If Necessary

By A. W. Dickinson

General Superintendent, Union Pacific Coal Co., Rock Springs, Wyo.



Trial Scraper Working in "Laboratory"

MOST of the coal mines in the United States are being worked by what is commonly known as the room-and-pillar or some similar method such as that which is almost standard in the Pittsburgh area. It has been the belief and best judgment of many coal-mine operating men that the employment of mechanical loading called coincidentally for a change in the mine projection; for example, the straight-face, the V-face, and so on. Though the application of many of these methods has been admirable and knowledge of great value to the industry has been gained, the mine staff on its first entry into the work of mechanical loading would do well to adapt the devices already employed in the existent mine workings. In the matter of machines one has today a great latitude of choice. There are, however, certain governing features in a mine already in operation which should be taken into consideration and weighed very, very carefully; as witness: (1) Size of mine car, (2) thickness of coal, (3) nature of roof, (4) nature of bottom, (5) impurities encountered, (6) pitch of coal, (7) general drainage of working places.

It is also highly important that the prospective entrant into the practice of mechanical loading of coal underground ask himself the following questions: (1) Is my ventilation adequate? (2) Can I shoot on the working shifts? (3) Are my haulage arrangements ample for the duty which will develop? (4) Is my power supply sufficient, and will it cover future needs? (5) Am I prepared to illuminate my mine properly?

AT THE same time an important point to be considered is that of multiple shifting of the machines, there being three unit shifts of 8 hr. each available in every 24 hr. For many years at metal mines and on tunnel and construction projects, multiple shifting has been developed with telling effect. One warning should be given regarding which more will be said later: Do not mix, in one mine, mechanical loading by day work with hand loading by contract.

The fundamental requirements of any organization facing the introduction of mechanical loading is to find and provide the right operating staff and suitable operating labor. It is an easy matter to buy bats and balls, and it is usually not difficult to find a ball ground, but where, how and by what means will you build up a winning team? For indeed, team work in mechanical mining and loading you *must* have, if a result commensurate with the investment in equipment is to be attained. Because there are so many and grave operating-staff and labor problems involved no one should start at one time both a change in the methods of recovery and a program for mechanical loading.

WHEN in the best judgment of the general staff of the organization it is believed wise to attempt a change to other methods of recovery, it will be found an excellent and valuable procedure to establish underground what is to all intents and purposes a "laboratory" area. In this "workshop," in a manner best determined by the staff, such departures from the standard practice of the mine as are deemed worth while may be tested to conclusion. Thus many, perhaps most, of the methods which it is necessary to prove may be tried and their results observed. By feeling the way carefully, many unnecessary expenditures and losses can be saved later. After thorough preparation and planning, the needs or methods worked out in the laboratory can be put into effect elsewhere.

As an illustration of what is meant by the foregoing description, it may be of interest to recite the experiences encountered at a group of mines entering upon a mechanical loading program early in 1925. As a first step, an engineer taken from the operating force and familiar with the

conditions of the coal bed, the labor and the equipment, was sent out over the coal fields of the United States under instruction to obtain all the information possible in a 30-day study, with particular reference to the mechanical loading of coal underground; later making a written report with recommendations. When the report was rendered, it was carefully studied by the staff and thereafter thoroughly and exhaustively discussed, this procedure not being a matter of hours, but of weeks. As a discreet step, a scraper was constructed by the company and given a careful trial beginning April, 1925. The place chosen for its operation was designated as "the laboratory," a point under 400 ft. of cover well advanced and close to the active face of the mine. Here the trials were to be carried out, the suitability of the scraper operation by tail-rope method ascertained and the proper roof span for scraper places determined, Fig. 1.

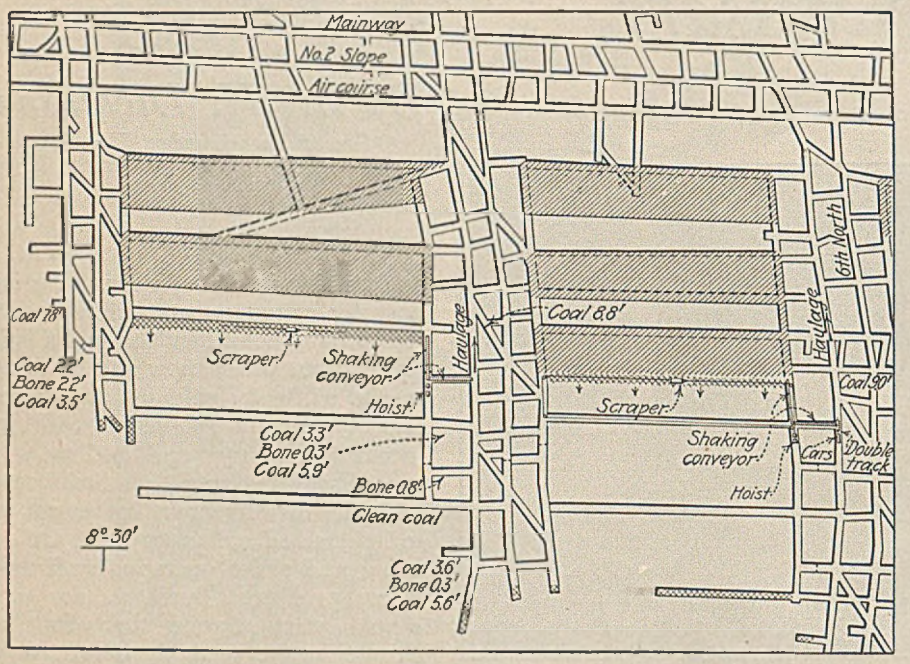


Fig. 1—Development of Blocks to Be Worked by Scrapers

All work done was predicated upon the theory of keeping equipment and men safe from roof disturbances at all times. Another ruling factor existed in the decision reached that the capacity of mine cars which was 4,000 lb. was not to be changed.

IN JULY, 1925, the practice of scraper loading was approved by the staff and after further planning and study, early in August, an order for one scraper-loading unit was placed with a manufacturer. This unit was received and placed in operation in February, 1926. The home-made experimental scraper was discarded, and the laboratory allowed to stand idle subsequent to January, 1926. However, the men trained on the unit were available for manning the new loader from February on.

In April, 1926, an order was placed for seven more complete scraper-loading units and by November they were all in operation. As will be readily understood, the operation of this number of units involved training intensively the many operatives who would be needed to handle the new equipment. The contributions of these men in ideas and hard work for the cause can hardly be sufficiently appreciated. They, with the staff men who were immediately associated with the installation at the face, gave every ounce of effort they could to the success of the work.

Meanwhile, in August, 1925, the curiosity of the staff was aroused concerning the possible application of the shaking conveyor to the loading program and it was conceived that it would be possible to construct a mechanism so that the telescopic end of the shaking conveyor could be made to feed forward with sufficient speed into the coal pile at the will of an operator. Such a device, it was realized, would contribute much to the loading program, particularly in view of the fact that it had been found extremely difficult to keep development work safely ahead of the scraper blocks (rooms). A shaking conveyor unit was ordered in August and received late in October, work being carried on from that time towards the development of a feeding Duckbill, with success attained in April, 1926.

After the arrival of the shaking conveyor unit in October, 1925, a serious and hard-fought attempt was made which lasted until August, 1926, to work by straight-face methods, driving narrow work up the pitch from the haulageway and drawing back 150-ft. blocks on each side, breaking the roof two cuts behind the face on props. This work was conducted at another mine from that where scraper loading was tried.

The tide of success and failure surged about this method, until it was finally abandoned, due to the realization of the staggering physical difficulties and excessive timber and timber labor costs. In the method just described, coal was undercut, drilled, shot and loaded by hand onto the shaking conveyor.

By August, 1926, startling results in the driving of narrow work with Duckbills had drawn the attention of the staff to the possibility of applying these devices to room work and to the drawing of pillars in exact reproduction of the standard method in vogue under the contract-mining system, but with the laborious job of hand loading removed. On the recommendation of the staff at the particular mine and field where the straight-face method had been tried in connection with the shaking conveyors, a method of driving rooms up the pitch with Duckbills was put into effect with immediate results, see Fig. 2.

It is pleasing to note that in the mines a sharp partisanship has evolved. Some men adhere to the scraper, others to the Duckbill devices. Much argument exists as to the relative value of the recovery methods which they are exemplifying. Accordingly, two schools have developed, that of the scraper and that of the Duckbill.

BECAUSE of the rather evident interest in the art of mechanical loading indicated over the country, it might be acceptable to set forth some of the arguments advanced by these partisans. The scraper loader advocates say: (1) that the scraper can produce more coal in an 8-hr. shift than the Duckbill; (2) that the

scraper can produce better lump coal than the Duckbill; and (3) that with the scraper unit less equipment is imperilled in case of ground or roof disturbances.

The Duckbill advocates say: (1) that they can work multiple shift (three 8-hr. periods in 24 hr.) if necessary and they chortle when they declare that the scraper place cannot be cut when the ropes are running; (2) that they can load under a weak roof, in fact, in any place in which an undercutting machine can work; also, that they can make large lump; (3) that the cost of a unit of their equipment is relatively low; (4) that a unit may be easily and rapidly moved and placed when moving a station; and (5) that the maintenance costs are low.

The multiple shift of 24 hr. advocated by the men of the Duckbill school may be developed either through the method indicated in Fig. 2, or by a modification of the so-termed "scraper block" as indicated in Fig. 3. Here the Duckbill proceeds up the straight face of the block operating in a coal bin made by placing lagging against props set from 4 to 6 ft. distant from the standing coal (which has been undercut). Additional sections are placed in the conveyor train as needed.

When coal is shot for loading by Duckbill using this method, snubbing shots should be employed in order that the coal may be broken so gently as not to disturb the lagging and props. The Duckbill is then followed by the undercutting machine at an interval of approximately 60 ft. and, as the undercutting machine feeds more rapidly than the Duckbill will advance, the operator and his helper may be provided with a drill to place the shotholes in step with the advances of the loading and cutting units.

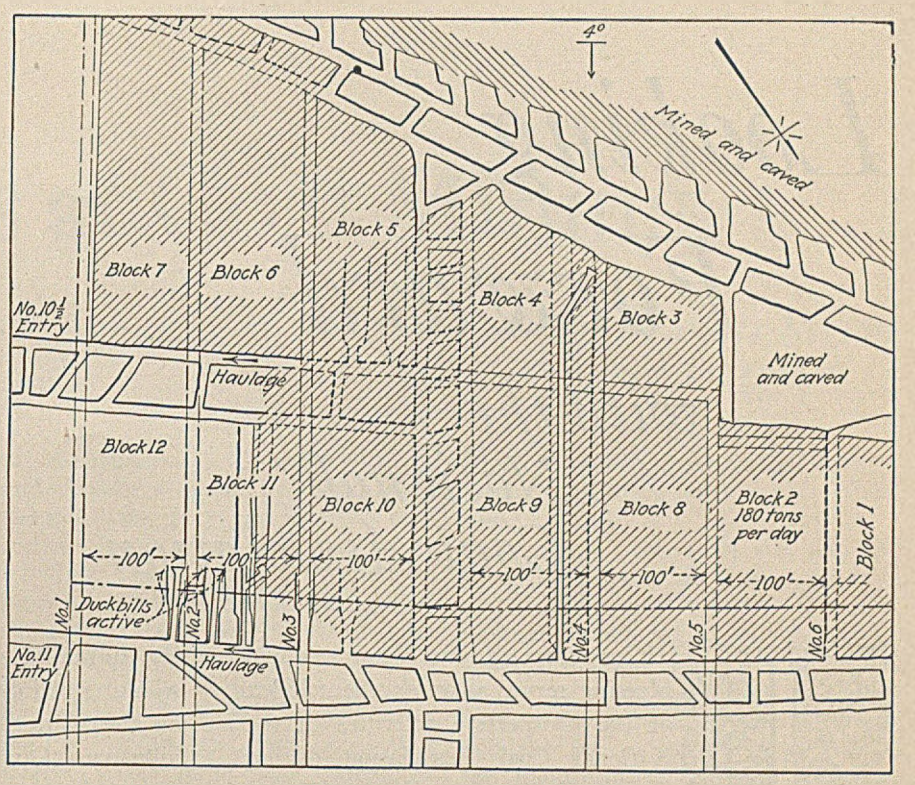


Fig. 2—Driving Rooms by Means of Duckbills

The coal worked under the methods just described varies in thickness from 4 to 11 ft. and in places carries as much as 10 in. of bone in one band. In some cases three bands of impurities must be handled. The devices described are considered as applicable to loading coal of 3 ft. in thickness and upward, with the thought, of course, that the equipment will be modified to suit local conditions as encountered.

It has been previously stated that it is not wise to have, in one mine, mechanical loading devices operated by day work with hand loading conducted on the contract method. There are many reasons for this, chief among which are: (1) Men engaged in contract loading may become dissatisfied; (2) those operating the mechanical loaders may also become uneasy; (3) supervision of a mine as a unit is somewhat disorganized; and (4) it is at times difficult to keep timbers, hand tools, powder, etc., in the proper hands.

In conclusion, it is not necessary to change from room-and-pillar to other methods of recovery when attempting mechanical loading. However, if after the staff men and labor are accustomed to the methods by which mechanical loading is employed in room-and-pillar work it is thought desirable to change to some other method, that is a problem for the man on the ground, thoroughly familiar with his mining field and his individual mine. Should he decide that a change is needed he should before taking action go out into the mining fields and see what the other fellow is doing. He should not start from zero, like a child who, by laying his fingers on the surface of a hot stove, learns that heat will burn and how it feels to be burned.

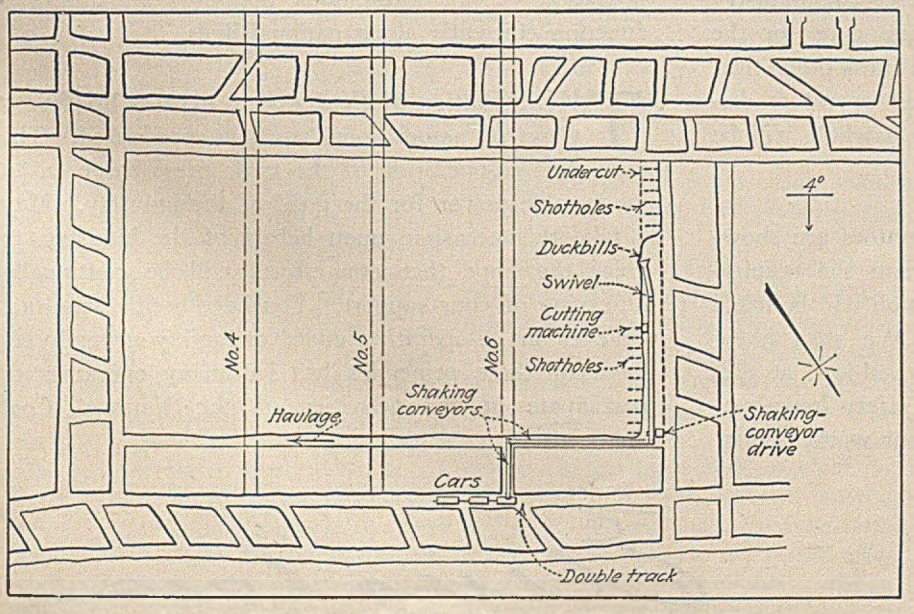
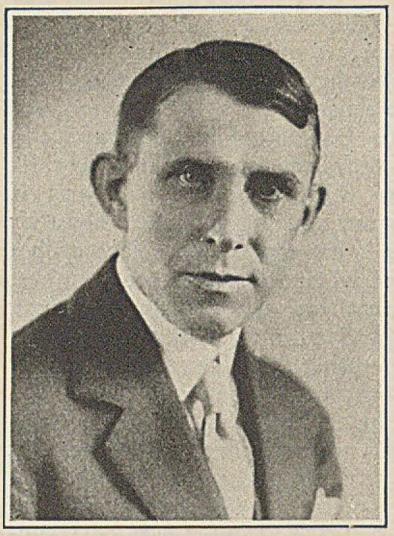


Fig. 3—Working "Scraper Blocks" With Duckbills

Looking Forward with the National Coal Association



E. C. Mahan

THE program of our Tenth Annual Meeting serves as an excellent index of the prospective activities of the National Coal Association during the ensuing year. The range of that program covered practically the entire field of major subjects which command the common interest of coal producers. I make particular reference to these subjects on our program: Budgeting, cost accounting, government and public relations, marketing, purchasing, research, safety and taxation.

MUCH will be accomplished for the industry by way of mechanical inventions and research. The progress of mine mechanization and the advancement of laboratory work hold vast potential possibilities. But the greatest good will likely be brought about by discoveries. When the operators of the country really discover the vital values of co-operative effort, many troubles which now beset the industry will disappear. There is positively no cure for the ills of this and every other line of business other than genuine team-work, and the sooner all operators discover this the sooner the industry as a whole will be established on a profitable basis.

THE growing interest which operators are showing in marketing problems warrants the assumption that increased effort in this direction will be made by the National Coal Association. We shall likely hold a series of conferences on this subject, at different points, during the year. The safety issue continues as a most important factor in our work, requiring unremitting attention. I have no hesitancy in speaking plainly and to the point respecting our position on the matter of legislative proposals to control the industry. Our recent meeting furnished further evidence of the united stand of the industry on this score. We also were most gratified to receive assurances of unqualified support in this particular from the leading business organizations of the land.

I COMMEND to the most careful consideration of every bituminous operator the minutes of the Tenth Annual Meeting, which will be mailed to the membership within a few days. Printed copies of the minutes will also be available to non-members upon request to the Washington office of the association. It will be most encouraging if operators will communicate with me, from time to time, giving their views on associational work. This organization requires the best thought of the industry and the whole-hearted co-operation of all bituminous operators in order to function efficiently along national lines.

THE invitation of *Coal Age* to express briefly my views on associational work is appreciated. The intelligent co-operation of the trade press has been an inestimable power for the good of the industry. May I take this occasion, upon behalf of the industry, to voice the hope that our efforts will be continually deserving of your support. You have been a steadfast believer in co-operative endeavor and your endorsement of these principles has led many operators to participate in the activities of the National Coal Association.

E C Mahan

A Banker Looks at Coal Mining

By Francis Sisson
Vice-President, Guaranty Trust Co.
New York City

THE QUESTION has been proposed whether the production of coal, one of the largest and most important of our national industries, can, to a more general extent, be financed publicly—whether coal securities can be made more popular with investors and be more widely distributed among them. Such securities, of course, already have been marketed in some volume; that with few exceptions they are selling on relatively high yield bases, and do not seem in general favor, reflects the fact that the industry is confronted with serious problems. To these problems earnest thought is being given; it is to be hoped they eventually will be settled from within. At all events, it is hardly within the scope of this brief article, which must be objective rather than subjective in treatment, to suggest specific remedies. Its purpose, rather, is to touch, in a broad way, on the requirements of the average prudent investor for income, and the manner in which, in substantial measure, the coal industry fails to meet them.

SINCE the purchaser of investment securities has a very broad choice of fields when placing his funds, it would seem pertinent to commence by considering the major characteristics he seeks in making a commitment. Safety of principal first, then safety and regularity of income, liberality of yield and possibility of appreciation are the main points to which he directs attention. Safety and regularity of return, of course, are very vital to the conservative investor for income, as distinguished from the semi-speculative or speculative investor, who sometimes seeks unusually high yield, but normally is more interested in capital appreciation, either in a short interval, or over a period of years. The conservative buyer frequently is dependent, in whole or in part, on the income from his investments, and is likely to be embarrassed seriously by a lapse, even though temporary, in interest payments.

At this point, before proceeding to a consideration of coal in the light of the rather broad generalities just set forth, it might be well to ponder a moment on the undeniable fact that the status of an industry affects alike the "unjust and the just." In other words, while there will always be shrewd buyers to purchase the securities of sound concerns of an industry in disfavor, the average investor, taking the not unnatural viewpoint that there are plenty of other outlets for his money, will shun obligations in that field.

NEEDLESS to say, the prices of all—good and bad alike—are affected by the consequent restrictions of demand. Two prominent instances in point are afforded by the traction and textile fields. Signs are not lacking that the corner is being turned in both; in individual instances it already has been turned; while in some cases it never has been reached, the way has been clear. But there is no question that at the present moment it is more difficult to sell the bonds of a sound traction or textile than the bonds of a corporation the business of which is not, in the popular mind, synonymous with poor earnings and pressing difficulties.

There are, of course, coal companies whose securities command high prices. But the constantly recurring labor troubles of the industry are heralded in front pages of the daily press, with unending reports of excessive facilities, overproduction, undue competition, and, in some instances, inefficiency. As a citizen, and as a business man, the individual of substance may be most interested in these problems; as an investor, however, he is most likely to turn his funds to other channels till greater progress is made toward their solution.

By virtue of its vast size and national importance, as well as the vital and steady needs it serves, it would seem eminently logical to conceive of coal production as a public utility. Surely no other industry is so closely knit to the service of transportation and the production of power. But the identification of coal securities with rail and power obligations, regarded the aristocracy of the investment field, while not inconceivable ultimately, at present would strain the imagination.

CERTAIN aspects of the industry, however, appear to facilitate the task of creating so solid a basis for its securities as would insure them a popular reception and broad demand. Property value exists in abundance to place behind them. Large operating units already exist, and more could be formed by purchase or merger, which could offer opportunities for bond or preferred stock financing in substantial volume. At present, however, but a scant few issues totaling in excess of $10,000,000, are outstanding, while a majority of those on the market are of less than $5,000,000 in amount. This, of course, does not make for active trading. Consumption requirements, too, in common with the demand for transportation or electric power, are relatively stable. The industry is fundamental and, unlike many other lines of business, can be affected only temporarily by caprices of the buying public, while it is not subject to sudden changes of habit or style.

IN ONE respect, however, it differs sharply from rail, utility or industrial enterprises whose securities have found ready acceptance with the investing public. It is essentially a producing rather than a manufacturing

business. The chief asset of a coal company are its lands—its mines—and its operations represent a depletion of capital that is not to be replaced. Were depletion the only problem involved, the usual sinking funds based on tonnage mined would be an entirely adequate solution. But the difficulty remains that known coal lands contain deposits sufficient for our needs for many years to come.

A LARGE coal company, to protect its investment and its existence, must control sufficient of these lands to assure its supply far into the future. To do so, in most cases, has involved outright purchase, and doubtless will continue to do so. It has not been feasible generally to acquire for nominal consideration long-term leases or concessions on a royalty basis, as oil companies have been able to do. Coal lands, until brought into production, involve carrying charges on the funds they represent and current payments in the form of taxes. It is a fact that unmined coal, while an ultimate asset of great value, is a present liability and a source of expense rather than revenue.

Unfortunately, steady and regular earning power in the coal industry has been conspicuous by its absence, especially in so far as bituminous operations are concerned. It is only too evident that the problem is broadly one of production and that many factors are involved. Overcapacity of the industry, heavy carrying charges of reserve lands, the large overhead involved in keeping open non-producing mines, the oversupply of labor and constant labor troubles, resulting in irregularity of supply, demand and price levels, and, to a more limited extent, transportation problems, all are contributory.

AT THIS point it might not be inopportune to consider whether current taxation policies of the states and the federal government do not aggravate present evils and encourage waste of a vital national asset. Coal in the ground can be mined but once, and until so mined is of no productive value. Furthermore, the land under which it lies practically never is income producing nor so situated as to be likely of itself to increase in value. In consequence, therefore, any taxes on coal lands based on appraisals that have included a valuation of the coal plainly are in the nature of a recurring levy on a capital asset in its essence non-productive until consumed. Their effect is to stimulate production at the narrowest margins of profit, and even at a loss, and to penalize the large and effiicent operator. Up-to-date and scientific technical equipment is extremely costly, and its economic and profitable use depends on large-scale and uninterrupted production. Producers making heavy outlays for its adoption must protect their investment with reserve lands to provide for future operations. Can a taxation policy be considered wise which intensifies the besetting evil of overproduction in an important industry, and discourages the introduction of modern methods?

THE federal income tax, too, favors and helps to keep in business the inefficient producer. Where supply, or potential supply, is in excess of demand, price levels are set by the consumer, and taxes, of course, must be absorbed by the producer. On account of the large expense involved in keeping open idle mines, and the burden of carrying charges on lands not in production, weaker companies, especially, are tempted to increase output on the narrowest margins of profit, while in some cases they can better conduct operations at a loss than suspend them altogether. Since such enterprises pay little or no income levies they are enabled longer to remain in business at the expense of more economic units.

THE logical tax for the coal industry perhaps would be a production tax on coal mined. Such an impost would promote conservation and discourage overproduction. It would fall most heavily upon inefficient enterprises, and doubtless would force many out of business, clearing the industry of dead wood. It would not improvidently place an unfair burden on progressive and well-managed units, which to protect capital outlays for technical equipment must carry extensive reserve lands to provide for output in years to come. It would not exempt from taxation companies operating without profit, favoring the continuance of their destructive competition. It might be expected, rather, to promote the efficient production of coal and greater care in its use. Its possibilities appear worthy of careful investigation.

Looking toward the future, a change in our present methods of consuming coal, which involve enormous waste, may be foreseen. With scientific and mechanical development, the time will come, and perhaps already is not far distant, when coal will begin to be economically transformed into power at the source of supply, and, in the form of electricity and gas, be transmitted to our industrial centers. The actuality apparently waits on further technical improvements in long-distance transmission—the solution, in many instances, of the problem of water supply, and the provision of capital. Superpower is becoming a reality; electrification of our railways will proceed, though slowly.

SUCH inevitable development must bring about a closer entente between coal and utility companies. If expensive power plants are to be constructed at the sources of fuel supply, it would seem evident either that the utilities constructing them must control, or have long-term contracts with the coal producers involved, or else that they must be built by the coal companies themselves. In the latter event, coal operators would need to control distribution systems or have such contractual relations with them as would protect their power station investments. The relationships to be developed will offer interesting and extensive opportunities for public financing and cannot but ultimately have a stabilizing effect on the industry.

FOR the present, while the larger problems engage the attention of leaders, individual operators can take such steps as are possible to help matters within their own organizations. Clearly, whatever the condition of the market, the low-cost producer is at an advantage, in so far as low-cost production is not achieved at the price of excessive overhead. The latter consideration at present renders doubtful in some instances, at least, purchases of expensive equipment, etc. Other means of cost reduction, however, which, though perhaps not so drastic in effect, require less capital outlay, should be sought vigilantly by all. Alert and efficient managements constantly can discover many ways of eliminating needless expense or increasing individual effectiveness, which mount in the aggregate. From the banker's standpoint, correct accounting methods and careful and well-planned financial and production budgets possess interesting possibilities. Thorough knowledge often reveals opportunities and paves the way for effective action.

ANTHRACITE—

Charts a New Course

By R. H. Buchanan
President
South Penn Collieries Co.

FUNDAMENTALLY nothing is wrong with the anthracite industry, but though this is true, existing conditions present many difficult problems which can only be solved by strenuous effort and greater co-operation among workmen, executives and wholesale and retail dealers.

Anthracite comes from an area geographically small where numerous coal beds lie close together one above the other. These seams, in most instances, are quite irregular both in contour and thickness. Early mining was carried on where the beds were thickest, easiest to get at and where the coal was of the best grade. In those days, because only a limited amount of capital was available, mining was carried on along lines which produced the desired tonnage as cheaply as possible and without any regard to the handicaps set up for future mining. Consequently, the best and thickest beds are practically mined out and the coal remaining is difficult and expensive to obtain.

Today much of the anthracite output is recovered from thin and previously worked seams. A large percentage of the remaining virgin coal lies at considerable depth and on steep pitches, making it difficult to mine. Because a large percentage of the coal seams has been previously developed by first mining a considerable part of today's operating cost consists of maintaining, ventilating and draining large non-producing areas through which the present-day tonnage must be transported or reached. The thin seams, often 2 to 4 ft. thick, lie between what were once large virgin beds but are now mined areas that must be carefully timbered and preserved.

Pumping requirements tend to become greater. Water encountered not only in new workings but flowing from abandoned areas rapidly increases the amount which must be pumped per ton of coal mined. Longer haulageways require enlarged transportation facilities, tracks must

R. H. Buchanan

be maintained over longer distances and more equipment is required to transport the coal from the working face to the preparation plants. More, better and safer ventilation has also become highly necessary and the ever-present hazard of fires and sometimes gas explosions must be faced.

Aside from these greater operating difficulties the anthracite industry is today facing serious competition from fuel oil, coke, gas, and bituminous coal. To meet this condition successfully, every operator must exercise almost eternal vigilance in his efforts to mine his coal as cheaply as possible, prepare it along the lines of the highest possible standards and see that his product is properly sold and serviced to the consumer.

The Road to Betterment

Since skillful management, economy and carefully directed sales plans will do most to permit the production and sale of anthracite at prices that will still allow the operator a fair profit, the industry could do much to assist itself in the following ways:

(1) By providing proper and efficient management to bring about every possible economy.

(2) By arranging for an interchange of viewpoints and experiences with new practices, methods and equipment which become available or can be developed.

(3) By co-operating on problems and maintaining closer contact with the workmen.

(4) By setting up uniform standards of preparation and reducing the number of prepared sizes of coal.

(5) By establishing a proper merchandising program.

Such steps as these are necessary and beneficial for both the large and small operating companies, because the success or failure of a part of any industry exerts an advantageous or adverse influence on the industry as a whole.

Efficient Management

The present-day responsibilities of successful management of anthracite properties necessitate a staff of executive assistants for the various departments into which the work is divided. As in other industries a man specially selected and fitted for definite duties must be placed in charge of certain kinds of work and held responsible for results. Such an arrangement would relieve the chief executive of numerous details in connection with the enterprise and afford the time and opportunity to devote his energies to the larger and more important questions and policies of the company, which, by receiving prompt attention, would materially improve the results. The function of an organization of this kind would be to give much needed attention to laying out five-year, or longer, programs of development and operation, resulting in greatly reducing the losses of time and money occasioned by day to day methods of operation, and would give the maximum ultimate return from the individual mine.

By providing ready means for exchanging points of view and experiences with various operating methods and equipment much money now spent along the same lines of endeavor by the various companies

could be saved. Duplication of such research efforts, as are now made, would be eliminated and more universal application of new ideas of a worth-while nature would be much faster. In this connection nothing would be better for the industry than to have a permanent and active bureau of its own to promote the interests of the anthracite industry in general.

The use of electricity in mining has already done much to combat the tendency of operating costs to rise. However, greater results can be obtained by means of a system which will broaden the application of many successful electrical machines and ideas which today are used at individual mines. Wide use of electricity in mining holds greater possibilities for reducing operating costs than any other single idea. Any method by which the many electrical improvements available from time to time may be more fully realized and broadly applied in the anthracite field would be worth a great deal to the industry.

Co-operation Brings Success

In some respects we have only begun to make use of the large economic benefits of electrical energy; many opportunities still exist to extend its use along new lines. By means of an anthracite association, with a research bureau, much more co-operative effort can be exerted to solve the industry's problems. The result of this co-operation would soon attract the attention of manufacturers and engineers in other fields who could lend much of their experience to develop and apply electrical and mechanical devices along new and different lines.

Savings in labor costs, amounting to between 30 and 40 per cent, have already been made in some of the lately built electrically operated preparation plants. Where steam-operated properties have been converted into electrically driven plants the savings in operating costs have been from 25 to 60 per cent. Only by complete electrification and the abandonment of all isolated, obsolete and inefficient steam plants can the greatest economies of electricity be obtained. Ventilating and large hoisting problems in some instances have stood in the way of complete electrification, but even the difficulties they hold out can be overcome by careful study, co-operation and the assistance of manufacturers.

For the past several years there has been a noticeable trend toward the elimination of a large number of isolated and obsolete preparation plants. In their place now stand new modern structures in many instances employing greatly improved coal-cleaning methods and using less manual labor. Much greater concentration of this nature can still be made to advantage. The same idea can be extended to the inside workings.

The industry, like every other, must rely more and more upon machinery to reduce operating costs. This being the case and due to a relatively fixed demand for anthracite much benefit can accrue by concentrating mining efforts in a few places where large tonnages can be produced. Scattered methods of mining limit the possibility of using mechanical and electrical equipment to the fullest extent, and the investment for such apparatus cannot be justified by the present small tonnages. Concentrated mining means larger tonnages from smaller areas and under such circumstances the economic possibilities of using more equipment increase rapidly. The labor required to produce a ton of coal can be reduced to advantage and the best way to accomplish this end is by means of machinery. Rapid and more complete exhaustion of a mine cuts down the operating and maintenance costs of the property.

Methods Will Improve

More co-operative effort and study will no doubt improve the methods and costs of preparing the raw coal from the mine. Most all of the lately developed coal-cleaning processes necessitate large new capital layouts which can only be justified by making it possible to turn out large tonnages. Relations between the employer and employee in the anthracite industry can be improved by the creation of greater confidence in each other, by the fullest co-operation and a determined effort to see that all working agreements are lived up to in every respect. In dealing with its employees the anthracite industry has reached the day when it should consider plans by which its workmen may obtain stock ownership in their companies. Such an arrangement would no doubt create a more sympathetic understanding of the various points of view held by employer and employee.

Uniform standards of preparation must be generally agreed upon and certain changes determined by exhaustive study and tests, beneficial to the consumer and producer, must be made. These things cannot be done successfully until the industry as a whole acts together. Thinner and poorer beds necessitate ever-changing methods of preparation and if high standards are to be maintained the industry must keep pace with the problems this condition presents. Few people appreciate the fact that an anthracite preparation plant is in fact a large factory. It is not unusual for a company to invest between $1,000,000 and $2,000,000 in such a plant. Surely when such investments are at stake the management should know what the quality of its product should be and be sure that the plant will not be made obsolete in a few months due to an inability to produce a product which will be satisfactory.

Merchandise Product

Anthracite operators should be keenly conscious of the necessity of having a complete merchandising program which extends all the way to the consumer. Merchandising results today depend upon service.

Unfortunately, even after every precaution has been exercised to prepare and size anthracite to meet the most exacting market requirements, rough handling and degradation in the retail yard may result in an unsatisfied customer. Many of the coal yards handling anthracite are operated by the same means and methods as used decades ago. The coal is frequently dropped and broken many times before it reaches the consumers' bins. A better yardstick of efficiency in handling coal is quite necessary. Efforts should be made to service each consumer and build up good will. When better handling and marketing methods are uniformly applied the producer will not be blamed for degradation beyond his control and consumers will be better convinced of the many advantages of anthracite as a domestic fuel.

What the anthracite industry needs most of all is whole-hearted co-operation. This concerns the operator, the workman, the wholesaler, and lastly the retailer, who is in direct contact with the consumer. With whole-hearted co-operation, even though there is little possibility of any large increase in production, and with only a normal increase in population, the future of the anthracite industry is assured. If such co-operation is not secured, the industry will shortly drift into the same position as the bituminous industry.

RECREATION—


C'mon in!

A Vital Force in the Modern Coal-Mine Community

Two Pages of Pictures Taken on the Spot

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

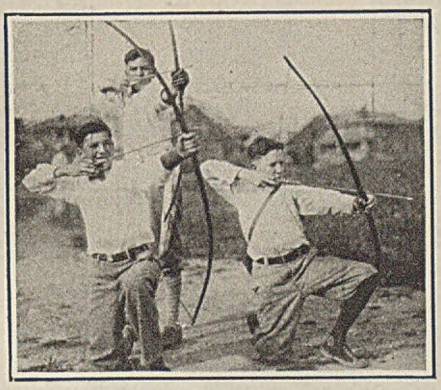
OF ALL the coal fields in the United States the Wyoming Valley of Pennsylvania is perhaps the most urban and densely populated. It would be but natural to expect, therefore, that any movement, having public welfare as its object, should here gain rapid strength. Yet what has been accomplished along the banks of the Susquehanna can be duplicated, or possibly even bettered, elsewhere.

Perhaps it was only a coincidence that the Kingston Coal Co. built the first playground in the anthracite region in the same year that certain public-spirited citizens in Washington, D. C., President Roosevelt included, formed the Playground and Recreation Association of America. There are many, however, who firmly believe that this company then started a ball rolling in the coal fields that has steadily gained both weight and momentum with the flight of years.

Today leadership in public play and recreation has passed from the hands of the coal producers. Yet, as may be judged from the accompanying illustrations, the coal companies did much of the pioneering and the shadow of breaker, headframe or substation frequently falls across athletic field, ball diamond and playground.

H. S. Baucher, secretary of the Playground and Recreation Association of America, writes *Coal Age* that, according to the annual report of Major Arthur H. Miller, secretary of the Wyoming Valley branch of this organization, the following communities, many of which are coal towns almost exclusively, are served: Wilkes-Barre, Kingston, Dorranceton, Edwardsville, Larksville, Plymouth, Courtdale, Pringle, Luzerne, Swoyersville, Forty-Fort, Wyoming, West Wyoming, Exeter, West Pittston, Midvale, Georgetown, Parsons, Plains, Hudson, Miners Mills, Ashley, Hanover, Newton, Lee Park, Sugar Notch and Warrior Run.

Fifty-two playgrounds, 4 indoor recreation centers, a swimming pool, a bathing beach, a municipal golf course, 8 athletic fields, 14 tennis courts, 90 quoit courts, 6 wading pools, 2 picnic grounds and 14 ball


Ready! Take Aim!

fields are some of the facilities provided. Last summer the average daily attendance at these recreation centers was 18,650 persons. The program of sports included: Athletic contests, community singing, band concerts, dramatics, holiday celebrations; first-aid, domestic science and handcraft classes; junior police, winter sports, and marble tournaments.

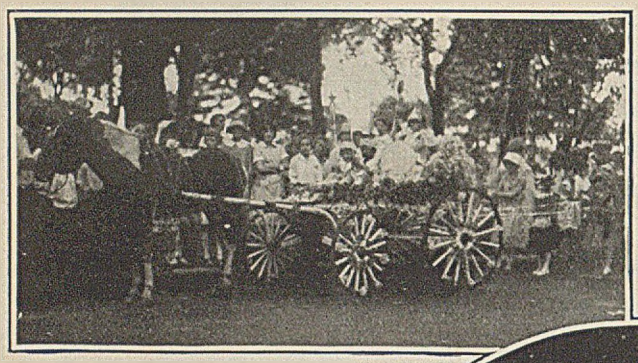
Under the direction of Frederick E. Zerby the Kingston Coal Co. built the first playground in the anthracite region in 1906. Since that date this company has constructed five others. These have all been equipped with apparatus built in the company's own shops. So practical was its design and construction that much of it is still in use after 20 years of the severest kind of service.

The Lehigh & Wilkes-Barre Coal Co. built its first playground in 1921 at Sugar Notch. In 1924 it built two others at Newton and Lee Park respectively. In 1922 the Haddock Mining Co. developed an athletic field and playground. Several other coal companies in the Wyoming Valley have given desirable tracts of land for use as playgrounds.

But the anthracite region has no monopoly on public recreation. Western Pennsylvania, West Virginia, Indiana, Illinois and some of the Western States are decidedly progressive in this direction. Thus, in Evansville, Ind., which is on the edge of the coal fields, the program is administered by the park board. Last year this community had 10 outdoor playgrounds, 5 swimming pools, a bathing beach, a municipal golf course, a summer camp, 3 athletic fields, 14 tennis courts, 2 wading pools and 3 ball fields.

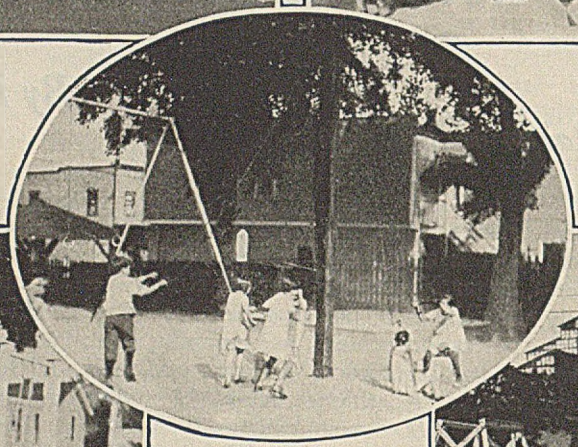
Centralia, Ill., a much smaller community, has an excellent program of recreation. No less than 60 acres are here devoted to sports of various kinds in which several hundred persons participated last summer. Baseball, football, basketball, horseshoe pitching, handcrafts, community singing, athletics, dramatics and holiday celebrations are special features.

This article makes no pretense of being a survey of organized recreation in mining communities. It is not even claimed that any large number of such communities have organized recreation. It is probable that the reverse is true. Enough has already been accomplished, however, to show the importance and practicability of the movement. Many centers of population that serve the anthracite fields, both directly and indirectly, are now provided with municipally administered recreation programs. Good recreation is also being carried on in many communities of the bituminous regions.

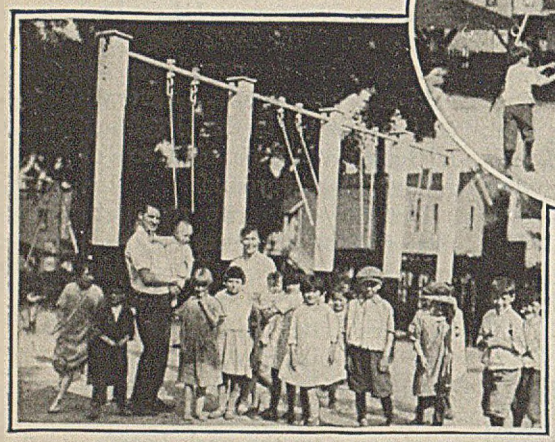


A Pageant in Wilkes-Barre

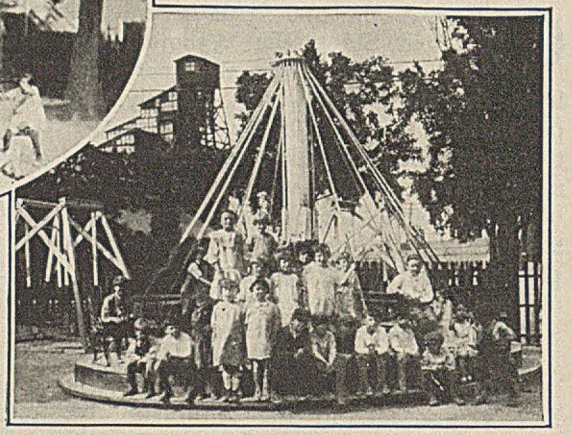
Swings Are Kept Busy



Maypole



Out for Fun

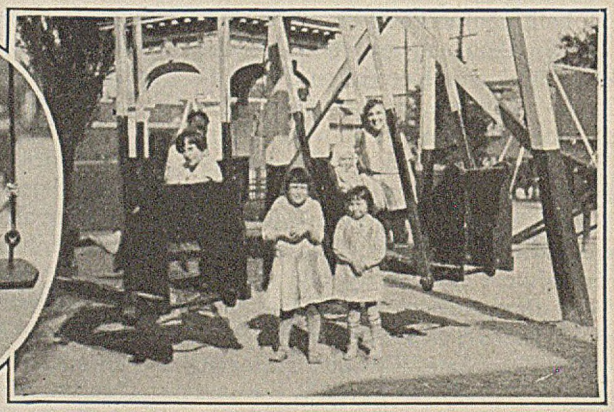


Happy and Healthy

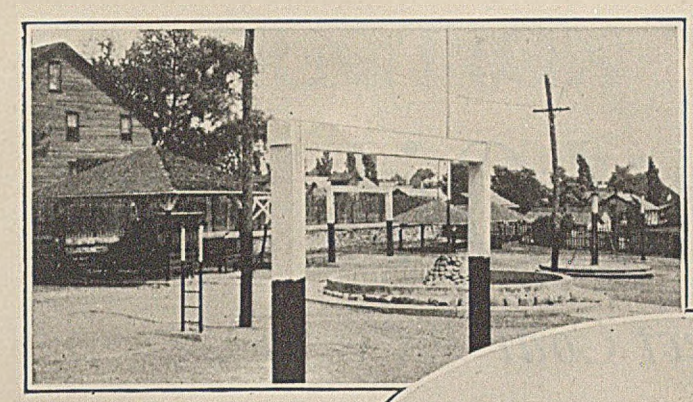
Folk Dancing

Keeping the Pot Boiling

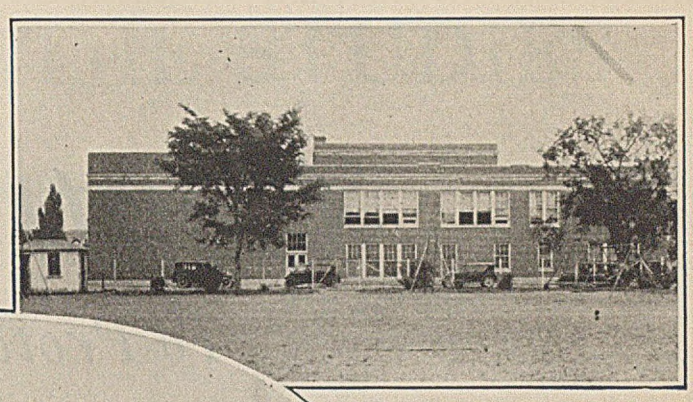
Write Your Own Caption



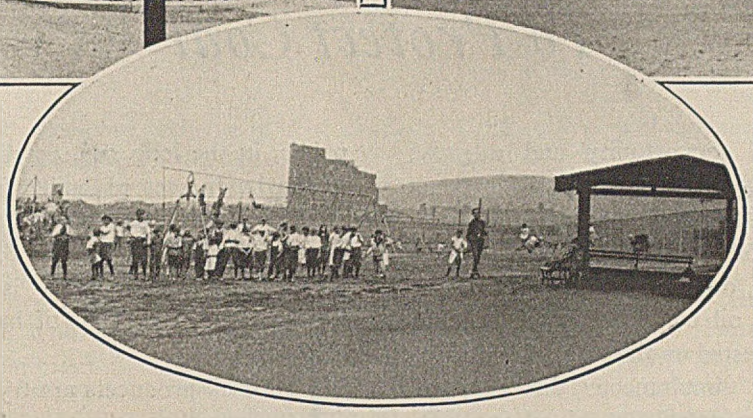
"Kids" of All Ages



During the Closed Season

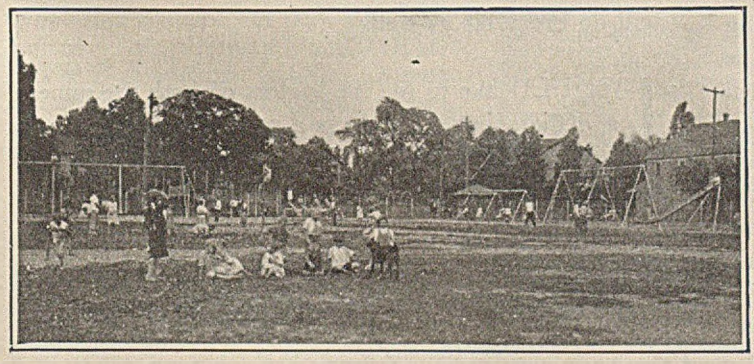


Playground and School

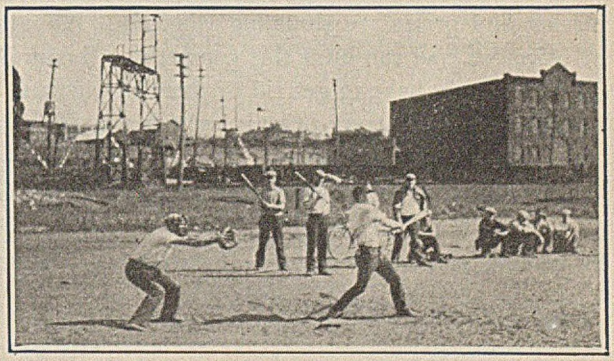


In the Shadow of a Breaker

Lively Times on a Hot Day



Training Muscles



Fair Ball

Scenes on Playground and Ball Field

Control Oil

To Protect Coal

A GREAT opportunity and a great danger confront the coal industry in the present crisis of overproduction in the oil industry. The coal men, perhaps, do not realize how large an element oil competition has been in the depression which has rested on the coal market since early 1924. The nearly simultaneous discovery of five record pools caused a great glut of oil in 1923. Storage facilities were soon overtaxed and a flood of fuel oil and even crude was loosed upon the boiler fuel market. Before then the consumption of fuel oil had been limited to well-defined areas in the Southwest and on the Pacific Coast. Now the wave rolled farther north and swung up along the Atlantic Coast. In 1920 the consumption of fuel oil and of crude used as fuel was 297,000,000 barrels, in 1924 it was 430,000,000 barrels. This was an increase of 133,000,000 barrels, and meant a displacement of 33,000,000 tons of coal in 1924.

GRADUALLY the situation improved. In the summer of 1925 fuel oil prices turned definitely upward and the pressure of oil competition began to be less severe. Now, overnight, we are threatened with another tidal wave of fuel oil. As Walter Teagle, President of the Standard of New Jersey, says: "Overproduction is recurring in a form so malignant as to seem to be without precedent in all past history." Stocks are piling up so fast that forced liquidation is inevitable. The bottom has fallen out of the fuel oil market and prices are slumping woefully. No cutting of prices of coal can meet this competition, because the oil men simply have to get rid of their surplus and will sacrifice it for whatever price is necessary to move it.

A GLUT of fuel oil is one ill wind that does blow literally nobody good. It harms the oil producers by forcing prices below cost. It harms the consuming public, in the long run, by diverting potential gasoline to the baser uses of boiler fuel which coal can meet. And it works very grave harm to the three million people who depend on the coal mines for their livelihood. The coal industry is in no condition to lose another 30,000,000 tons of business to fuel oil.

THE oil producers are trying to hold back the flood by some co-operative plan to control the insane competition in exploiting flush pools. The Federal Oil Conservation Board appointed by President Coolidge has already recommended action along these lines. The oil men can do it if they have public support. In my judgment, the American people will give their support if they once understand the situation.

HEREIN lies the opportunity of the coal industry. Let the associations of coal operators and the miners' union step forward and give the oil industry every possible support. The public should be made to understand that this flood of fuel oil is unsettling the coal industry in much the same way that the Mississippi is washing out the farmers in the bottom lands, and that at the same time it is wasting our national heritage of oil with criminal recklessness. We need this oil for gasoline and lubricants and it is a sad commentary on our national housekeeping if we cannot manage our resources more thoroughly. Oil for house heating is meeting a real need, but most of the fuel oil is being burned under boilers where the poorest of our coals will do every bit as well.

I WOULD like to see the leaders of both the miners and the operators address a memorial to the President of the United States urging his support for some means of checking this impending flood of fuel oil.

John Raskob

PRODUCTION TIME STUDIES

Aid Management

By Jerome C. White
Planning Engineer, Pittsburgh Coal Co.
Pittsburgh, Pa.

AS MANAGEMENT becomes more of a science it uses more of the methods of the scientist. Time study is the microscope of operation; it also furnishes an example of analysis. Building up production standards from known correct operation times is a form of synthesis. In the article "Mechanization Necessitates a Change in Management," which appeared in the April 14 issue of *Coal Age*, charts 1 and 2 on page 530 are analytical; chart 3 is an example of synthesis because it was built up from the known elemental times shown in charts 1 and 2.

Time or operation studies are made in order to substitute fact for "judgment." As a means of increasing production they are gradually replacing the older method of general observation. "Time and operation study is more than mere timing with a stop watch. Mere statistics as to the time which a man, or a crew of men, takes to do a given piece of work do not constitute time study. Time study involves careful study of time in which work *ought* to be done." (Frederick W. Taylor.)

"Time study may, therefore, be defined as a searching scientific analysis of methods and equipment used or planned in doing a piece of work; development in detail of the best manner of doing it, and accurate determination of the time required." (Management Handbook.)

The coal industry is being advised to plan, schedule and control its operations if mechanization is to be a success. Mechanical loading, however, is but one element in the new scheme of coal production. In order to plan, schedule and control for maximum production, management must first have data upon which to work. As one operation depends upon another, loading upon haulage, haulage upon hoisting, and hoisting upon tipple performance, it can be seen how important it is to have these basic data. When the whole operation is broken down into its constituent elements and studied minutely the solution of the whole problem is greatly simplified. Sources of waste may arise from faulty methods of both the management and the workers. Time studies reveal these wastes and properly allocate them as to causes.

The operation studies described in this article are caging, hoisting and dumping at two shaft mines. At one for instance, the largest single item of delay was shown to be the shortage of empty cars. At the other mine, while not exactly chargeable as a delay, it was noted that if the bottom could be re-arranged to accommodate more loaded cars so that longer trips could be hauled and some surplus loads and empties could be stored to "take up the slack," production would be increased.

On the chart shown in Fig. 1 it will be seen that there were times during the day when a motor arrived at the bottom with a loaded trip before the preceding trip had been completely discharged. On the other hand, if the locomotive was a few minutes late the hoist would be idle. More sidetrack room on this bottom would provide load and empty storage which would act as a reservoir. In this particular instance it required careful and accurate handling of motor crews to keep the bottom sidetracks in coal. On account of heavy grades the trips were limited to 22 cars each and a pusher locomotive used. Two crews hauled to the shaft.

It will be seen that more sidetrack room would allow greater flexibility in both hoisting and haulage. As each locomotive was scheduled to arrive at about the time a trip should be caged off, every hoisting delay increased the time lost by the haulage locomotives, as one depended upon the other; conversely, every locomotive delay meant a cessation in hoisting. In this case, had there been storage room for surplus loads, caging could have proceeded even though a locomotive might be delayed. On the other hand, with such a storage available a locomotive could drop its loads, pick up its empties and leave even though there were a delay in hoisting the previous trip.

THE hoisting study, shown graphically in Fig. 2, reveals a case of unequal car distribution. That this is the case can be seen in the early part of the morning, when too many empties were allowed to go out in

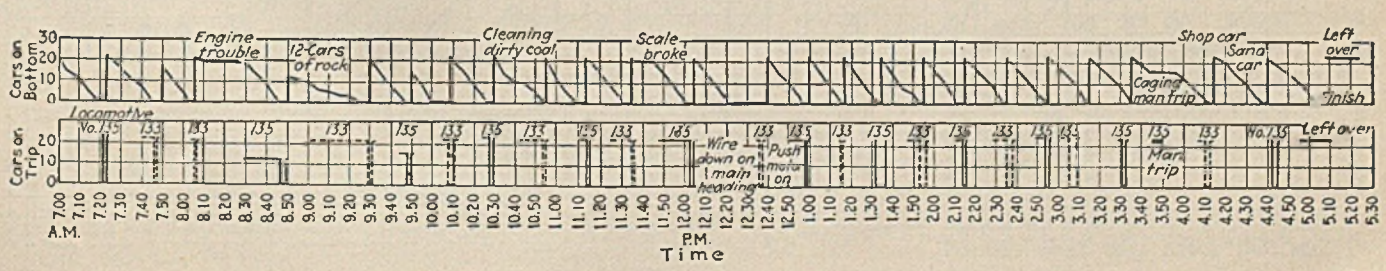


Fig. 1—The day's operation at a glance

The upper section of this chart shows the number of cars at the shaft bottom during the day. The vertical scale indicates loaded cars and the horizontal scale minutes. The degree of pitch of any diagonal line is an indication of the speed of caging, hoisting and dumping. The lower sections represent the arrivals and departures of the locomotives. This chart of Mine A is made from Table I.

TABLE I—MOVEMENT OF TRIPS AT SHAFT BOTTOM, MINE A

Loco. No.	Arrived[1]	Pulled In[2]	Loads	Out	Trips	Total at Bottom	Allowed Min.[3]	Delays: Wait on Cage, Min.	Delays: Interval Between Trips, Min.	Remarks
133	....	....	....	6.58	..	..	..	..	..	
133	7.20	7.22	23	7.24	1	4	3	1	..	Gath. loco. on head end. Heavy loco. used for pusher.
133	7.40	7.47	22	7.48	2	8	3	5	16	
135	8.03	8.06	21	8.07	3	4	3	1	15	
5	8.31	8.47	12	8.50	4	19	3	16	24	Dirt.
133	9.01	9.29	21	9.31	5	30	3	27	11	
135	9.44	9.48	15	9.50	6	6	3	3	13	
133	10.05	10.08	22	10.11	7	6	3	3	15	
135	10.24	10.28	29	10.30	8	6	3	3	13	
133	10.42	10.55	22	10.56	9	14	3	11	12	
135	11.10	11.13	22	11.15	10	5	3	2	14	
133	11.25	11.35	22	11.36	11	11	3	8	11	
135	11.48	12.03	22	12.05	12	17	3	14	12	
133	12.35	12.36	22	12.38	13	3	1	2	30	Regular 10-ton push motor on.
135	12.50	12.58	22	12.59	14	9	1	8	12	
133	1.15	....	22	1.16	15	1	1	0	16	
135	1.32	1.32	22	1.37	16	5	1	4	16	
133	1.47	1.53	22	1.56	17	9	1	8	10	
135	2.11	2.14	22	2.16	18	5	1	4	15	
133	2.28	2.35	22	2.38	19	10	1	9	12	
135	2.49	2.54	23	2.56	20	7	1	6	11	
133	3.11	3.15	23	3.19	21	8	1	7	15	
135	3.29	3.30	22	3.32	22	2	1	1	10	
...	3.45	3.50	..	3.50	23	5	1	4	11	Man trip.
133	4.07	4.10	22	4.13	24	6	1	5	17	
135	4.40	4.42	22	4.45	25	5	1	4	27	
133	4.55	....	22	....	26	..	..		10	Trip left over.
...	....	....	535	....	26	205	49	156		

[1] Time of arrival at switch to sidetrack. [2] Time of pulling into sidetrack to discharge loads. [3] Allowable delays to do necessary switching.

proportion to the number of loads received. That this affected the entire day's operation is shown by the number of delays experienced during the remainder of the day, as each locomotive then "waited for empties."

The advantage of plotting the time-study data in chart form for easy analysis and forcible exposition can be seen by a comparison of Fig. 1 and Table I, and Fig. 2 and Table II. The tables contain the numerical data, yet they do not tell their stories as forcibly as do the charts.

The tables show the total time lost during the day but a close and rather laborious study must be made in order to allocate the cause of each individual delay. The charts bring out each delay by itself and show its relation to the whole. Where a group of mines is operated the chart of one production study may be made available to the other superintendents for possible use. In this way the maximum utility would be made of the one study, thus increasing its range of effectiveness.

After the production or time study has been made, it is important that the information thereby secured be used in such manner as to yield the greatest benefit. One effective method of attaining this end is plotting the results on a chart. The purpose for which such studies are to be used, and by whom, will determine the extent to which it is desirable to go in charting the results. If the outcome of the studies is to be presented to several officials of the organization, it should be plotted and reproduced by blueprinting. The effectiveness of a single study will be increased in this way.

In the construction of the charts constituting Figs. 1 and 2, Tables I and II respectively were used. On the horizontal scale one division equals 10 min., and consequently 1/6 of this division equals 1 min. In the vertical scale one division equals 10 cars, or 1/6 of this division is equal to 1 car. In the original working chart cross-section paper was used, inches being divided into tenths. In preparing this chart for publication it was necessary to reduce it to the size shown.

The upper parts of the two charts represent the number of loads on the sidetrack; the height of the line at any point indicates the number of cars standing. The degree of pitch of a diagonal line is an indication of the rate of hoisting. For instance, in both charts some lines will be noticed to be steeper than others, which shows that hoisting was faster than when the line sloped less sharply. In Fig. 1 it will be seen that hoisting was slowed up at 10:30 a.m. by dirty coal. At 8:50 also the effect of dumping rock can be seen on the hoisting curve.

In handling the arrival and departure of locomotives with their loads and empties varicolored lines were

Fig. 2—An indicator chart for haulage and hoisting

Just as an indicator diagram shows when a steam engine needs correction the above chart lays bare a day's operation at a shaft mine. The interference of the locomotive "curves" indicates congestion of locomotives at the shaft bottom. This chart of Mine B was made from Table II and visualizes the data it contains.

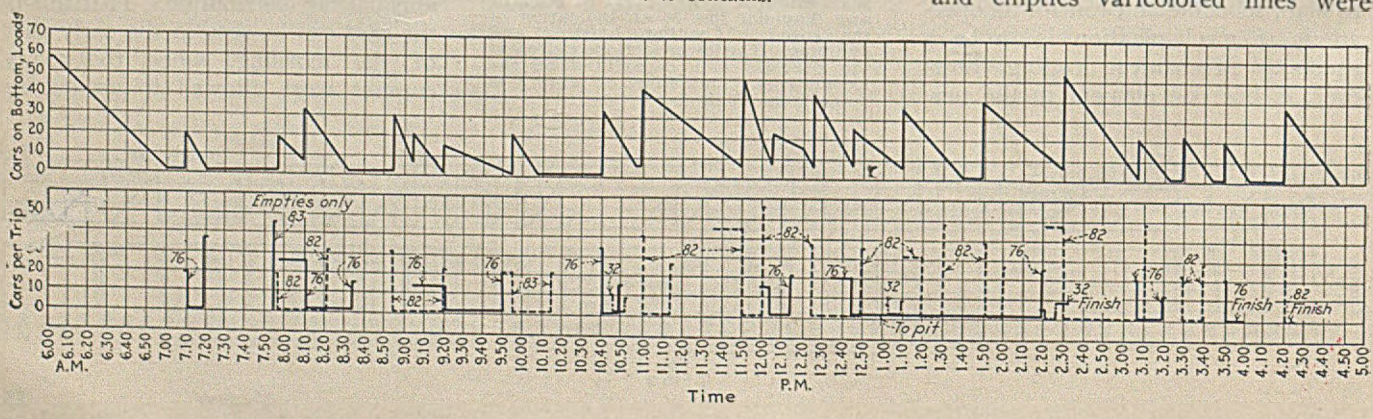


TABLE II—PERFORMANCE AT SHAFT BOTTOM, MINE B.

	Time					Delays			
Loco.	Arr.	In	Loads	Out	Mty.	Lds.	Mty.	Mis.	Total Delays
76	7.10	7.10	19	7.20	37	..	10	...	10
BL	....	7.55	..	7.55	45	..	..	...	..
82	7.55	....	18	8.22	31	..	27	...	27
76	7.58	8.10	25	8.35	15	12	37	...	49
83	8.55	8.55	30	9.20	22	..	25	...	25
76	9.05	9.20	14	9.50	20	15	30	...	45
82	9.55	9.55	20	10.15	20	..	20	...	20
76	10.40	10.40	33	10.50	12	..	10	...	10
32	10.45	....	10	....	..	..	..	...	..
82	11.00	11.00	39	11.15	26	..	15	...	15
82	11.35	11.50	44	12.00	55	15	10	...	25
76	12.00	12.05	15	12.15	20	5	10	...	15
82	12.25	12.25	36	12.49	35	..	24	...	24
76	12.35	12.45	19	2.20	25	10	..	155	10
32	1.03	1.03	6	....	8	..	..	...	..
82	1.10	1.20	30	1.30	47	10	10	...	20
82	1.50	1.50	39	2.00	26	..	10	...	10
32	2.20	2.20	5	....	8	..	..	...	..
82	2.20	2.30	47	3.10	49	10	40	...	50
76	3.07	3.07	20	3.20	12	..	13	...	13
82	3.29	3.29	22	3.40	28	..	11	...	11
76	3.50	3.50	20	3.52	..	..	..	...	...
82	4.20	4.20	37	....	..	..	..	...	..
			548			77	302	155	379

Total number of trips received, not including 3 from S. Drain				19
Number of trips sent out, not including S. Drain				18
Tons hoisted				1,149
Mine cars	On bottom 6.00 a.m.		57	
	Delivered		548	605
	Hoisted	coal 552		
		rock 50		602
Locomotive No. 76 hauled	165 loads	141 empties		
Locomotive No. 82 hauled	362 loads	339 empties		
Locomotive No. 32 hauled	21 loads	26 empties		
Locomotive No. 82 took		45 empties		
	(3)	548	551	

used on the original chart, but in the illustrations these are necessarily shown by solid and broken lines.

When a trip arrived at the loaded sidetrack switch at the shaft bottom the number of the locomotive and time of its arrival were noted. On the chart this latter is shown above the corresponding time; the horizontal length of the line shows how long the locomotive was delayed before discharging its trip. The vertical position of the locomotive line indicates the number of loads it had, and where this line drops to zero shows the time at which the locomotive discharged its loaded trip. The latter portion of the same line shows the time of departure and the number of empties taken. The total length of this line shows how long a locomotive stayed at the sidetrack. For instance, in Fig. 1, locomotive No. 133 arrived at the bottom at 9:01 a.m. but could not discharge until 9:29, a delay of 28 min.

In Fig. 2, locomotive No. 82 arrived at 7:55 a.m. with 18 loads but did not discharge its trip until 8:10, and waited until 8:22 a.m. for empties. Locomotive No. 76 arrived 3 min. after No. 82 but did not discharge its trip until 8:10 and waited until 8:35 a.m. for empties. It therefore remained at the bottom a total of 37 min. It can thus be seen that locomotive No. 76 could not discharge its trip until part of No. 82's trip had been hoisted. Where two or more lines run together this indicates that two or more locomotives were at the bottom sidetrack at the same time.

Haulage and hoisting are but two phases of operation to which time study may be applied advantageously. Mechanical loading is a fertile field for this type of study. However, as loading is but one phase of the complete operating cycle and is entirely dependent upon other operations, of which haulage is one, it can be seen how necessary it is to know the details of each operating unit.

Time studies, whether made by the operating department or a separate division of the organization, are aids to management control. They serve two purposes: first, they are the means whereby actual operations may be analyzed, and, second, they furnish facts upon which to base standards of production for men and machines.

When such standards have been once set actual performance may be stated as a definite numerical degree of efficiency. In this process facts have been substituted for judgment. Management has then approached nearer a point where it can be measured.

From time studies production standards may be arrived at. By these standards are meant the best times in which specific jobs may be done or operations performed under existing conditions. Standard rather than average times should be used.

As the technique of production management advances in the coal-mining industry it will be necessary to drop the use of averages. Production standards, not "average performances," will be used in planning to increase output. As an illustration of this, in Table I it will be seen that there was a total delay of 156 min. "waiting on cage." This would make an average delay of 6.24 min. per locomotive trip. The allowed or standard time was 3 min. per trip with the light pusher locomotive and 1 min. with the heavy pusher. The difference between average and standard performance here is 107 min. At a standard time of 12 min. per trip this delay represented a production loss of nearly 9 trips. Fig. 1 shows the nature of these delays and indicates to what extent they are within the control of the management.

A steady flow of coal to the tipple is necessary if a mine's maximum output is to be reached and maintained. If at certain periods of the day the tipple is out of coal and at another period it is choked with coal, both the tipple and the whole mine suffer. To remedy such conditions it is necessary to know:

(a) The capacity of the dump in cars per minute and the number of standing cars necessary to fill up the intervals between trips; (b) the running time of locomotives between sidetracks and the dump; (c) the hours of the day that coal is slow in coming and the hours that it crowds the tipple, and what sections of the mine most effect these variations. All of this required information may be obtained directly from such charts as Figs. 1 and 2.

It is absolutely essential to have this information when designing a production control or dispatching system. A dispatching system, if limited to haulage alone, serves to build up the transportation feature of a mine. But why not extend dispatching into its broader phases and use its possibilities for complete production control? As, for instance, the scheduling of cutting machines, whether night or day cutting be done, and the routing of shot-firers, and so on, upon whom the miner is almost as dependent as upon transportation. The exact control of production that extends clear to the miner at the working face is the ultimate in management technique. Such control is at present limited by the facilities available for its operation. Complete production control by which management will be able to control every operation that affects production will be the next step after haulage dispatching.

Coal

The Premier Source of Energy

IT IS the replacement of slowly flexing arms and legs by rapidly revolving wheels that has speeded up America in the past few decades. The pulsing of blood in human muscle now does far less of the world's work than the surge of steam in the engine. Brute force has given way to mechanical power, and the net result has been the quickening of every industrial process and the speeding of every transportation function. Man-power has been multiplied many fold. No longer is a man a man—he is five men, ten men, twenty men.

WITHIN the present century, the power equipment of the individual has more than quadrupled, even without counting our pleasure automobiles. By comparing decade with decade, the large increases in volume of production, of work done, are seen to be due more to additions in power equipment than to increases in number of workers. The machine is doing our work for us by making each workman more and more productive. So it is that electrification takes the place of immigration in enabling our mines and our farms to meet the ever-increasing demand for raw materials and our mills to turn out the ever-larger supply of manufactured products.

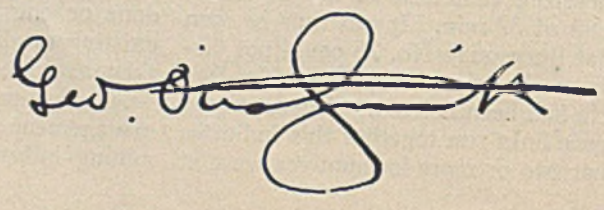
WHENCE all this energy that turns the wheels? Tryon has shown that the old-fashioned sources furnish only a minor part of the energy now consumed in the United States for both heat and power; firewood, 6 per cent; water power, 4 per cent; work animals, 3 per cent; and the wind less than one-tenth of 1 per cent. His preliminary figures for 1926, comparing coal with only its three principal competitors—oil, gas, and water power—put coal far ahead, with nearly 70 per cent; oil next, with nearly 20 per cent; and gas and water over 5 per cent each, water power leading somewhat. And the annual consumption of energy from these four sources continues to mount up to higher figures—more than 25,000 trillion B.t.u. last year.

WHAT of the future? How great are the stores of energy available for the America of tomorrow as well as of today? Frankly, we have more than our share of the world's supply of stored-up energy. Using the human measuring stick, our water-power reserve is about half a horsepower to the man, woman and child of today's population, less than one-fifth of which have we put to use. Of coal, the per capita reserve is not less than 23,000 tons, and we are using this up at the rate of less than 6 tons a year. As for petroleum, only the most wildly optimistic estimates of known and unknown pools can figure a reserve equivalent to a small fraction of 1 per cent of the coal reserve—or, say, a couple of hundred barrels for each of us, from which we are drawing 6 or 7 barrels a year.

IN THE central stations, whence flows most of the magical current that multiplies American man-power, the fuel-driven prime movers outrank in capacity the waterwheels about three to one and in output during the average year not quite two to one. New installations last year amounted to more than 2¼ million horsepower, and the new fuel plants exceeded in total capacity the new waterwheels three to one, although in cost of installation only about two to one.

LAST year's fuel consumption at these public utility plants was equivalent to 45,800,000 tons of coal, with oil and gas each representing only about 5 per cent of the total fuel consumed. True, oil and gas are more easily produced and used, and water power attracts more public attention, but, fortunately, steam development does not flounder in "the muck of litigation, political opposition and interstate quarrels" which impedes the progress of water-power development.

IN ESTIMATING our national assets, whether present or future, coal stands far in the lead as a source of energy. As the premier energy resource, then, coal may be looked upon as setting the ultimate limit to America's prosperity.



RAILROAD FUEL—

And Its Relation to Coal Mine Management

By Malcolm Macfarlane

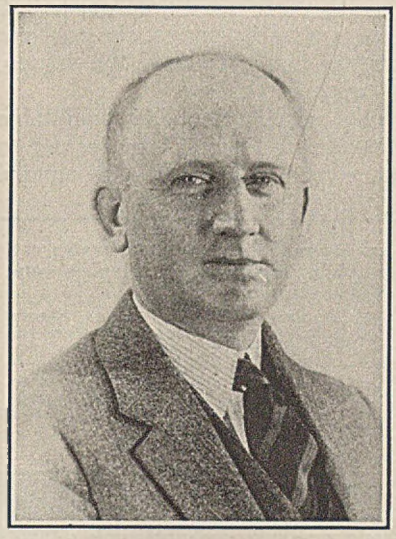
General Fuel Inspector
New York Central Lines
New York City

IN 1926 railway expenditures for fuel amounted to approximately $475,000,000. Of this amount, about $350,000,000 was spent in the purchase of slightly more than 140,000,000 tons, or nearly 25 per cent of the total production, of bituminous coal. Coal thus represents one of the largest items in railroad operating costs and, consequently, fuel performance and economy are of supreme importance to railway executives.

Careful supervision of a myriad of details, to an extent hitherto unknown, must today be exercised by the railroads of America. The greatly increased traffic which the railways are called upon to carry, and the exacting service demanded of them, make essential the study and consideration of innumerable factors. The most important of these are motive power and fuel—and the dependence of motive power (and, therefore, of our entire transportation system) upon fuel is so great that the latter correctly may be called the backbone of the railroad. Although the railroads have devoted much time and money in improving the use of coal, many mines have not kept pace with these developments, as a study of the subsequent facts will show.

The International Railway Fuel Association, whose membership includes not only representatives of practically every railroad of the United States, Canada and several foreign countries, but also of many prominent coal companies, is one of the foremost organizations in this country in the promotion of fuel economy and in the advancement of co-operation on this most important subject.

The importance of maximum locomotive efficiency and, consequently, of efficient fuel to the railroads cannot be stressed too strongly. Approximately 90 per cent of all fuel purchased by the railways is burned in locomotives, and about the same percentage of all locomotive fuel is bituminous coal.



Malcolm Macfarlane

As chairman of the committee on inspection, preparation and analysis of fuel of the International Railway Fuel Association, Mr. Macfarlane is particularly well qualified to discuss the importance of coal in transportation. His early association with his grandfather, Dr. James I. Macfarlane of Pittsburgh, who, in 1873, published "Coal Regious of America," also has contributed to his knowledge of all phases of coal production.

Although the railroads have large coal bills, they have greatly increased the use-efficiency of fuel during the past ten years. This improvement, made necessary both by the increase in transportation requirements and by high operating costs, has largely resulted from changes in locomotive design, the adoption of the latest equipment, and the installation of modern economizing devices. Some of the most important of these adaptations, many of which have resulted in greater locomotive tractive effort and lower fuel consumption, are: Mechanical stokers, boosters and auxiliary locomotives, superheaters, feed-water heaters, coal-pushers, anti-friction bearings, heavier rails, etc.

To what extent are these various improvements used and what results have been attained from their adoption? Nearly 62,000 locomotives were in service on April 15, 1927, and approximately 20 per cent of these were equipped with mechanical stokers, about half were fitted with superheaters and more than 55 per cent had automatic fire doors. Because of the comparative recentness of their development or because their use is not yet sufficiently extended, data on the many other devices and attachments are not available in full However, it might be said that on January 1, 1927, there were approximately 2,400 coal-pushers and 3,000 "boosters" in use on locomotives in the United States.

It has been necessary for the railways to expend large sums of money to adopt the foregoing and other improvements. However, as a result thereof, the total charges to operating expense for fuel and material in 1926 were approximately 25 per cent less than in 1920—about the same reduction was made in operating expenditures for labor. During the same period, the number of gross ton-miles of freight handled increased nearly 15 per cent. Dynamometer tests show that the tractive effort of locomotives has increased more than 20 per cent in the past ten years—the average locomotive in 1926 had a tractive power of about 42,000 lb. contrasted with approximately 32,000 lb. in 1917. The same method of test shows that anti-friction bearings have reduced starting resistance to one-seventh of that of plain bearings. The overall thermal efficiency of the locomotive has increased approxi-

mately 33 per cent since 1917. The coal burned per 1,000 gross ton-miles of freight decreased from about 200 lb. in 1920 to approximately 150 lb. in 1926—a reduction of 25 per cent. The reduction in fuel consumption in passenger service, also per 1,000 gross ton-miles, amounted to about 25 per cent—decreasing from approximately 600 lb. in 1920 to about 450 lb. in 1926. These are but a few of the many economies that enabled the railways as a whole to approximate in 1926, for the first time, the percentage of return to which the Interstate Commerce Commission seven years ago held they were entitled under the provisions of the Transportation Act.

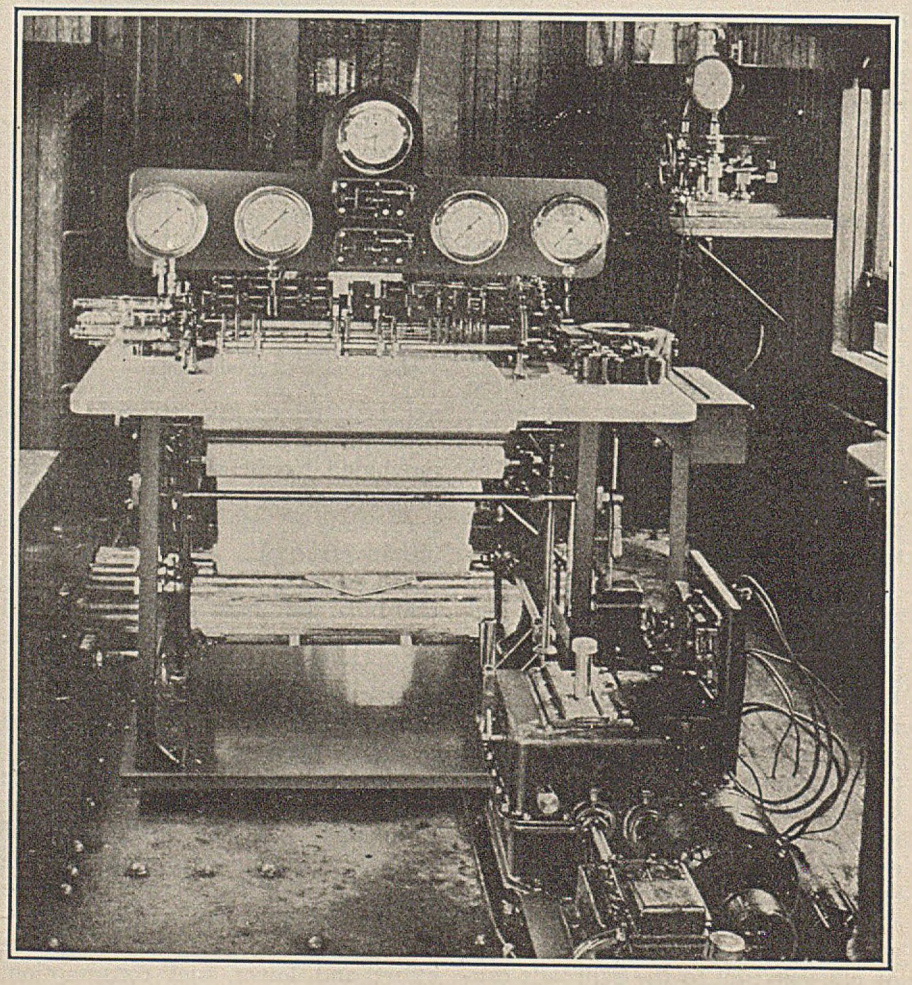
It has already been indicated that coal is really the backbone of our transportation system. As such, let us see what the railroads are doing to assure to themselves at all times a continued supply of clean and properly sized coal. Let us also see along what lines, other than through the adoption of new and improved devices and equipment, they are promoting fuel conservation.

AS representative of the largest railway systems in the world, the New York Central Lines offer an excellent example of the extent to which the railroads have gone to protect their enormous coal supplies. The New York Central buys its coal from several hundred mines located in seven states, and all purchases are made upon the recommendation as to quality of the Fuel Inspection Department or directly under its supervision. In addition to the general fuel inspector, this department is composed of 13 men located at central points in the states from which the coal supply is received. These inspectors visit from 30 to 50 mines per month—not always this number of different mines, for sometimes, if necessary, the same mine will be visited two or three times during the month.

Elsewhere in this article is shown the type of form used by a fuel inspector when he first visits a mine from which the purchase of coal is contemplated. The various blanks are carefully filled out and any suggestions for improving the product, made to the mine superintendent or other responsible authority, are also noted. This form is then forwarded to the main office, where it is studied and its product approved or disapproved. The coal purchased from approved mines is classified as suitable for main line or divisional passenger service, or freight. The report is then filed, together with many others of a like nature, under its proper classification. Subsequent forms, known as daily inspection reports, are filed with the initial report and are referred to whenever it is desired to purchase coal of a certain kind and quality in a certain district. If the supply from any mine continues to carry a high percentage of ash, to contain an excess of slack or large amounts of foreign substances —cutting-machine bits, mine spikes, iron pins, pieces of wood, etc.—a letter is sent to the shipper notifying him that this condition exists. If, after several warnings, the coal continues below standard, the mine is embargoed.

This service is being maintained at a cost of from 0.3 to 1c. per ton and, considering the results obtained in protecting the operating departments and in the reduction of fuel expense, has more than justified itself. Beneficial results are reflected in a greatly reduced number of engine failures, uninterrupted traffic and unsurpassed service. If successful in reducing, by only 1 per cent, the quantity of ash and other noncombustible material in the coal supply, the fuel inspection departments of the railroads of America would save about 1,500,000 tons of coal annually. It has been conservatively estimated that an increase of 1.5 per cent in combustion efficiency results from a reduction of 1 per cent in the ash content of coal. On 150,000,000 tons, this is a saving of 2,100,000 tons. Thus, a reduction of 1 per cent in ash content would result in a total saving of about 3,500,000 tons of coal, or more than $7,000,000.

Further indication of the importance of fuel performance, in all its aspects, to the railways is found in the comparatively recent development of the dynamometer car—which measures, among many things, the pounds of coal (of various grades and sizes) burned per gross ton-mile under varying conditions, locomotive tractive effort, train speed, steam



Instrument table of dynamometer car, showing recording mechanism and pressure gages

Dynamometer-car tests have shown that transportation delays (often the result of badly cleaned and poorly prepared coal) are costly. To stop and start a 10-car passenger train costs from $0.50 to $1.50. A 100-car freight train loses from $1.50 to $6.50 through each unnecessary stop.

NEW YORK CENTRAL RAILROAD

INITIAL MINE INSPECTION REPORT

File No. .....

Date of inspection.....Inspector.....
Operating company .....Address.....
Location of mine .....County.....State.....
Railroad .....Division.....Billing point.....
Geological name of seam.....Local name of seam.....
Kind of mine .....Date opened.....Daily output.....
Method of mining.....Analysis: Chart of seam.
Kind of tipple .....Moisture .....
Kind of screens .....Ash .....
Screening area .....V. C. M. .....
Picking tables .....F. C. .....
Side or end chutes.....Total .....
No. of men on picking tables.....Sulphur .....
In cars .....B.t.u. .....
Other duties .....
Grades of coal possible to load.....
Per cent ¾-in. screenings in mine run.....In 1¼-in. lump.....
Where was sample taken .....
Grade of coal containing least impurities.....
What grade is suitable for engine use.....Power plants.....
Is present preparation suitable for fuel supply.....
Are railroad cars cleaned before loading.....
Where is coal weighed in railroad cars.....Which wt. is used.....
No. of entries working.....No. of rooms and width.....
No. of shots in entries.....In rooms.....Kind of powder.....
Powder used per shot.....Kind of machines.....
Condition of bits.....Width of cut.....Where made.....
Is coal snubbed.....
Are there wet places in mine and where.....
Are there faults in mine.....
Roof condition and its effect on preparation.....
Are impurities gobbed by loaders.....
Floor condition and its effect on preparation.....
Describe characteristics of coal.....
.....
What docking system is used.....Type of equipment they can load.....
Remarks and suggestions for improving the preparation:

pressure, etc. In addition to the one in use on the New York Central Lines, dynamometer cars are also in service on the Pennsylvania; Norfolk & Western; New York, Chicago & St. Louis; Southern Pacific; Chicago, Milwaukee & St. Paul, and Illinois Central railroads. The New York, New Haven & Hartford Railroad also plans shortly to install such a car. These cars cost from $50,000 to $65,000, require a crew of 20 technically trained men and, except for two or three months in the winter when weather conditions interfere with accurate results, are in continual service. That in use on the New York Central covers approximately 50,000 miles per year working under the Test Department—a branch of the Equipment Engineering Division.

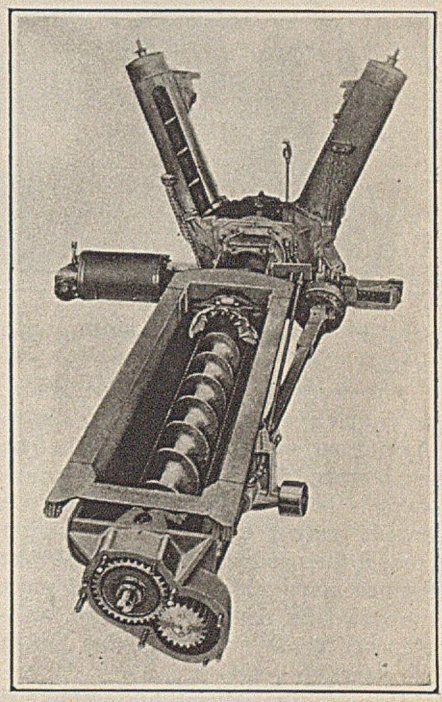
In tests made with this car, the coal is accurately weighed on platform scales, before firing, in quantities of 100 lb. It is also carefully sampled and analyzed on each run. In this manner, the operating performance of coal under certain conditions is accurately determined and the best coal for a certain use is likewise found.

Monthly reports of fuel economy and locomotive performance, in condensed form, are submitted by superintendents to the operating executives from which they can clearly visualize fuel performance. In addition to these reports, periodical chart books are submitted which graphically show the fuel performance on each railroad division. Fuel performance reports and charts are carefully studied by railway executives to bring about any necessary improvements or corrections.

For the purpose of properly instructing new firemen to obtain the necessary high degree of efficiency in coal firing, the railroads maintain a corps of trained and experienced men who are responsible to the Motive Power Department. This organization consists of road foremen of engines, assistant road foremen and traveling firemen. Fuel supervisors also play an important part in this work, and the entire corps is in close touch with every detail which goes to make up this complex problem.

How can better mine management furnish the railroads with the kind of coal they must have and why should every effort be made to give them a satisfactory fuel?

One of the most important features in the preparation of coal for locomotive use is the proper mixing of machine slack in run-of-mine coal.



Mechanical stokers, more than 12,000 of which are in use on our railways, have many advantages

These devices have made possible the design and construction of larger locomotives, higher sustained speeds, longer locomotive runs and the use of lower grade fuels such as sub-bituminous and lignite coals. Although stokers are of strong and rigid construction, foreign matter in the coal may interrupt their operation by jamming the conveyor mechanism.

Whenever possible this should be done inside the mine as the coal is loaded into cars. If this is not feasible because of mining laws, an arrangement should be made on the surface whereby each car of machine slack is followed by a car or preferably several cars of run-of-mine coal. This will insure a proper mixture and its importance in the proper preparation of coal for railroad fuel cannot be pointed out too often or stressed too strongly. Such action will eliminate the possibility of locomotive tanks receiving an excessive amount of slack or fine coal at coaling stations.

All is not coal that's sold

Miscellaneous mine material, such as shown here, is often found in coal delivered to the railroads. This, in addition to tramp iron, rock, slate and timber, may cause serious trouble if it becomes lodged in the grates or mechanical stokers. Producers of coal, however, are not the sole offenders in this matter, as railway employees frequently throw scrap material on loaded or into empty cars.

The necessity for good preparation, particularly with respect to the cleaning of coal, must be emphasized. The importance of this feature to the railways is being realized by them to a greater extent each year. For that reason, the producer of coal must take the necessary additional steps to meet the railroads' demand for clean, well-prepared coal—not only today but in the years to come.

Prior to the advent of mechanical loaders, the cleaning of coal began with the more or less closely supervised loading by hand of mine cars at the face. Impurities were removed as the coal was loaded and final preparation was accomplished at the tipple and in the railroad cars as they were loaded. These methods are still in force, but the use of loading machines is throwing all the burden of coal preparation on the tipple. Such machines load, without discrimination, everything that is cut or shot down—bone, slate, clay, and other impurities are loaded with the coal and there is very little opportunity for cleaning at the face by the miner.

Today, many important consumers closely inspect the preparation given to their coal supply. Therefore, the changed conditions of preparation which will be brought about by the increased use of loading machines will necessitate the more extended use and development of methods of obtaining clean coal. Of course, the coal *can* be cleaned by the addition of sufficient picking tables and men at the tipple. Further, there seems to be no evidence of any appreciable increase in the amount of slack due to mechanical loading. Therefore, the quality will depend entirely upon how much the mine operators are willing to expend for the equipment necessary to fully prepare the coal at the tipple instead of partly at the working face—as is now done in those mines where hand loading only is used. As previously indicated, the railroads of the United States and Canada now have thousands of stoker-equipped locomotives in operation. Removal of all extraneous matter, such as mine-car couplings, machine bits, wooden wedges, etc., is most imperative. Any of this material, when lodged in the stoker, stops its operation and may result in costly transportation delays. To eliminate the danger of tramp iron in the coal supply, it is also essential that mine cars and railway cars be thoroughly cleaned before loading with coal.

THE accompanying illustration, showing the kind of mine material that has been found in cars of loaded railway coal, distinctly indicates the various forms of foreign matter with which the railways must contend in the operation of stoker-equipped locomotives. The best results in the elimination of such material are obtained through the constructive criticism offered by fuel inspectors to the supervisory forces at mines and collieries.

Another extremely important relation of the coal industry to the railroads is indicated by the estimate that 40 per cent of the revenue freight tonnage of the railroads comes from and the inbound mine tonnage bring the mines—the non-revenue fuel coal the total up to 50 per cent. Further, it has been estimated that although the bituminous coal industry has about $4 per ton of annual output invested in coal properties and equipment, the railroads have at least $7 per ton invested in transportation facilities which are provided for the movement of coal and coke.

There have been many instances where suggestions made by railway fuel inspectors, for improving the preparation of coal, have been followed. By this improvement, the operators have received commercial orders as well as orders for railway fuel. The fuel inspectors of our railroads are willing at all times to co-operate with the coal producers, and it is by means of this reciprocal sentiment that the coal industry and the railways of America will meet with the greatest mutual success.

It is, therefore, apparent that the railroads of the country have a very real interest, entirely aside from the consideration of the utilization of coal as a locomotive fuel, in the prosperity of the coal industry.

Illinois Institute *Discusses* Mechanization and Safety

MECHANIZATION and safety were the high spots in the discussions of the Illinois Mining Institute on its annual boat trip late last month. Applications of mechanical loading to present operations, problems of power generation and distribution, when it is advisable to depart from standard practices and new developments in blasting were among the subjects considered while the members of the Institute journeyed up the Illinois River from St. Louis, Mo., to La Salle, Ill., and back to their starting point in the steamer "Cape Girardeau."

The first business session of the trip was held on the morning of June 17 with President William Kidd in the chair. Gust Fritz, board member of the United Mine Workers for the Belleville subdistrict, urged cooperative effort in promoting the coal industry of the state.

DISCLAIMING any intention of posing as an official spokesman for the union, Mr. Fritz voiced his personal disapproval of the numerous suspensions which have afflicted the industry. He believed that a better understanding between employer and employees in the coal industry was not impossible.

W. K. Kavanaugh, president, Southern Coal, Coke & Mining Co., agreed with Mr. Fritz on the desirability of a frank interchange of opinion between the mine workers and the operators. He was against endeavoring to lower production costs by reducing wages—except as a last resort. There were many producers, he added, who did not believe and did not want to believe in mechanization because they did not have the money required for investment in new equipment.

AFTER some crystal-gazing by Dr. M. M. Leighton, chief of the State Geological Survey, Urbana, Ill., who foresaw a phenomenal growth for Illinois in the next quarter of a century, Henry T. Bannister, safety engineer, Madison Coal Corporation, explained the set-up of the fire-fighting organization maintained by his company. "Adequate protection against fire at a coal mining plant," he pointed out, "implies much more in the way of equipment and organization than is needed at the ordinary industrial operations. Most industrial plants, being located at or near cities, are assured of sufficient protection by the municipal fire departments. In such cases a few fire alarm stations at strategic points, together with the usual hydrants, hose reels and automatic sprinklers, comprise about all that is needed. On the other hand, the average coal mine is not only a proposition entirely to itself but, in addition to its surface fire-fighting facilities, must also make adequate provision for handling underground fires."

Starting back in 1900 with apparatus which now seems crude, the Madison Coal Corporation has improved and increased its equipment both above and below ground. This equipment, which includes a chemical fire-engine at each plant, is regularly inspected. Fire drills are held weekly. The cost of this protection, said Mr. Bannister, has been comparatively small "and has paid for itself time and again" in reducing property damage and saving human life."

IN THE discussion which followed Mr. Bannister's paper, the question was asked how the fire fighters are protected from heat. Mr. Bannister replied that the men wore helmets in places where the smoke was thick. Limestone and shale dust have been found to be effective in keeping down the fire.

At the afternoon session, presided over by Prof. A. C. Callen, University of Illinois, George E. Lyman, general superintendent, Madison Coal Corporation, presented an extended paper on "Mechanical Loading." It was his opinion that:

(1) Mechanical loading will supplant hand loading to the same extent and just as surely as machines and locomotives have displaced undercutting by hand and animal haulage;

(2) Several types of loading machines already have been developed so far past the experimental stage that their practicability has been established;

(3) The heavy investment required makes the application of loading machines to mines now developed of doubtful propriety except where a long operating life is assured by ample mining territory;

(4) Saving in operating costs, based on present wage rates and making allowances for shearing, top preparation and additional overhead, should run from 25 to 32c. per ton, with possible increases under efficient management;

(5) The success of mechanical loading depends as much, if not more, upon management as upon the machine.

THE Saturday afternoon session, presided over by James Needham, general manager, St. Paul Coal Co., opened with a paper by Erle Ormsby, president, Donk Bros. Coal & Coke Co., on "Standard Practice in Its Relation to New Methods, Based on the Idea that Progress Is Usually the Result of an Intelligent Departure from Standard Practice." After a short recess D. D. Wilcox, general superintendent, Superior Coal Co., took the chair. Mr. Needham, then, strongly urged the greater use of permissible explosives. Lee Haskins followed with an outline of his experiences in using different types of explosives, including the new CO_2. This explosive, he claimed, produces better coal. While more expensive in narrow work, he said it was cheaper than powder in wide long faces.

Swinging to a discussion of safety in general, John E. Jones, safety engineer, Old Ben Coal Corporation, gave figures on accidents with black powder. Mr. Fritz declared the miner could be counted upon to cooperate with the operator in using the safest and best explosive. A. D. Lewis, director, Illinois Department of Mines, presented a detailed statistical study of the accident record of Illinois mines since 1882. Maximum progress in accident reduction will not be attained until each miner becomes his own safety engineer.

A Proposal for Stabilizing the BITUMINOUS *Industry*

By Mark Jones
Management Consultant
New York City

THIS ARTICLE is written to stress the need for a more comprehensive view of the national economic problem presented by the bituminous industry of the United States. It deals with but one way of inducing stabilization and is not intended to imply that there may not be other and probably better ways to attain that end. Neither is it intended to imply that the writer expects immediate accomplishment of the desired result.

UNDOUBTEDLY, much time must elapse and great losses probably occur before there is the necessary agreement as to the direction of future policy. The aim of the paper, therefore, is to suggest the direction of future policy more than immediate or expedient objectives.

IN 1926 the lack of a program made a difference to the bituminous coal industry in the United States of more than $400,000,000. Apart from this direct result it had an unsettling effect upon most other industries, the cost of which cannot be estimated.

To control production or dispose of the surplus must be the underlying purpose of the program adopted to stabilize the industry. The difficulties in the way, however, are as numerous and great as one might expect from a situation in which are involved more than 7,000 coal mines, 600,000 miners, $4,000,000,000 of capital, an annual output valued in excess of $1,250,000,000, and an anuual payroll of over $750,000,000. The difficulties of the situation are further aggravated by the facts that the industry does not enjoy the confidence of its customers or the public, that it has long been a football for politicians and the press, and that in financial circles its credit is at a low point.

There are too many separate and distinct management units, too many mines, and too many miners. Few coal companies are really profitable. In organization and methods the industry is still in the "handicraft stage" although it has just begun to reach toward the factory system with the view to adopting its essentials.

THERE has not been sufficient stability in the industry to provide a foundation for use of the management methods which have been effective in stabilizing and improving the service to the public in other important industries. Ownership and management are still in the same hands to an extent that tends to reduce the quality of management. In comparison with other important industries the managers of bituminous companies are not well paid. Managers who have a knowledge of coal and at the same time have skill in the management of large organizations are not immediately available. Local mine operating officials are required to give attention to too many duties of too many kinds and varieties to permit them to concentrate on the primary task of creating and maintaining conditions immediately pertaining to getting out coal at the minimum cost.

THE improvement of railroad service and the removal of the car supply problem is the most recent development making for unsettlement and one of the most basic factors in the present situation.

Refinancing of coal properties which have failed is reducing their capital charges against operations, and thereby tending to undermine the stronger companies at no advantage to the public—thus accentuating the instability of the industry.

The labor policy of the industry is based upon the principle of conflict as opposed to that of co-operation. General strikes no longer enlist sympathy for either labor or management, are selfish in cause, and in this basic industry lack rational justification.

Free play of supply and demand has produced a price system which unduly favors the larger coal consumer at the expense of the smaller consumer. There are violent fluctuations in prices which, in the long run, cost the consumers far more than would be the case if prices were stabilized between reasonable levels.

THERE is not a sufficient percentage of the bituminous producing capacity of the country under one or a few companies to provide the basis for any substantial leadership within the industry itself.

The anti-trust laws of the United States are the most serious barrier to early stabilization of the industry because they prevent the kind of planning and co-operation necessary to formulate and execute a stabilization program through private initiative.

In considering the various courses of action which might be followed in order to stabilize the industry and transfer it from the liability side to the asset side of the national economic balance sheet, it seems clear that none of the five interested parties alone can do what is necessary. The industry, the investors and bankers interested in the industry, the coal consumers, the government, or labor—none alone can do what is necessary.

The industry is "affected with a public interest" but not sufficiently to warrant departure from a policy of private ownership and management except as a temporary measure.

The lag as between the policies and methods of the bituminous industry and those of the industries dependent on it for power prevents the necessary industrial equilibrium. As the number of other industries and

their present values so greatly exceed the number of units and amounts invested in bituminous coal, the latter industry has no choice but to put aside its individualistic philosophy, abandon its "hands off" attitude, and proceed toward integration and co-operation.

THE managers of the industry have not sufficient confidence in each other to provide the basis for sound co-operation. They have the psychology and habits of conflict. The inevitable fact that some owners must retire from managerial positions and some managers must lose their positions if the necessary reduction in the number of management units is effected, militates against prompt action toward the reconstruction of the industry.

The idea of a national labor union as a means of stabilizing the bituminous industry, stabilizing prices, or stabilizing wages has been tried and has failed so far as the public is concerned. Seventy-five per cent or greater unionization of mines cannot be accomplished in a legal manner. Only a subsidy to the union through legislation or the suspension of state policing and prosecuting functions to permit warfare will make it possible.

In comparison with the other problems of the industry the labor problem is a minor one which, as the result of certain acts of the federal and state Governments or government officials, has been emphasized out of all proportion to its importance.

FULL publicity should characterize the planning and reconstruction of the industry. The aim of the reconstruction program should be to reorganize the industry in the interests of the public but at the minimum financial sacrifice to those who have not made the most prudent investments in coal properties.

Nationalization of the industry will not be as advantageous from the standpoint of the public as a reorganization which aims toward continued private ownership and operation with a minimum of governmental supervision after a reorganization period. The industry requires but temporary parental supervision in order to establish hope and faith, change its habits, and bring it to relative economic maturity.

Uncoördinated local enterprise cannot give mining communities the quality and quantity of the various community services required on as favorable a basis as a modern management organization operating in many communities. The return on capital used in connection with the housing, feeding, financing, recreation, and amusement of employees in the smaller mining communities should be definitely limited to not more than 10 per cent per annum on the necessary fixed and liquid capital.

From a legal standpoint the property rights involved by a non-legal reorganization which may require radical treatment of the less economic properties should be dealt with on the basis of a temporary national emergency which arises out of the necessity of arresting the decline of one industry in order to prevent its collapse and also on the basis of the necessity for preventing the infinitely greater impairment of property rights and values in other industries which may easily occur as a result of the instability of this one.

EUROPEAN conditions are basically different from those in the United States and offer very little by way of suggestion for progress in the bituminous industry in the United States in the near future.

The entire bituminous coal industry should be placed in the hands of a board of reorganization managers for not more than a 6-year period with the view to uniting the five main interested groups for the purpose of formulating, adopting, and executing a program designed to stabilize the industry without expense to the Federal or State Governments, with the maximum possible protection of the present investments in the industry but without an increase in the bituminous price level.

In order to round out a tentative program which may ultimately be crystallized in a unified program for all of the main parties in interest, it is proposed that a Federal Bituminous Stabilization Board of not more than five men be created, and that as soon as legislation can be secured the board be given all necessary powers to put the entire industry through what might be comparable to a friendly receivership.

Board Nominated

The writer would nominate for membership in this board: Herbert Hoover, Secretary of Commerce; R. B. Mellon, banker of Pittsburgh; C. W. Watson, president, Consolidation Coal Co., New York; C. H. Markham, president, Illinois Central Railroad, Chicago; and Gerald Hughes, attorney, Denver. This group should function as a board in the formulation of policy and in the informal enlistment of co-operation on the part of important parties in interest pending Federal legislation and formally thereafter as the immediate agent of the President of the United States.

Pending the legislation necessary to give the board the proper Federal status, the President of the United States or the Secretary of Commerce should ask the gentlemen named or others of equal or better qualifications to organize informally and do everything that can be done without legislation.

All costs incidental to the work of the Federal Bituminous Stabilization Board and the costs of reconstruction measures formulated by that board should be pooled and paid by the industry through a tax levied by the Federal government, collected by a government department, and paid into a separate and distinct fund to be managed by the Treasury Department or otherwise put under the supervision of the Stabilization Board. At the outset a credit of $50,000,000 should be established with the Treasury of the United States which might be drawn against by the board until it has been able to formulate the necessary plan to create its own resources, through the kind of levies upon the industry which will do the least possible harm to the industry as a whole or to particular units.

How to Raise Money

Pending Federal legislation the board should ask forty persons or companies interested in the problem to provide between $1,000 and $10,000 each for one year in order to enable it to do the many things that can be done pending legislation.

As has been previously mentioned, the five main groups which must co-operate are: (1) The managers of the industry, (2) the investors and bankers, (3) the coal consumers, (4) the Federal and State governments, and (5) labor.

1 THE INDUSTRY—The program of the industry itself should aim at concentration, consolidation, co-ordination, and co-operation. The following measures should have consideration for that end.

Through consolidation one holding company should be organized with not to exceed 20 per cent of the developed bituminous producing capacity of the United States. The basis of organization should be the consolidation of existing corporations which are at least earning their fixed charges, first, with a view to assembling the best qualities of a limited number of kinds of coal; second, with a view to assuring the maximum degree of accessibility to the principal markets for these kinds of coal, and, third, with a view to including mines according to their potential possibilities for low-cost production. Properties should be included from southern West Virginia, northern West Virginia, Pennsylvania, Ohio, Illinois, Kansas, and at least one from the Colorado-Wyoming-Utah-New Mexico area. The company should have unified sales, financial, and accounting organizations, but a separate operating organization for each producing district. I should suggest building this company around the Consolidation Coal Company.

One or two other holding companies with between 10 per cent and 15 per cent of the required producing capacity of the country should be organized along similar lines. I should suggest building one of these companies around Island Creek Coal Co. and the other around the Pittsburgh Coal Co.

Holding Company Proposed

A holding company should be considered for the purpose of taking over retail distributing coal companies in the ten largest cities of the United States east of the Mississippi River provided that the subsidiary in no one city handle more than 49 per cent of the annual retail sales of bituminous coal in the economic area of which the city is the immediate center.

No bituminous coal of any kind should be sold to anyone at any time or place for an amount that will yield the producer a net sales realization of less than $1.50 per net ton nor more than $4.50 per net ton on the coal sold. The aim should be to average a sales realization to the producer of not less than $2.50 per net ton and not

more than $3.25 per net ton on all of the coal sold by each company.

A new price system should be devised for the 6-year period beginning with a base price for a southern West Virginia coal and sub-basing prices at one point in each of the Pennsylvania, Ohio, Illinois, Kansas and Colorado fields. Price differentials should be imposed on the basis of the month in which the coal is ordered shipped with a view to maintaining the highest selling price during the months when the most coal is burned and the lowest when the least is burned. The aim here should be to place a value on the co-operation of the consumer in making plans for twelve months and thus facilitating storage by the consumer and the maximum possible regularization of production.

The organizations and methods of retail distribution should be reviewed and simplified with a view to closer co-ordination for improved service to consumers at a lower total distribution cost.

A standard cost system for the industry should be developed and made effective.

Concentration Advocated

All coal mine operations should aim to concentrate production in mines of larger capacity but limited to the economic capacity determined upon to fit the local underground conditions, provided of course that the aim is always to make the mine a low-cost producer. There should be the maximum practicable substitution of capital for labor through the adaptation of mining systems and the use of machinery. Underground traffic control should be carefully systematized and supervised. Schedules of production based upon the probable car supply should aim at the outset at not less than 250 days of work per year for each property, and more later.

A comprehensive educational campaign should acquaint consumers of coal with the true nature of the economic problems of the industry and enlist the co-operation of all large coal users in the execution of a definite program of concentrated purchases for a term of years from those companies which will give reasonable guarantees of continuity and dependability of supply, the minimum possible fluctuation of prices, the best possible service, and the maximum possible contribution toward stabilization.

The managers should agree that no reductions in the rate of compensation of coal miners or other mine labor will be considered or proposed, unless after a study of the situation it appears to disinterested observers that the particular district within which the properties are situated is facing the possibility of a decrease of 20 per cent in the demand for its coal in comparison with the average production per year for the prior five years.

Wage Study Urged

A study of the main factors in the wage situation in each important district should be made with a view to determining the relationship between the wages paid coal miners and the other mine labor and the wages paid employees of other industries situated within the same district.

An employment system should be developed under a separate management organization not subject to the immediate control of local mine operating officials and should strive to place men where they may work to the best advantage of all concerned and particularly with greater regularity. There should be one employment headquarters at the most central point of each mining area and these should all be connected by telephone with a regional headquarters.

A housing corporation should be organized in each district to hold and manage all houses now owned by coal companies. The management should be entirely separated from local coal mines. The charter should limit earnings to 6 per cent on the capital required to conduct the business.

A hospital and health service should be organized in each district and managed as a corporation separate from local mine operations and should operate on a limited dividend basis. The mining companies should pay for services rendered to those injured in the course of employment, and the individuals should pay for services rendered to families or to those injured otherwise than during their employment.

Chain Store Suggested

A chain-store corporation should be organized and maintained for the operation of stores providing for the needs of persons residing in mining communities under 5,000 population. The operating officials of coal properties should not be in a position to exert influence on the management of the business of any particular store, but might have an advisory relationship to the general management of the store system on important policies and problems. Pending the creation of a chain-store system for mining communities, the large coal companies should so departmentalize their organizations that those responsible for the production of coal in a given mine or community have no direct control over stores.

A chain of banks should be organized and operated in each of the ten or twelve bituminous districts with the view to locating a bank in each mining community of five thousand population or less down to a minimum population to be determined later. The banks should be financed through stock issues, should establish reserves with a central co-ordinating board, and the Federal charter for the system should limit their earnings and dividends. The banks should operate to advance the interest of all concerned and those of the employees of mining companies especially. The local operating officials of mining companies should not be eligible to be directors or officers of the local banks. The local coal banks should take over and handle all matters pertaining to paying employees, advances on pay, and loans.

Insurance System Mentioned

A savings, pension, and life insurance system should be developed for administration through the local coal banks but with the view to placing risks with established pension and insurance companies.

An amusement and recreation organization should be established separately from the local mine-operating organizations to provide both amusement and other recreation of the best obtainable quality at a reasonable cost. The stock of this organization should be taken by the coal companies and the Federal charter should limit the earnings and dividends.

Forestation should be studied with the view to the adoption of a comprehensive program for use of all surface lands owned by coal companies and not more productively utilized.

Fundamental research on coal, its composition, treatment, and the possibility of combining its use with other fuel products should be provided for through a program built around an institution like the Carnegie Institute of Technology at Pittsburgh. A guiding board should be immediately related to this work and should be composed of coal users, managers, and educators.

Study and experimental research on the problems of coal users with the view to improving combustion and devising new methods of using coal should be provided for under a program built around an educational institution located east of the Mississippi River. A guiding board should be immediately related to this work and should be composed of coal users, managers, and educators.

Provision should be made for market and sales research under a program built around the appropriate department of Columbia University in New York and the University of Chicago, each with a guiding board suitably composed of coal users, managers, and educators.

There should be but one trade association of national scope for the bituminous industry and it should serve to facilitate planning and promote better management, leaving research and statistical work to government departments and leading educational institutions.

2 INVESTORS AND BANKERS—Investors and bankers should have a two-fold program: To use restraint and discrimination in financing and to guide and advise with industrial stabilization as the end in view.

A bituminous company that has failed should not be refinanced and reestablished as an independent entity. If it is to resume production, it should be merged with a going concern to which it will add something of value.

Unless it can be accomplished in some other way more advantageously, the investors and bankers interested in the industry should arrange for studies in each bituminous producing district for the purpose of developing and maintaining a program to indicate which mines in the district it is in the public interest to operate. This program should be public information and it should serve as a guide in all financing.

Bankers should acquaint themselves with the basic problems of the bituminous industry and should co-operate in its stabilization by advising purchasers of coal to concentrate their purchases over a period of years on one or two companies and specify the shipments regularly throughout the year to help regularize production.

Financial houses should take the initiative in bringing about the consolidation of coal-producing companies on the basis, first, of the quality of the coal owned by each company; second, the possibilities for low-cost production from the present mines as well as in mines which might be opened up, and, third, proximity to markets.

Pending legislation financial houses should make financing conditional among other things upon adequate quarterly and annual publicity, on the financial condition, earnings and expenses, and statistics of distribution and production.

3 COAL CONSUMERS—The program of coal consumers should aim to concentrate business in one or two companies regardless of the possibility of temporary price advantages from others and should also aim at the utmost co-operation with the producers in facilitating regular production throughout the year.

Large consumers of coal should avoid the purchase of coal properties and the operation of coal mines of their own as soon as reasonable progress is made in creating the basis for dependable service on the part of companies selected in connection with the concentration of their business. Consumers now operating coal mines should execute management contracts placing them under coal companies. As long as consumers operate developed coal properties they should co-operate to the utmost with companies in coal mining exclusively on all common matters of basic policy, particularly concerning labor.

Railroads should not encourage the opening up of mines as a means of developing traffic so long as coal of a satisfactory

quality can be secured in the same area from other mines on the railroad in question or from mines on other railroads.

The railroads together should arrange for a study by persons not connected with any existing railroad with a view to analyzing the present rate structure governing the movement of bituminous coal and formulating suggestions as to changes which seem desirable in the interest of a sound economic development of the country and an improvement in the service of the bituminous industry to its customers. This study should not be made by the Interstate Commerce Commission or persons connected with it, although any important changes which the study proposed would naturally be submitted to the Commission.

During the period of reorganization of the bituminous industry, the carriers should maintain a joint organization for the regulation of coal-car movements and should arrange for the pooling of the coal-car supply so far as this may seem necessary in the interests of better service.

A system designed to show the annual deliveries of coal at destination points on all railroads by quantities and kinds of coal and month of delivery should be developed with the view to having the information flow through the Interstate Commerce Commission to the proposed Stabilization Board or the agency it designates.

A system by which the kinds and quantity of coal in transit between the mine siding and the delivery track at point of destination can be known either daily or weekly should be devised for management through the railroads and the Interstate Commerce Commission.

4 FEDERAL AND STATE GOVERNMENTS—The programs of Federal and State Governments should aim to remove the legal barriers in the way of co-operation to stabilize the industry but at the same time should substitute more specific safeguards. The underlying policy in legislation should not be regulation and restraint but friendly encouragement, co-ordination, stimulation, and direction.

The Bituminous Stabilization Act should be based on recognition of the existence of a national economic emergency and should automatically expire six months after it becomes effective. Among many other features, it should: (1) Repeal the anti-trust laws in their application to this industry; (2) require a certificate of public necessity for the opening of new mines or for mines closed because of financial failure; (3) specifically authorize the creation of three large coal companies; (4) create a Stabilization Board and prescribe its powers; (5) authorize a limited employed personnel with small district organizations to work as a part of the staff of the Department of Commerce but under the supervision of the Stabilization Board; (6) authorize the formation of a bituminous reserve holding company under a Federal charter to take over developed coal mines of a specified daily capacity or greater, provide for compensation to the owners on the basis of cost less depreciation, provide for annual dividends on the stock of the holding company not to exceed 3 per cent, provide for the raising of the amounts so paid as dividends through a tax on the sales of operating companies, and provide that the business of the company shall be exempt from all Federal, state, and local taxes; (7) prescribe the basis of determining the rates of labor working in and around mines on a district basis and the procedure to be followed in effecting a change in wage rates; (8) prescribe that a strike involving more than one company shall be considered a conspiracy against the public interest and indicate suitable penalties; (9) require the use of a uniform cost system, publication of quarterly and annual reports on production, marketing, financial conditions, and financial results, and the operations of each coal company; and (10) prohibit the leasing of Federal or State coal lands through public auction for a specified period.

5 LABOR—In considering a program for stabilization of the industry from the standpoint of labor, the facts seem to require that a line be sharply drawn between the employees of mining companies and union leaders. They represent two separate groups and their interests are now widely divergent. It also seems necessary to introduce a departure from the method followed in dealing with the subject in the preceding four sections because the issues in the realm of labor policy finally resolve themselves into a conflict between two philosophies, each of which is the direct antithesis of the other. The first is conflict; the second, co-operation.

The idea of conflict as the controlling principle in the relationships between the manager and the employee has had a thorough trial. To persons not immediately involved, it appears that this idea has proven a failure so far as the bituminous industry in the United States is concerned and so far as the years 1915 to 1926 inclusive are concerned. The impression that failure has resulted comes first from the fact that a labor policy based on conflict not only has contributed nothing to the improvement of the service of the industry to its customers and the public, but on the other hand has been a source of great and unnecessary annoyance and has had a most wasteful and unsettling effect upon society in general and the economic structure of the country in particular. It also seems to have failed in that it has not even advanced the economic well-being of the employees.

A labor policy based on the idea of co-operation between the employees and the managers impresses me as offering enough more to the employees and the public to warrant an experiment in the nature of a right-about face. The alternative of what is proposed has been tried and proved unsound. The experiment seems warranted by the possibility that enlightened managers can do so much more to advance the economic well-being of employees than any other leaders. I am laboring under no illusion as to the quality of management in the bituminous industry. There is no doubt but that it has left much to be desired. That, however, does not impress me as justification for continuing policies which make for continued civil war. My proposals simply mean that in surveying the assets and liabilities in the bituminous situation I see more to build on in the case of the manager than in the case of the labor leader and particularly if all the safeguards are adopted that are proposed elsewhere in this paper.

Neither does this proposal imply that I am a foe of the trade union. Undoubtedly there are conditions where the trade union might be a social asset and a useful instrument for advancement of the interests of employees without crossing the line where it becomes a social menace. Its value, however, is chiefly in an industry where there is a large number of small proprietors, a number of proprietors or managers who are grossly deficient in social vision, or an industry where the nature of the work makes regular employment impossible. The managers of the bituminous industry have been deficient enough, but under proper safeguards they can acquire the habit of doing much better than has been possible in recent years. It appears easier, more promising of early results, and less expensive to build up their weaknesses than to take the time and pay the cost of attempting the impossible task of designing a rational and workable policy based on continuing the same basis of relationships as has been in effect during recent years.

So far as a national union of miners is concerned there appears to be no need or rational justification for it during an experiment of this kind. A strong national union has had a greater opportunity to prove that it is a socially desirable agency than has ever been accorded a union under at all similar conditions. It has been unable to realize upon the opportunity. Moreover there is less and less prospect each day of establishing conditions under which it might regain public confidence and its own effectiveness.

Employees should co-operate with the managers to the utmost with the view to increasing the individual output as well as to reducing the cost of producing coal. It should be understood, of course, that this is based on the view that the proposals previously suggested for the safeguarding and improvement of working conditions be adopted. The policy of resisting new methods and the use of machinery should be abandoned. The fact that the needs and desires of employees can be satisfied to a greater extent in other ways than through strikes should be considered.

Objectives of Program

1 Sufficient earnings by operating companies to enable them to pay 10 per cent on capital necessary to conduct the business after reasonable provisions for reserves have been made, Federal taxes and Stabilization Tax paid.

2 A reduction in the number of coal companies to not more than 500 with at least three thoroughly responsible large companies.

3 A reduction in the number of coal miners to not more than 350,000.

4 Not less than 275 days employment per year for the employees necessary to produce the coal required if modern methods are used.

5 Compensation to miners that compares favorably with that paid employees of other industries and the best possible working and living conditions.

6 A reduction in the fluctuation in monthly production to less than 5 per cent of the average monthly production.

7 The elimination of price fluctuation of more than 10 per cent from a standard price determined upon for the shipments of each month from each producing district and for each of the main grades of coal.

8 Dependable service to consumers.

9 The cessation of strife.

Reaching the Miner's Heart

By Whiting Williams

Why will men "work their heads off" for one foreman and not another? In the answer to this question lies failure or success for many a boss. How about good will and fair play? Why not ask the men sometimes under what kind of bossing they do their best work?

"OH, SURE"—so an ore-mine captain told why he had forsaken his old job in the coal pits—"you can take care of yourself all right. But how do you know but what some fool down the entry-way is goin' to get careless and blow himself and everybody else to Kingdom Come?"

"On Wednesday next," so the conservative leader tried to comfort his radical "Bolshie" companions in the little mining town in the Rhondda valley of Wales, "I'll be in Paris at the world convention of miners. At ten o'clock the representative from America will move to commence a world-wide propaganda for the 30-hour week. At eleven o'clock, the German"—etc.

I certainly know of no other great field of work in which men enjoy such a sense of unity and comradeship with all their colleagues and fellow tradesmen throughout the world and yet at the same time take so much pride in their own individual craftsmanship and independence. The first time I heard an ignorant Polish miner refuse to follow the polite suggestion of his superintendent about the drilling of the "face" for his shots I expected to see him fired on the spot! He certainly would have been discharged if he had been working on the steel plant's open-hearth floor whence I had lately come. Instead, the "super" simply shrugged his shoulders and walked away with his, "Well, Jo, it's up to you to get down your stuff whatever way looks best to you."

Even the average day or "company" man appeared immensely more interested in showing himself a good craftsman than any of those steel-plant laborers where the boss stood at our elbows ready to "hog" away the satisfactions of everybody's efforts. Just because his foreman could get around only once or twice a day, a mine worker would talk almost by the hour about how to do the job up to the queen's taste.

"The guy that strung these wires"—so the wire-man kept saying one day—"he sure was some slob. If you and me, buddy, can't do a better job than this, we oughta eat our hats!"

"W'at you t'ink, buddy?"—the timberman would puff between the terrific blows with which he was forcing the prop beneath the roof—"W'at you t'ink boss he say when see dees job tonight? 'Steve good timberman?' Mebbe yes; mebbe no? W'at you t'ink?"

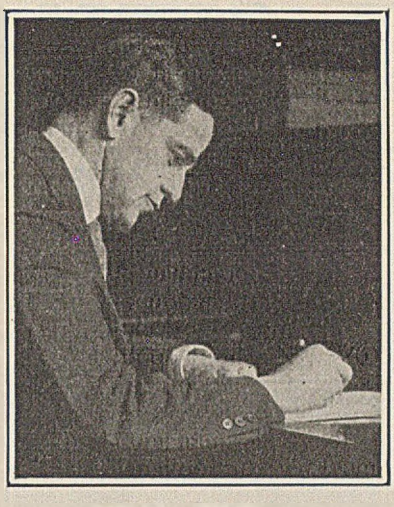
Now it looks as if this craftsmanly independence which has always so marked the miner were about to be assailed by the machine loader and the enormous changes it will bring in the relations between man and man, and especially man and foreman, below ground. But, certainly, every imaginable step ought to be taken in order to make sure that the new "concentrated" methods do not destroy the miner's magnificent belief in his job and in himself as the capable doer of it.

Already, for one thing, those foremen who are going to have the big gangs under them ought to be discussing weekly with the "super" all the differences the new methods will mean in the handling of their men—and all the ways that can be found to help save the old pride and utilize it, too, for a still stronger hold on the old feeling of miner unity and comradeship. Such discussions probably would mean, for one thing, that the utmost possible use be made of the gang piece rate.

THIS has given a good account of itself in Europe. When, for instance, I asked for a job at the "face" in a French pit, I was told that this was possible only on the invitation of the gang or *chantier* itself, and then only after the members had long watched a man's performance! In the Saar and the Ruhr valleys of Germany it

was the same with the *Kamaradenschaft;* I could break in only by saying that, as an observer of methods, I was willing to work without pay.

If similar gangs here were given not only a gang rate for the loader but also some responsibility for, and some financial interest in, the handling of the cars and other secondary services, it would be only a short time before the men would grab with delight this means of enjoying new duties as substitutes for the old individual craft satisfactions. For it is largely the obstacles and stoppages in these secondary services that bring the ambitious room-miner most of his heartbreaks—unless he finally ceases to care altogether!



Whiting Williams

IT IS EASY to recall my disappointment the day in the Pennsylvania coal mine when "Scotty" Mack and I tried to get a record production —and would have got it, too, except that a careless driver let our heavily loaded car go off the track into a watery hole just a few feet from the face! It was bad enough to have to wrack our backs trying to push and jack the car up into place, to say nothing of losing all the time and output. But what struck me was the calmness with which the old fellow accepted the misfortune, with his shrug and, his "Never mind! 'Tis often and often this happens, buddy!"

It will come close to a crime if the new machine methods—also the new methods of management—do not lessen the number of men thus taught by almost daily experience not to care too much or try too hard!

But in addition to what is done "inside" to keep the old pride going on the job, there is much that could well be done above ground—without waiting for the new machinery. One of these steps would be equally useful to gang-member or room-worker. It would be the effort to bring the miner and the public closer together.

Without doubt the coal worker would be easier to get along with if the whole outfit from "super" to "snapper" were not so far away from all of us and we from them. Could not the quality of the mine-camp movies be improved so as to carry a better idea of us up to the dwellers in the valley, and could not all of us be shown more movies of the coal valley's life and work, on which all of us are so dependent? Certainly, every railroader knows that one reason for his own joy and pride of job is that everybody sees him at his work—and nearly everybody envies him his familiar contact with, and mastery over, his big engines and trains. Not one of us but can understand the pride, and the disappointment, of the mother who explained:

"My five boys have all turned out pretty good—all but one. Four of them are railroad men, like their father and their uncles—we're a railroad family. But the fifth—well, nothing would satisfy that boy but to go off to college and learn to be a—barber!"

IT IS UNFORTUNATE for miners and for all the rest of us that today most people are so far away from the coal town as to believe that, of course, every worker would prefer almost any other conceivable kind of job to mining coal—"down under ground, away from the sun and air!" Yet, everyone familiar with the coal towns knows that this is completely untrue —partly because of those satisfactions of craftsmanship, and partly because every miner knows that, unless coal is mined, thousands of factories must shut down and millions of people be cold and hungry; partly, also, because most miners agree with my Italian companion who said:

"Oop outside, one-a day hot, one-a cold; one-a day sweat, one-a day freeze! No go-o-od! Here, inside, no hot, no cold; all-a time same t'ing. Nice-a place to work!"

If no conceivable publicity or other program by the industry could bring coal digger and coal user closer together, each more respectful of the needs and the convenience of the other, perhaps the new machinery will of itself accomplish this same result. Exactly that, at any rate, ought to happen when everybody in the mines can be supported by a larger per diem production than at present. For, when all is said and done, the average output per inhabitant in our mine towns—from the miner's family to the boss' and the butcher's and the baker's—is only about one ton per day!—too small to give anyone the livelihood and the liberty desired.

THIS amount surely will be tremendously increased as rapidly as progress can be made with the new machines and with the various changes in management methods required for efficient coal production and preparation.

But this increase in earning power will not give full measure of the hoped-for satisfaction and contentment in the coal towns unless there can come—with it and with the whole range of new methods—a new approach to the soul of the miner and a new effort at a better understanding between him and his manager and all the rest of us.

THE COAL SITUATION—

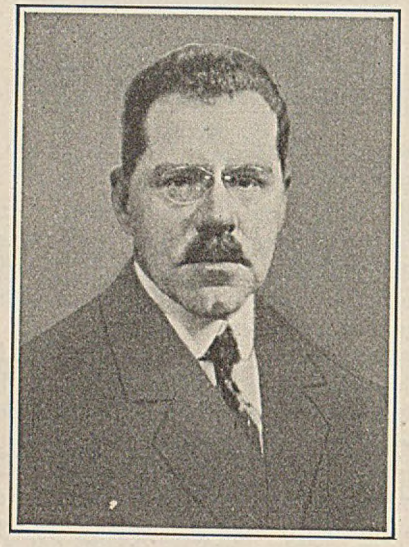
A Critical Analysis

By Dr. Walter N. Polakov
Consulting Management Engineer
New York City

ALMOST inestimable opportunities for improving operating economy by modernizing managerial methods are offered by the coal industry today. Anyone failing to take advantage of the present juncture in the bituminous coal industry is bound to be outstripped by his competitors. On the other hand, anyone promptly seizing the opportunity offered by the present psychologic, economic and technologic situation will reap benefits which will place him, for many years to come, among the industry's leaders.

Why? First, because the bituminous industry is largely over-developed and unless a coal dictator restricts production after the fashion of the oil industry, the best organized mines will easily win in competition. Secondly, because the present method of mine management is so notoriously haphazard and wasteful that an introduction of modern principles of industrial management will do much to reduce idleness and inefficiency. Thirdly, because the advent of machine mining takes the bituminous coal mines from the class of contract-partisanship into that of factory production with all the advantages of the latter now within their reach.

IT IS generally conceded that the coal industry of America is over-developed. The productive capacity of our mines is conservatively estimated to be 800,000,000 tons of coal per year. Yet our annual consumption of bituminous and anthracite coals (including the terrific waste in their utilization) is only 500,000,000 tons annually. The possible output is reduced to the actual tonnage mined by means of irregular production and not by shutting down needless openings or scheduling the output of all mines to a definite allotment consistent with the demand. This irregular production, which results in many days during which both the mines and miners are idle, means that



Dr. Walter N. Polakov

not only are there more men in the industry than are needed but also entails the intermittent use of mine equipment.

Enforced idleness means that the miners, having to meet their living expenses continuously, must and do ask a higher rate of pay for intermittent work than would be necessary if they had steady employment. This, in turn, entails an added expense per ton of coal mined. The second condition, idleness of equipment, is somewhat more complex. Irrespective of the output, capital charges, ownership expense, etc., must be met, and these also add a heavy increment to the cost per ton. At the same time, operators naturally are likely to be less eager to introduce costly mining machinery wherever there is no assurance of the steady utilization of such an investment. Incidentally, maintenance of mines—pumping, ventilation, etc.—must go on, whether the mine is idle or operating part or full time.

PERCENTAGE OF MACHINE-MINED COAL*

	1923	1924		1923	1924
Pa.	64.1	64.8	W. Va.	78.7	82.0
Ill.	68.3	71.6	Va.	73.5	79.7
Ohio	88.5	86.4	Ky.	84.2	87.2
Ind.	54.3	59.8	Ala.	42.6	50.7

* Compiled by U. S. Bureau of Mines.

Consequently, the mines of the Central Competitive Field were much slower in adopting machine mining than the Southern mines. This is clearly shown in the table comparing the records (for the last two years for which data are available) of four states in the competitive field with those of four Southern states.

IT IS likewise noteworthy that although the total output of coal in 1924 was 14 per cent less than it was in 1923, the four Southern states listed in the table actually mined 997,000 tons more than in 1923. During the same period, the four states included in the Central Competitive Field showed a decrease in production of 41,917,000 tons. Yet, during the period 1916 to 1924, the production rate per man-hour in the entire bituminous coal industry increased 29 per cent.

Now, bearing in mind the increase in proportion of machine-mined coal, and remembering the average annual coal consumption—500,000,000 tons—consider the data furnished by the American Railway Association on the coal production of the non-union mines. During the week of Dec. 4, 1926, the non-union mines shipped 9,250,000 tons of coal and there were idle at that time non-union mines with an annual capacity of 2,000,000 tons. This is a potential output, even with the existing managerial methods and equipment, of 585,000,000 tons annually—more than the country's present requirements.

At the same time it is important to note that, with continued years of industrial expansion, the demand from the nation as a whole for coal did not increase with the increased production of all other commodities. The expanded industrial activity and enlarged production were apparently taken care of by the advancement in engineering and managerial technique. For instance: In 1922, although the power industry generated six billion

kilowatt-hours more energy, it consumed one million tons less coal than in 1919. In 1925 the railroads, which consume approximately one-third of the country's coal output, saved about 10 per cent of coal per passenger train car-mile and approximately 14 per cent per thousand ton-miles of freight when compared with the average of the preceding five years.

Comparing the index of industrial activity of this country with the total coal consumption, it is seen that in 1925 there was 30 per cent greater industrial activity with somewhat less coal used than during the preceding five-year period. There were 90,000,000 tons less coal used than in 1920. It is therefore reasonable to conclude that, with the improved economy of coal utilization, with increased productivity per man-hour, and with excessive mining capacity, the coal industry as a whole is facing a profound reorganization.

ALONG what lines is this reorganization to be expected? It is only necessary to recall some outstanding reports and data, periodically published by unquestionable authorities, to realize that the bituminous industry is not only overmanned but also notoriously undermanaged. There is ample evidence that there is not enough supervision of mine operation; inadequate accident prevention; almost total absence of planning, scheduling and task setting; plant engineering and maintenance departments are in an incipient stage; and that traffic management is underdeveloped. In brief, the industry is to be compared with the metal industry of pre-Taylor days, or with the textile industry before Gantt, or the automotive industry antedating Ford.

It may be advisable to cite a few illustrations. A typical report of the Bureau of Mines, stressing the laxity of supervision and management, says:

> "After securing a position of trust as superintendent . . ., fire boss, or mine foreman, some men seem to have felt it unnecessary to keep safety principles in mind. . . . "(Serial Report No. 2373.)

Another serial report, No. 2167, again stressing faulty management, speaks of the fire boss:

> "His territory is so great that in order to reach all the work faces, and chalk the required date at the face, he must travel at a rapid walk, or even run. When such haste is necessary to cover the required ground, it is manifestly *impossible* for the fire boss to make a careful inspection or examination of the roof, timber, wire, gas, etc., and doubtless in his hurry *many unsafe* conditions escaped his notice."

Endless examples could be quoted to illustrate the point. The last coal Fact-Finding Commission admitted that the most important conclusion it had reached was that "The miners' union, which has so far devoted its major attention to economic matters, will, in safety matters, find a wide field of usefulness."

NO. OF ACCIDENTS IN PA., 1918–1921*

Year	Mine Accidents	Industrial Accidents
1918	50,249	134,595
1919	44,067	108,477
1920	47,787	127,192
1921	50,756	89,441

* Data from U. S. Department of Labor, Bulletin No. 339.

The table showing the number of accidents in Pennsylvania is ample evidence that coal mines pay their toll of human lives at a regular rate throughout the years whereas, with the introduction of safety methods in industrial plants, the accident rate in industries other than coal mining is rapidly diminishing. This is clearly shown by the recent report of the American Engineering Council by Mr. Wallace.

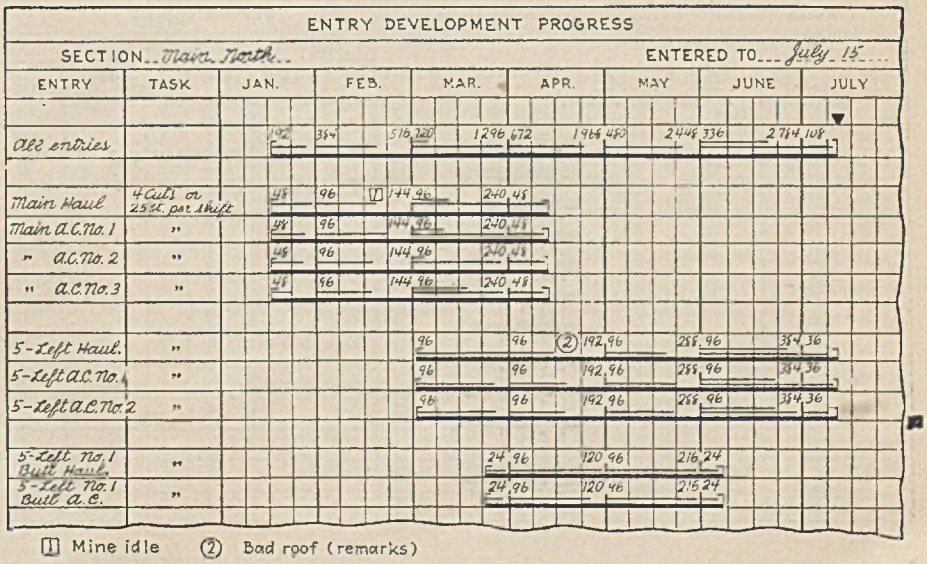
That the mine accidents listed in the table are largely avoidable by proper supervision and care on the part of the management, is evidenced from their classification by causes. Falls of roof and coal account for 50.0 per cent of the deaths; accidents from mine cars and locomotives, 18.6 per cent; gas and dust explosions, 12.2 per cent; electricity, 4.2 per cent; explosives, 3.8 per cent; other causes underground, 3.6 per cent; and accidents at the surface, 6-1 per cent.

The contract system of payment is the most glaring example of a practically complete transfer of responsibility from management to men. Unlike any other industry, except probably some isolated examples where families in the slums are still producing on contract, millinery, artificial flowers, hand-colored postcards and tableware, management of coal mines does not assume its share of responsibility to provide men with work and an assignment of tasks to be performed at a specified place in a specified time, at a specified wage rate.

ON the other hand, in view of the fact that expansion of national industry does not require expansion of coal production, and also that machine mining under the régime of scientific industrial management has invariably greatly reduced the cost of production, the welfare of mine workers will depend upon the degree to which the industry will modernize its equipment and its managerial methods. The reasons for such expectation are obvious:

(1) With the increased investment for underground coal mining equipment, the overhead expense of idleness will become so heavy that the operators will not tolerate irregular operation. Therefore, means for steady employment will be found and developed.

(2) With the increased productivity, due to machine equipment, scheduled operations and better maintenance and safety, the worker's share per year in the fruits of his effort will increase more rapidly and compensation per ton of coal will decrease.



Charts Progress of Development Work

DEPT.							DATE													
	MACH. No.	STOPPED					Started	STOPPED					Started	Elapsed Time	EXP. RATE	EXPENSE OF IDLENESS				
		NO WORK	NO MAT'L	NO TOOLS	NO HELP	REP'S		NO WORK	NO MAT'L	NO TOOLS	NO HELP	REP'S				NO WORK	NO MAT'L	NO TOOLS	NO HELP	REP'S

DAILY IDLE MACHINE REPORT

(3) With the development of an integrated coal industry, embracing production of chemicals from byproducts of the mines, the excess of mine workers gradually will be absorbed by the associated chemical industries.

(4) Although the development of an integrated coal industry provides additional employment, it also requires heavy investment and, therefore, tends not only to stabilize employment, but also to eliminate financially weaker and socially irresponsible competition.

Ground will thus be broken in the almost virgin field of scientific industrial management for the planting of the seeds of modern industrial organization and management, which have made American industry an object of admiration and envy throughout Europe. Nevertheless, it would be a grave mistake to think that a bituminous mine or the whole coal industry could overnight be reorganized, Taylorized or Fordized. The transition period is always a delicate one; it is now complicated by the unsettled labor situation, and anything resembling a "scientific management," except for a few half-hearted attempts in some isolated instances, is practically unprecedented in the coal industry.

The problem, therefore, is to devise some "easy steps for little feet." These are to be found in the now classical method developed by the late Henry L. Gantt. It is assumed that the mines are opened and equipped to produce coal. Therefore, efforts must be first of all directed:

(1) To learn how they are performing the work for which they are established.

(2) To discover the reasons why they are not doing as well as they should.

(3) To remove the obstacles so disclosed. To do this, a few fundamental questions must be asked:

(a) Are the orders for coal filled on time; if not, why not?

(b) Are all the machines and working places used; if not, why not?

(c) If orders are filled and all equipment used, is the work done as fast and as cheaply as it should; if not, why not?

To be able to answer these logical questions it is, of course, necessary to previously establish a certain goal or standard as to what should be done and then compare the performance with the task set.

If all of the questions are answered affirmatively everything is as it should be. However, should the answer to the first question be that mine production lags behind orders, the duty of the management is to find out why this condition obtains and quickly remedy the trouble.

Should some working places or machines be idle, again the question is "Why?" If it be because of lack of orders, these must be secured; if there are no cars, they should be obtained; if idleness is due to breakdowns, it is necessary to schedule the maintenance work, etc.

If orders are filled promptly and all mines and machines are in use but the output per man-hour or machine-hour is below standard, the management must determine the cause and at once remove it. Otherwise, production costs will rise, the men will become disgruntled and production will consequently suffer.

WORKING PERIOD.....WEEKS *One* DAY..... PERIOD ENDING *June 27* 19 *27* SECTION.....

OPERATION OR MACHINE CLASS	TASK (TONS)	OUTPUT (TONS)	PERCENTAGE OUTPUT TO TASK 10 20 30 40 50 60 70 80 90	DETAILS OF EXPENSE OF IDLENESS DUE TO					EXPENSE OF IDLENESS				REMARKS
				LACK OF ORDERS	LACK OF LABOR	LACK OF MATERIAL	REPAIRS	POOR PLANNING	TOTAL	UNAVOIDABLE $	UNAVOIDABLE AMOUNT	INCREASE IN EXPENSE OF PRODUCT $	AVOIDABLE	
Cutter No. 1	*300*	*240*												
" *No. 2*	"	*189*												
" *No. 3*	"	*144*												
" *No. 4*	"	*159*												
" *No. 5*	"	*225*												
Loader No. 1	"	*168*												
" *No. 2*	"	*156*												
" *No. 3*	"	*174*												
" *No. 4*	"	*204*												
" *No. 5*	"	*183*												
Total	*3,000*	*1,842*												

Charts Cost of Idleness

FOR a busy executive to secure all this information is not an easy task and, in most instances, even if he gets the reports it is nearly impossible to clearly evaluate the importance of each factor in its relation to the whole operation. The plan of presenting these data and answers to an executive in the form of a set of three simple charts was first applied by the writer to the control of power production showing: (1) The relation of output to demand; (2) the load carried by each unit and the cause of idleness of machines; and (3) the efficiency of each employee or shift. Gantt applied the same graphic method to other industries.

THE four accompanying charts illustrate possible applications of the same method to the coal mine. In the first, assumption is made that the mine operates on an average of 24 days, of one shift each, per month. It is further assumed that mechanical equipment is used to advance the respective entries a fixed number of cuts each shift—the number depending upon the conditions encountered. Where circumstances are favorable, the assigned daily task is four cuts of 6¼ ft. each or a total of 25 ft. The advance in each entry per month is indicated by thin lines and the cumulative total by heavy lines. The figures at the left of each monthly space indicate the number of cuts scheduled for that month, while those on the right register the progress desired. The causes of delay are indicated by numbers within various symbols entered in the space for the month in which the delay occurred. The key to these symbols, together with remarks of explanation, are recorded at the bottom of the chart. The graph designated "All Entries" sets forth the program for, and progress in, development work for the entire section. Since it is necessary, for purposes of ventilation, that all entries in a group be advanced at practically the same rate, when trouble is encountered in one entry work in the others is temporarily stopped. Two thin lines within a monthly space indicate that double shifting has been practiced in order to make up the yardage lost during earlier periods. All of these various points are best brought out in the middle group of entries shown in the first graph.

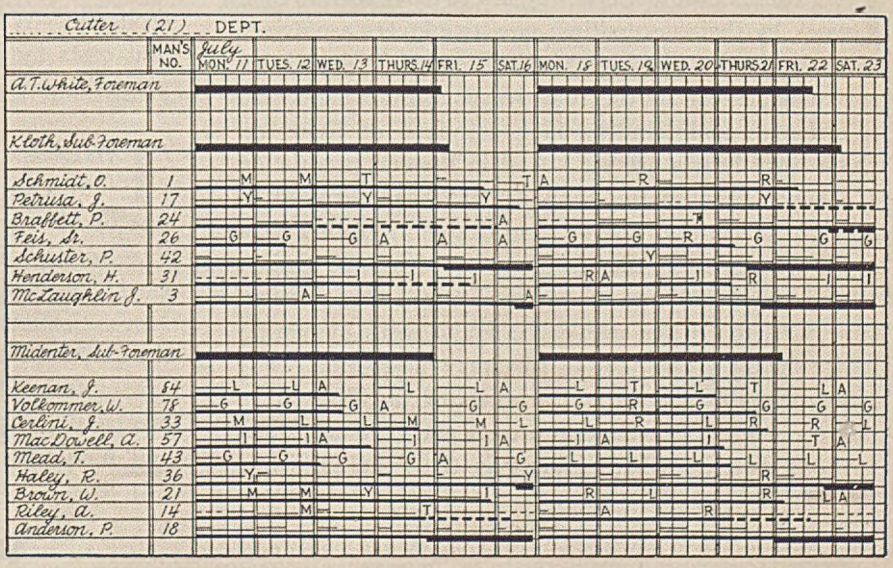
The second and third charts, after Gantt, show machine performance and money lost due to idleness. The machines in the third chart produced a tonnage equivalent to only 61 per cent of their capacity whereas, on the day recorded, orders for coal allocated to them measured 87 per cent. A record of this kind is highly effective because it sets forth, in a simple manner, the *cost* of idleness. It can and should be used in recording daily, monthly and yearly performances.

THE fourth chart, furnished by courtesy of Wallace Clark, shows labor performance in one department of a machine shop and vividly illustrates the possibility of increasing the efficiency of labor by this means at a mine plant. Each daily space represents the amount of work to be done in a day. If less was performed the thin line is drawn proportionately shorter; if more, the lines are doubled up at the end. Broken lines indicate time taken for jobs about which it was not known how long they should take. Heavy lines are the summaries of the work done per week. Thus, one of the subforemen got out more than four days' work in a week while another just four. The next week the first subforeman got out more than five days' work in a week while the second was still a day behind. Letters after short bars denoting less work done in time allotted indicate cause of delay thus: A—absence of operator; G—green operator; T—tool trouble; I—instructions missing; M—material causing trouble, etc. When the trouble is so known, it enables those responsible to find a means of eliminating it.

By proper use of these chart records, a system of management based on facts, not on opinions and traditions, can be built from the bottom up. Such a system is a great aid to executives, entirely understandable to workmen and clearly places responsibility upon the proper person or cause —thus enormously simplifying the managerial work.

Charts of the type accompanying this article have been in use for many years in a great variety of industries and have proven, beyond any doubt, that a method of control based upon them can develop an organization on a sound foundation free from any theorizing. Control of this kind leads to natural development of such other managerial mechanisms and lines of co-operation, between departments and between departments and office, as are conducive to greater production and lower operating costs. Its installation requires no investment, upsets no practices—excepting those that gradually are brought into ill repute —and gains appreciation and understanding of the men.

THE introduction of this graphic control of production naturally presents some special problems and requires a definite technique of installation which necessitates the consulting services of one experienced in that work. On the other hand, this method of discussing what hampers individual companies and how the obstacles can be overcome is equally applicable to a study of the industry as a whole. The example of the U. S. Shipping Board, Ordnance Department, Aircraft Production Division, Emergency Fleet Corporation, etc., in scheduling by this method during the World War, proves the value of the plan, even on a large national scale, for purposes of control. These results suggest study of this method by the coal industry.



Machine Shop Labor Performance

Mine Mechanization

The Engineer's Opportunity

MASS production is characteristic of American industry and mass production has been made possible only by close, careful organization and liberal use of mechanical power. Just as Chinese farmers, depending upon the hoe and the spade, can make a living only out of richer land, with the result that a smaller percentage of cultivable land is actually cultivated in China than in the United States, so the countries and the industries that depend upon human labor unduly cannot work any but the richest of their raw materials.

THEY cannot make possible a rich, full life for any but the most efficient and active of the men employed. To use low-grade ores or low-grade material and still make it possible for the slower or less efficient workmen to earn enough to have a comfortable living requires the maximum substitution of mechanical for human labor and spreading the brains available over the maximum output. The men who by ability, training or experience are capable of sound thinking must devote their energies to planning, designing and supervision. They must so organize the work and so equip the worker that it will be possible for him to produce enough output to give to each the total necessary to sustain that standard of living which has become his. Unless this can be done men will not work effectively.

IN TIMES past it was customary to drive men to their work by their necessities; now employers are driven to mechanization and increased efficiency in organization and management by the high wages workmen demand in order to maintain the high standard of living on which their hearts are set. And in the end production is cheaper because the thinking has been directed to the right place, the planning and designing, rather than to the wrong place, the maintenance of output against unnecessary handicaps of equipment and organization. Time was, too, when men were led to work by setting before them the opportunity for fierce dissipation. The saloons, gambling halls and brothels of the West were long considered necessary to attract and hold workmen in those districts where mining is the main industry.

GOOD roads, automobiles, radio and other features of modern life have broken in on that isolation. Dissipation, delightful as it is, breaks down efficiency and modern industry declines to depend upon it as an aid to industry. Enable men to earn good wages, then sell them good goods on the installment plan and so keep them at work is the modern philosophy. But they must have good goods, things that give real satisfaction, and there must be a place even for poor workmen; some way for the man below the average as well as the man above it, to produce enough goods to permit the employer to pay him the wages he desires and not wreck his business. This has been shown to be possible in factory work. To some extent it is becoming possible in farming, since an American farm on an average consists of 57 as against China's 3.1 acres.

THE miner has so far benefited least from mechanization and in particular digging and loading coal underground is even yet America's largest job of hand labor. It is hard work. Without efficient organization and hearty co-operation it is impossible in most places for a below-average miner to dig and load enough coal to earn the amount of pay we all as fellow citizens would be glad to see him get; and mining, as every other industry, must provide work for its less efficient workmen. We can waste resources by taking only the best and most favorably situated coal. This is poor national economy. We can "charge it up to the consumer"; at least at times we can. This again is poor national economy. What we must do is reduce or keep down unit costs by efficient production. This requires planning, designing, and supervision—mass production.

THIS is the work of the engineer and it is in an effort to accomplish this that the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and the National Coal Association have joined in a serious study of Mechanization in Mines. Success here will not solve all the problems of the coal industry; the tendency of all raw-material industries to overproduce is more fundamental still, but it will make possible low-cost production and high wages—both excellent bases for prosperity.

H. Foster Bain

MERCHANDISING—

Its Application to Bituminous and Anthracite Coal

By Harry Wellman
Professor of Marketing, Amos Tuck School
Dartmouth College

Quick turnover is an essential of successful business today. Ideal conditions—steady demand and steady production—are out of the question, but co-operation will do much.

THE OTHER DAY I overheard two salesmen discussing the credit of a local grocer. One salesman was considerably worried, but the other said, "Oh, don't worry; that man is all right; he hasn't room enough to fail."

That statement contained nothing but the truth. It simply expressed the fact that, today, turnover is all-important and that warehouse or storage space constitutes a real menace to nearly all distributing business.

Perhaps the greatest problem of the coal industry is the local dealer. People used to say that when a man failed at everything else, he became a grocer. Maybe some of them did, but a lot of them went into the coal business. Generally speaking, the local dealer is not a good business man. He probably started in handling coal at some time when it looked as if he could make a little money by so doing. He builds storage facilities and stores coal for his local trade, who will pay him when, if, and as they can. His credit system is strange and wonderful and his knowledge of costs is almost non-existent. One year he figures that he made money and the next year he knows that he lost money. He is in a constant state of warfare with his customers, since he always passes the buck to the man from whom he buys and at the same time neglects to co-operate with the producers in the matter of different prices for different sizes.

A good deal of money has been spent advising the consumer that he could save money and secure equally good results if he would buy the smaller sizes of coal. He has also been advised that the sale of the smaller sizes would reduce the cost of stove and egg. Actually the small dealer makes no distinction in his prices to his regular customers. I am not assuming that this is true of the larger dealers nor of the better coal merchants. It is true, however, of countless small dealers scattered around the country who figure that coal is coal and who estimate their profits for the year on their average tonnage at an average price.

IF WE were to study the distribution of coal as we study the distribution problem of any other manufacturing process, we would start with an analysis of the product, the market, and the sales channels used to reach the market. With the facts determined in each of these divisions, it would then be possible intelligently to establish a sales and advertising policy. We find that a very simple analysis will give us a fairly good picture of the product.

First, we find that coal is a necessity and that the coal fields are fairly well concentrated within a few states, which at once brings up the problem of physical distribution. We find there are two general classifications of coal, hard and soft; that the hard coal industry manufactures a family of products (different sizes) some of which have little or no demand. We find that soft coal can be mined in many regions, that its production is largely an extractive rather than a manufacturing business. We find, also, the beginnings of standardization of sizes, the attempts to trademark coal and the production of fuel briquets made of bituminous, anthracite, semi-anthracite, coke and semi-coke.

It is estimated that 10.3 per cent of the bituminous coal produced is used by domestic consumers, that industrials require 31.7 per cent, that the railroads use 27.9 per cent, that gas and electrical utilities take 6.7 per cent and that 4.1 per cent is exported.

DOMESTIC consumption of anthracite amounts to 55.1 per cent of the total; gas plants use 1.8 per cent; industrials 20.5 per cent; railroads, 7.1 per cent and exports 5.1 per cent. If these estimates, made by the Department of the Census, are correct, we have a rather permanent, definite market established.

Coal reaches the market through wholesalers and retailers, by direct selling from the mines, by contract and spot direct and through selling agencies to railroads, public utilities and small industrials. In other words, coal has been sold by every possible method and the use or non-use of the method has been largely determined by the pressure of over-production.

SINCE nearly 60 per cent of the anthracite production goes to the domestic trade, the anthracite problem is more nearly concerned with its small dealers and its inability to sell its smaller sizes and screenings. Just recently *Printer's Ink* announced a campaign of advertising for the education of the public, in which the anthracite operators propose to educate the consumers in the use of small coals. The announcement reads, however, that this campaign will not be

inaugurated until dealers have definitely signed up to carry it out in detail and co-operate in every possible way in getting the idea across. This means a limited use of the idea.

Briefly, the anthracite operators know where their market is and did know that that market was stable. The introduction of oil heat has made some difference in the consumption of anthracite coal. It will probably make more difference in the future rather than less. This means that the anthracite operator will have to regard his product in truth as a manufactured article and will have to use more intelligent selling methods in covering his domestic user. Market analyses will determine who his customers are, where they live, and the average amount of coal they can use during the year. This analysis will serve to check up his present dealer connections and cause him to make different arrangements if this proves to be desirable.

WITH a better knowledge of the market, with a more careful selection of dealers, the time would be ripe for an advertising campaign to educate the public. The public must be sold the necessity of eliminating handling and storage charges. They must be taught that the best place to store coal is in the bin of the consumer—and they must be served by coal dealers who also appreciate it.

Along with this plan might come the introduction of a budget system for the householder which would make it possible for him to have his coal delivered as suited the production schedule of the mine and paid for on the monthly installment plan. In other words, this will entail the introduction of regular deliveries throughout the year and standard monthly payments in place of bulk payment in the Fall or Winter. This will improve the credit standing of dealer and consumer alike. If the plan is offered with a real price reduction, the public will accept it.

IN MAKING any preliminary suggestions regarding the distribution of soft coal, it is necessary to seriously consider the fact that no great step forward can be made in distributing coal until some corrective is applied to its production. Unless some reasonable control of the amount produced can be secured, it is impossible to attempt to operate any intelligent plan of distribution. Since we know fairly accurately the amount of coal needed yearly, it is apparent that a reasonable restriction of production to secure only the needed volume might be maintained. If the coal trade intends to produce regardless of the market, there is no plan whatever that can prevent the present conditions from continuing. Since failures and unnecessary sales costs are always paid for by the public, it seems possible to assume that the public itself might be satisfied with a reasonable production control which would insure more standard prices throughout the year.

IT IS also imperative that the coal operators, the miners, and the public understand that the coal problem is really a selling, not a mining, problem. Instead of approaching it from this angle and making a careful study of the market and its possibilities, operators have spent their time and money in continuous labor difficulties. Labor has fought back, indeed has often been the offender because it demanded that it receive a sufficient *per diem* wage to offset the fact that it received employment for only 200 days or less during the year. Any other manufacturing business attempting to adjust itself to the present situation would seek to develop means whereby its production would keep pace with its selling schedule. In other words, it would attempt to create a steady flow of its product from factory to consumer.

IN THE bituminous business, it is apparent that contracts should exceed 59 per cent of the output. This would leave to be sold for domestic consumption and to gas and electric utilities only about 16 per cent of the annual production provided the export ratio was maintained. This domestic consumption could be considerably stimulated by the right kind of advertising as discussed under the marketing of anthracite. This advertising should stress the fact that the consumer determines the price of coal and that if he will take his fuel in season, he will assist in establishing an uninterrupted flow of coal from the mine to the consumer's bin and all the prices will be reduced.

One of the outstanding abuses in the distribution of bituminous coal arises because too many companies ignore the fact that transportation is the greatest single item in the total cost and vigorously attempt to get business far outside of their logical zones of distribution. This situation could be corrected by careful market analysis which would determine profitable selling territories, eliminate the more distant regions, and work a benefit to the general industry since the abandoned territories would be opened up to operators more favorably located.

Under the present system, competition has been so keen that distance was practically wiped out. Coal companies have sold wherever they could for any price they could get. The prices realized have been out of line and profits have been materially lessened. This situation is parallel to the condition of many of our national manufacturers who have found that it costs them more to get the last hundred thousand dollars' worth of business than their entire profit on the balance of their trade.

The final factor that must be considered is the point of view of the public. The public has assumed that every once in so often someone would announce that coal was going to be higher, that a commission would be appointed, and that public opinion would be aroused. And then, when all the shouting had died away, the price of coal *would* be higher, but without material benefit to anybody. The dealer has passed the buck to the operator, and the operator has passed the buck to the miner. The public has paid and has paid unwillingly. This means that the public is willing to accept any substitute for coal that may be offered at approximately the same price. The terrific increase in the sale of oil burners and the subsequent increase in the use of fuel oil offer a thorough proof of this statement. The over-production of oil this year has again sold the public on the idea that there is an almost unlimited supply of this fuel which will be available at no greater cost than coal.

COAL is a necessity and as such is two-thirds sold when it is mined. Since this is a fact, the emphasis in all distribution plans should be placed upon the regularity of production and on organizing this production to meet a known consumer's market.

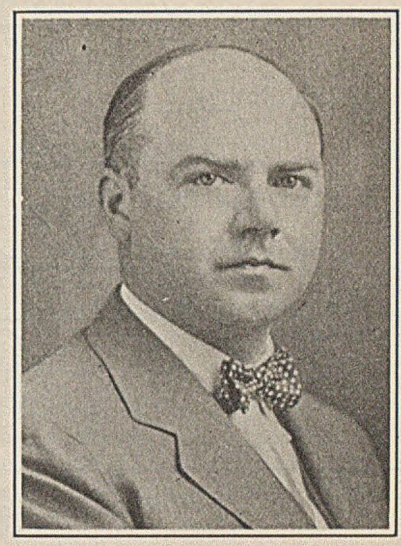
No great advance will be made in the distribution of coal until the industry itself appreciates that its problem is entirely one of selling. When a reasonable amount of time, effort, and money is spent in perfecting the distribution plan, it will undoubtedly be found that the greatest savings can be made in reducing the present number of dealers, in educating those that are left, and in convincing the public that the best place to store coal is in the consumer's bin.

EFFICIENCY—

Through Payroll Analysis

By Paul Weir

General Superintendent
Bell & Zoller Coal & Mining Co.
Zeigler, Ill.



Paul Weir

Few incentives are more conducive to a large amount of good work than friendly rivalry. It seems to be an almost universal desire to do as much or as well as the other fellow. Exact information from an unbiased source furnishes the basis for an accurate comparison between man and man, gang and gang or section and section of the mine. In a properly planned accounting system such data can be readily gathered from the information used in making up the payroll.

INFORMATION of much value to operating officials can be compiled from most payroll sheets and from the data used in making them up. There are, however, some systems of recording these initial data that lend themselves more readily than others to the compilation of this useful information. A description of the system in use at the two mines of the Bell & Zoller Coal & Mining Co., at Zeigler, Ill., and an example of the usefulness of the information which can be prepared, will better enable one to understand what is meant by the above statement.

The No. 1 mine of this company employs 1,350 men, of whom about 1,000 are on the underground day shift. The No. 2 Mine has 1,250 employees, 900 of whom are on the day shift underground. These mines are so situated that the payrolls for both can be easily handled from one central office. The No. 1 mine is three-quarters of a mile north of the office, which is in the center of the town, and the No. 2 operation is one and a quarter miles southwest of it.

All employees, both tonnage and day men, are classified, first, according to occupation and second, according to the location of their working places. A group of check numbers is set aside for each classification. The No. 1 mine check numbers run from 1 to 1999 and those for No. 2 mine from 2000 to 3999. At No. 1 twenty check numbers are allotted to each mining machine for loaders working after it. The check numbers on No. 1 machine run from 1 to 20, on No. 2 machine from 21 to 40, and so on. Of the 20 numbers assigned to each machine, probably four or five are vacant. These take care of the labor turnover during each pay period, thus making it unnecessary to issue the same number to different men during any particular period. Machine men are grouped together. A block of numbers is set aside for gang or consolidation work. Hand loaders where such are employed are also grouped together.

Day or shift men present a similar problem. Their classification, and consequently their check numbers, are arranged to correspond with the different accounts into which the cost of mining is divided. A group of numbers sufficiently large to embrace all employees on each class of work together with a few extras to take care of the labor turnover is set aside by the central office.

An employee is identified entirely by his check number. All such numbers are issued and changed only by the central office in accordance with a note from the mine manager. The employee calls for and receives his lamp by his check number, he draws his supplies by his number, he is given credit on the daily tonnage bulletin and on the time book by this same number. Even his pay check bears this number.

A DESCRIPTION of the sources of data for the payroll is essential inasmuch as it is used in compiling information that is not shown on the payroll itself. The daily tonnage bulletin is familiar to every mining man. By grouping loaders according to the machine which does their cutting, the machine's total is readily computed. The weighman adds up the tonnage of each loader and of each machine every day before going off shift. A time-keeper is stationed in the lamp house at each mine. He receives the time books from the various bosses every day, and enters

Mine No. 1 1/26 1927

Chief Pay Roll Clerk:

Please change Jos Smith Ck.No. 62

To Loading on No 6 machine

E.P.L. Mine Manager.

Mine Check Transfer Slip

each man's time in his own books after checking it against his lamp record, which shows the number of hours each underground employee had possession of his lamp. It has been found advantageous to keep this lamp record of tonnage workers as well as day workers. Many tonnage men fail to realize that their failure to work a full 8-hr. shift decreases the production of the mine.

THE advantages of this system of applying certain groups of numbers to definite classes of employees are many. Inasmuch as the mines are laid out so that each section has four or five mining machines, the daily tonnage bulletin and the payroll show at a glance the amount of coal being produced in any section. Within half an hour after the start of the day shift, the lamp-house man is able to report to the person in charge of transportation the number of loaders on each mining machine that are in the mine that day. This greatly facilitates the proper distribution of mine cars. The chief payroll clerk is also aided in making his distribution of labor charges. Checking of rates paid to various classes of labor is facilitated.

On first thought one is likely to get the idea that this system is complicated and unnecessary. The operating department of this company has found that it involves less clerical work, reduces errors and is much more satisfactory than the haphazard methods that are in common use. The officials feel that it is necessary in order to efficiently handle the records of so large a working force.

An example of the use to which the information so readily obtainable can be put is found in the following. Every mining man recognizes the fact that an increase in daily production without an increase in the working force means a lower cost per ton. Within the past two years, both mines of this company apparently had reached the maximum production possible with the existing haulage and hoisting equipment. The idea, therefore, of increasing the average quantity of coal hauled in each mine car received serious consideration as a means of increasing production and decreasing cost. Such a result was admitted by all to be desirable, but many questioned its practicability. A concerted effort, based primarily on figures compiled from the daily tonnage bulletin, accordingly was made.

Distribution of Check Numbers in No. 1 Mine

Machine loaders	1— 840
Hand loaders	841— 899
Machine men	900— 999
Shot firers	1,000—1,015
Timbermen	1,016—1,045
Tracklayers	1,046—1,080
Tracklayers' helpers	1,081—1,120
Wiremen	1,121—1,130
Examiners	1,131—1,142
Bratticemen	1,143—1,155
Electricians	1,156—1,170
Main shaft bottom	1,171—1,195
Switchers	1,196—1,202
Trappers	1,203—1,225
Motormen	1,226—1,260
Trip riders	1,261—1,305
Night shift men	1,306—1,350
Gang men	1,800—1,999

The average weight of coal per car was computed for each loader in the mine throughout a pay period. Next the average weight of coal per car for each machine group was figured. Then the average weight was calculated for entire sections. This information was furnished to the mine manager and his section bosses. The continued sending out of cars not fully loaded indicates either that some physical condition of the mine prohibits maximum loading or that the loader is unwilling to fill his car to capacity. If all the loaders in a certain machine group send out small cars there must be a low cross-bar somewhere on the haulage entry or a low piece of roof or a bad stretch of track that will not permit a fully loaded car to pass. If 15 loaders on a certain entry send out fully loaded cars and five others send out cars only partly loaded, the conclusion is either that these five men are unwilling to fully load their cars or that there is something wrong in their working places.

AFTER the investigation above cited all adverse physical conditions were immediately corrected in so far as it was possible to do so. Rivalry between different sections sprang up. Loaders vied with each other in turning out large cars. Much interest was shown in a semi-monthly bulletin that carried the names of the 25 loaders who were sending out the heaviest cars. The men became thoroughly sold on the idea that better filled cars meant a larger sum on their pay checks.

Within a short time the average height of cribbing or topping on the cars increased by 3 to 4 in., which on the large cars in use meant 600 to 800 lb. more coal per car. The approximate number of cars being handled each day at No. 1 mine is 2,000, and at No. 2 mine, 1,700.

IT might be argued that these results could have been obtained without resorting to detailed data. This undoubtedly could have been done, but not so easily nor so quickly. Until confronted with figures to the contrary, some of the section bosses firmly believed and stoutly maintained that the weights of the cars coming from their sections were above the average. This belief, no doubt, resulted from the fact that an increase or decrease of 1 or 2 in. in the height of cribbing on a car is hardly perceptible.

Data prepared in the same manner have been useful in isolating those loaders who invariably use too much powder. Such a practice produces an excessive percentage of fine coal in the mine-run output. Comparisons are easily made also between sections as to the efficiency of the haulage, the cost of trackwork and the cost of timbering.

COAL PROCESSING—

Its Future at Low Temperatures

By Dr. Horace C. Porter
Consulting Chemical Engineer
Philadelphia, Pa.

Low-temperature treatment of coal produces a smokeless fuel having many advantages not found in other solid fuels. A greater yield of coke or char, more valuable oils, richer gas, satisfactory utilization of lignites and of the poorer grades of coal, and other virtues as yet not clearly defined—these are a few of the other advantages of low-temperature distillation.

THE PUBLIC is being educated rapidly, in this day and generation, to want for its fuel something better, something cleaner, something more rationally and systematically organized than is raw coal. The oil burner is but a stepping stone to the wider use of gas and other processed fuels of bituminous coal. It is an advance and a good one, but will have to yield, in time, in the wide field of heating and power to other advances that bring into use fuels both abundant and efficient.

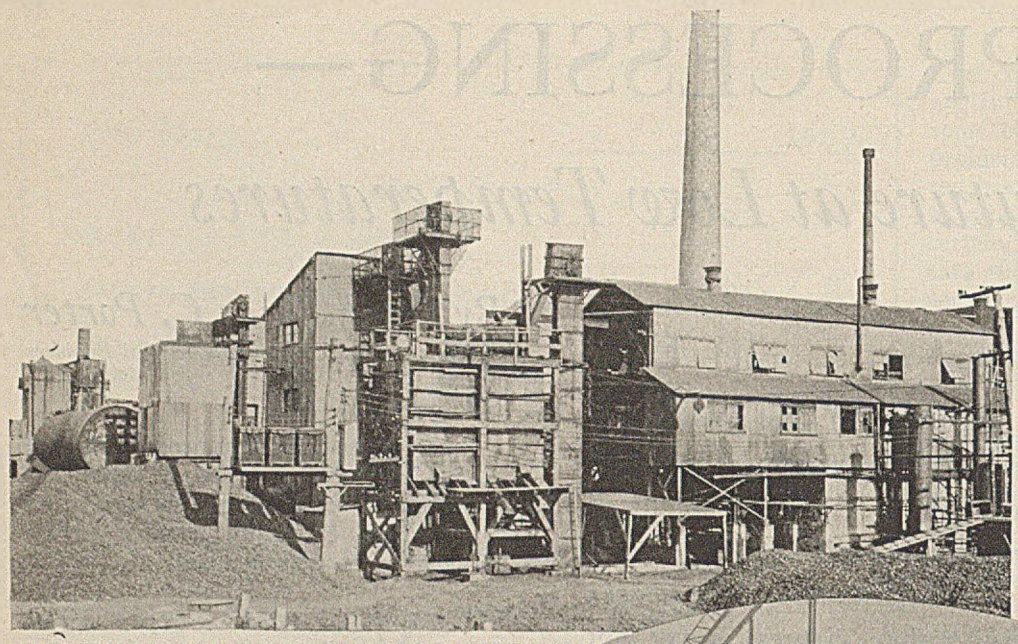
However, coal processing will not progress very far, it is certain, unless it is found to pay. A limited amount of such treatment, in the form of coke and gas making, already is paying well because the public finds the products, for certain purposes, preferable to raw coal and therefore readily pays the price. As other processing methods make possible costs and products that will convince the public of their desirability when compared with raw coal, then will those processes also become established and grow. It is my opinion that this growth in coal processing is bound to come, by one method or another, or by mergings or combinations of methods. It is likely to be rapid in the next 25 years.

BY "COAL PROCESSING" is meant producing other commodities, generally other fuels, from coal by some process that essentially alters the character of the material. Whether it be metallurgical coke, city gas, dyestuffs, motor fuel, or methanol, an essentially different product is made. In fact, many such products, that are in demand by industry and the public and therefore command a satisfactory price, are now being successfully produced and marketed. When other and newer modified fuels, and perhaps chemical products, arise from new processes of coal treatment, wonderful opportunities await them if they can be made by simple methods and, thus, at reasonable costs.

Now, where does the coal operator stand—or where should he stand—in the light of this prospect? The new methods are likely to require less coal per unit of energy usefully applied than is now used. On first thought this does not, commercially speaking, appeal to the coal producer. But when he considers other fields and remembers that the consumption of electric current has grown by leaps and bounds, notwithstanding a constant and rapid improvement in the efficiency of its use; when he recalls that in this great age of iron, steel, cement, manufactured rubber goods and gasoline, the use of these commodities has multiplied tremendously; the coal producer, when he looks at his own future in this light, is assuredly more and more convinced that, for the best interests of his business, efficiency in the use of coal must be fostered and advanced by all possible methods. This is true even though continuous progress has been made in obtaining increased returns per unit of raw material.

"MORE POWER to you" applies well to coal, the mainstay for many generations to come of the power resources of industry. But it may be transposed—"more coal for power"—and be equally applicable. For, as wider and wider expansion of the use of mechanical power to do the world's work continues, it is likely that coal and the lignites will for a long time constitute the principal source of the energy required.

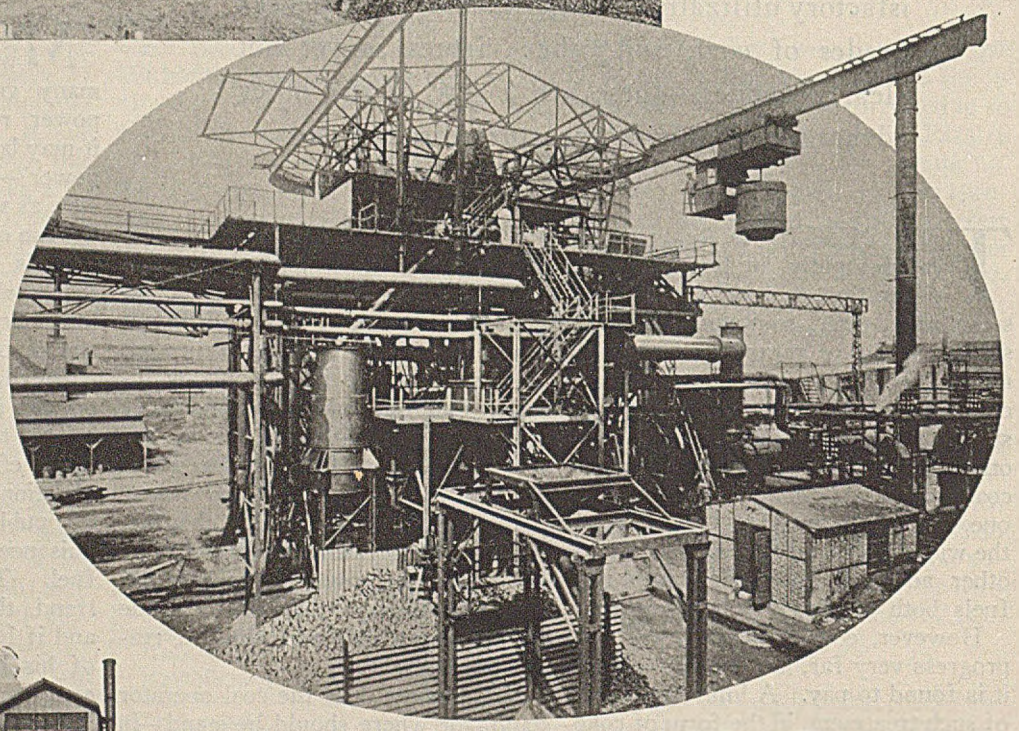
Inevitably, however, as time goes on, the user of coal will increase his efforts to reduce his power costs by more efficient methods of fuel application and to meet the demands of public opinion for minimizing nuisances created by the burning of fuel. The coal operator sees this trend, this handwriting on the wall, and if he is alive to the best interests of his business, he is promoting by every means at his command the development of smoke-abating fuels and devices, of carbonizing processes that can be widely and generally applied to raw coal, of all processes that will economically convert coal into forms of fuel that can be more efficiently and more acceptably applied. With these ends in view, there are two lines of endeavor now being followed in this country. One of them, gas making, has had a long and honorable career and in recent years has made rapid progress. It can make immensely greater forward strides when it finds a means of making available to the average fuel consumer its very efficient and convenient product at a price but little above that of the equivalent of coal—say, for some communities, a gas with a heating value of 400 B.t.u. per cubic foot at 35 to 40c. per thousand. When this

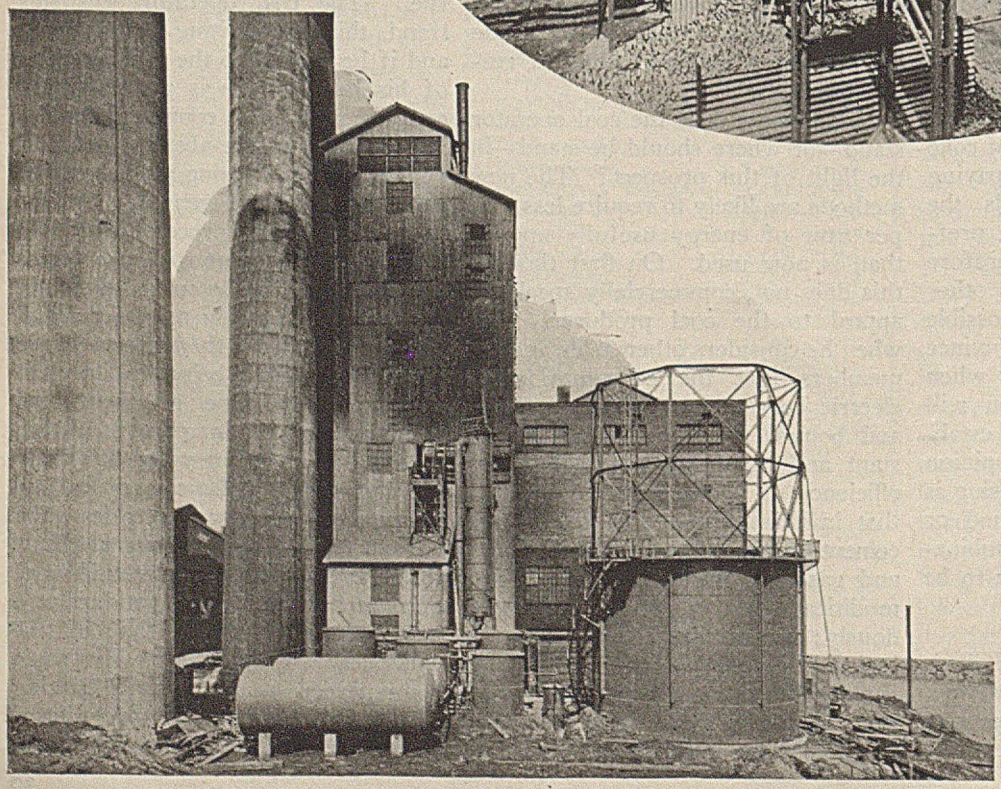


Carbonizes at Low Temperatures

In operation at Fairmont, W. Va., since August, 1924, this plant employs McIntire's process. It has a capacity of 50 tons per day—a full commercial plant would consist of several retorts and carbonizers of the types used here.

Permanence Stamps These Coal-Processing Plants





A Low-Temperature Operation in Europe

This K S G plant, located near the Stinnes mines at Essen, Germany, has a capacity of 80 to 100 tons per day and has been in commercial operation for two years.

Processes Finely Pulverized Coal

At Milwaukee, Wisconsin, is located this commercial McEwen-Runge low-temperature unit having a rated capacity of 210 tons and an estimated throughput of 380 tons daily.

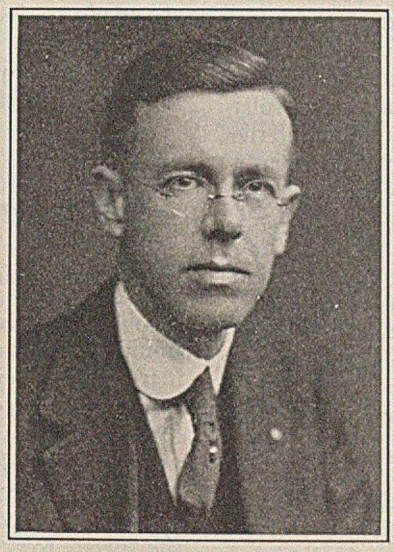
is accomplished, the incidental and intangible gains resulting from the use of gas will place it on a directly competitive basis with raw coal. If it can solve the variable load problems that arise from such expansion, the great future of the gas industry is assured.

THE OTHER line of endeavor is coal carbonization—not for gas making, primarily, but for the preparation of improved forms of solid fuel for general use. This endeavor, looking toward modification and beneficiation of raw coal, has not as yet met with much commercial success in fields other than the comparatively limited one of metallurgical fuel. So-called "domestic coke" made in high-temperature ovens for the general trade has not, at the present time, won for itself a large measure of acceptance at the prices that its producers feel they must ask. Such coke has found a certain market as a substitute for anthracite at prices somewhat below those usually paid for the best grades of that product. However, as a general fuel to substitute largely for bituminous coal in any considerable number of its fields of application, the virtues of coke appear not to have been of strong appeal—at least, not strong enough to attract widely the price required.

This raises at once the question: What can be done to make a carbonized fuel more attractive to the fuel consumer — both industrial and domestic—and to lower its price to a figure commensurate with its attractiveness? The coke producer can do much by avoidfng or discouraging efforts to sell hard metallurgical coke, unsized and poorly sales-serviced, to the domestic and general fuel market. He can reduce costs, and therefore selling prices, by employing modern high-capacity ovens in large installations of the super-plant central-station type, distributing gas over large areas, and by devising methods of utilizing lower grade and cheaper raw material than is present practice.

There also now enters into the problem the question of whether newer and somewhat different systems of coal carbonization may not perhaps be able a little better to meet the consumers' wishes as to fuel quality and lower costs. Such low-temperature processes or combination processes have been struggling for almost a generation to establish themselves commercially and, although their progress has been slow, encouragement lies in the fact that capital from sources prominent in the industrial world continues to be advanced in increased amounts to foster experimentation and development.

Fuel, carbonized at low temperatures, is being found to have, to a relatively high degree, a quality of combustibility which may even need to be restrained under some conditions. But, when regulated, this will mean increased capacity and efficiency, joined together in a measure not possible with other solid fuels. It may also mean that when and if certain disadvantages (such as bulkiness and friability of the fuel) that now exist are lessened or overcome, the consumer will find virtues in this fuel that will not only enable him to afford it but will also serve to create an active demand for the product.



Dr. Horace C. Porter

As engineering development progresses, production costs can, in all probability, be reduced. Simplification of design and operation is likely to bring this to pass. To counterbalance the costly item of low capacity inherent in low-temperature distillation, plant and labor costs must be kept unusually low. Whether this can be done remains still to be demonstrated.

THE SYSTEM of low-temperature distillation has an appeal in one sense more rational than high-temperature carbonization, namely, that it avoids much of the degradation of valuable gases and oils in the coal to carbon, pitch, anthracene and naphthalene, which have inferior values. The system which obtains from coal, in the community where used, the maximum margin of aggregate values (commercially rated) over its cost of operation is the one that will find the greatest success.

As compared with high-temperature carbonization, low-temperature distillation cannot make up in tar returns for its loss in tar and ammonia. But if the coke obtained from the latter process proves to be not only higher in net yield but of a quality to command a higher price, then the account may be squared. As previously indicated, to maintain a favorable relationship, plant and operating costs need also to be lower.

Into this comparison there also enters a question of the relative costs of raw material. A process which will cheaply make, from low-priced slacks, Midwest and Western coals and lignites, an acceptable, high-grade, smokeless fuel by raising materially the use-efficiency of such coals through elimination of inerts in their composition will be successful. Such processing will eventuate at some time in the future when the coal regions of the West need to be opened up more extensively and more economically.

A BOILER FUEL is, of course, improved if inerts like water and carbon dioxide are removed from its composition, and in many of the higher-oxygen coals of the West, such beneficiation may amount to 15 to 25 per cent. Low-temperature carbonization may perhaps be found to accomplish this better and more economically than high-temperature processes.

Power plant interests are watching these developments. It is only a question of whether the gains that can be obtained from low-temperature distillation will provide a sufficient margin over costs and, on the supposition that the latter will continue to be reduced, it seems there is a hope of success for the pre-carbonization advocates. The rich low-temperature gas can be sold to gas works at 4 cents a "therm" (100,000 B.t.u.) for enrichment purposes and the oils can be disposed of for at least fuel-oil prices. On this basis, a ton of coal purchased at $4 should yield about $2.75 in byproducts and about $2.50 to $2.75 in value of processed solid fuel. This is a total of, say, $5.25 to $5.50 per ton of coal processed, which will give the operator $1.25 to $1.50 per ton to cover costs and profits—there is also the possibility of increasing the capacity and efficiency of power plants.

COAL AGE

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JOHN M. CARMODY, *Editor*

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Forecasts Help Even if Confined to Fixed Expense

In spite of the fact that budgets or forecasts are made and used as guides by thousands of business men, including some coal men, many coal operators still feel that such work is impracticable. They will be encouraged, therefore, to analyze carefully the address of George E. Frazer before the National Coal Association in Chicago last month. Out of a long and intimate experience with the financial and operating problems of many industries, including coal mining, he pointed out clearly that it is not only possible but necessary to success that executives set up such forecasts based on data furnished by their accounting departments. Fixed charges, many of which continue even when mines are idle, are known. Reduce them to a day-by-day cost. "Many a capital expenditure has been made that never would have been made if day-by-day costs had been set up. Many a mechanical device would be immediately installed in mining operations today if a similar accurate consideration was given by experienced men in the industry on the basis of day-by-day costs of doing business."

The possibilities for economies through such a procedure certainly justify careful study on the part of responsible executives.

Original Ideas Intelligently Applied Have Power

A successful business man remarked a few days ago that ideas are among the most important forces in life. A single idea frequently changes the course of a business or a system of operation. Every executive knows they come from strange places. Sometimes a superintendent, sometimes a foreman or workman advances a new thought indicating that he has gone more deeply into a particular problem than the average executive usually goes. These occasions are all too infrequent. This is probably due to the fact that men are not sufficiently encouraged to think for themselves. They follow routine.

In order to stimulate original thinking on the part of operating officials on the job, and about their immediate job, *Coal Age* introduces into this issue a new department—"The Bosses Talk It Over." Foremen and superintendents encounter every day scores of problems that are like those met by men in similar positions throughout their field and other fields. These form the basis for this department. Problems and discussion will be printed regularly. Results so far as any individual operation is concerned will depend on how carefully these problems are analyzed and how thoroughly they are discussed locally among the men responsible for results.

The chief executive may find here a fertile field in which to discover among his own men new ideas that will contribute to the solution of his own and their problems. Here again encouragement and stimulation play their part. Men can think. They will take pride in helping to solve problems if they are made to feel their ideas will be given serious consideration. Why not get practical results by making these questions subjects for discussion at foremen's meetings?

Mechanization Requires Increased Technical Training

With the advent of the mechanical age in coal mining, the success of the industry is becoming increasingly dependent upon the training of the engineers employed. With machine cutting and loading, improved systems of underground transportation and better processes of preparation, all of which involve new and complicated problems of maintenance, power distribution and management, the need for men thoroughly trained in many phases of engineering assumes greater importance and significance. Consequently, neither the purely theoretical nor the wholly practical man can satisfactorily and competently meet the problems presented by the new order of things in mining.

The engineering colleges and universities, particularly of the United States, have recognized these facts for some years. They are eager to co-operate with the operators and are desirous of furnishing them with men who are not only thoroughly trained but also imbued with the importance of the work they are called upon to do. Such men not only justify their training but greatly aid the industry they serve.

How are the desired results being accomplished? By incorporating, in the regular courses, practical shop and field experience in addition to laboratory work and visits to mining operations. In many instances, this training is further augmented by compulsory summer work—either in practical operations or in a continuation of laboratory or shop courses. For the practical man who has not had a college education, our engineering institutions have recently developed night classes and extension training in mining centers under the personal supervision of one or more members of the college faculty. In addition, the colleges and universities have adopted, and greatly extended the scope of, the correspondence course as a means of fur-

nishing the man on the job with the theoretical knowledge necessary to a complete understanding of his work. The value of these methods, both to the men who enroll for them and to the operators, is already evident and will make itself even more apparent in the future.

What can the producers of coal do to further and aid this valuable, if not practically indispensable, work of our scientific schools? Many methods suggest themselves but probably the most important are: Establish, endow and maintain research laboratories at those institutions properly equipped to undertake such work; co-operate to the fullest extent by furnishing summer employment for mining students and by permitting them to visit the actual operations during the regular term; and encourage and aid their "practical" men, now working in the mines, to enroll for the various forms of extension training.

Are the producers of coal fully aware of the additional service they can render to themselves and their industry by personally visiting mining classes and talking to these groups in the practical language of the industry? This includes summer extension classes as well as regular college courses. Young men are always keen to know from men who have already made good what lies ahead in the way of responsibility on the job.

Use of Playgrounds Develops Citizens and Conserves Health

At first blush it may seem a far cry from the production of coal to the building and management of playgrounds, yet many high coal-mine officials are today making it their business to see that suitable recreational facilities are provided for their employees. Children, whether they be young or old, are certain to play somewhere. Is it not to the advantage of all concerned to have a suitable and safe place set apart for play exclusively? Years ago the Kingston Coal Co. saw the advantages of having a safe place available wherein the children of its employees might play. Its first playground was accordingly constructed in the Borough of Edwardsville, Pa., just across the street from one of its largest collieries. This playground, with the apparatus originally installed, is still in use and still giving good service. Several other similar places have since been constructed by this company.

But it is not enough for the coal company to provide space, fitted with the necessary equipment, and then sit back and say, "Now let's see if they use it." In many cases failure has resulted from this attitude. The play instinct is indeed strong, but greatest success is attained only when playgrounds are supervised by or through some local organization. Respect for property must be taught. The care of both grounds and equipment must be part of the training given. Arrangements should also be made to apportion the time so that everybody, little boys, big boys, little girls, big girls and adults, can get their proper share of the use of the playgrounds.

This can be best accomplished through directed play. Recreation directors are, therefore, essential. They are specialists in their line and many young men and women throughout the country devote at least their summer vacations to directing playgrounds. But in reality they do vastly more: they tie recreation up with community life in such a way as to achieve maximum use of the playgrounds, maximum interest on the part of adults, and under their direction children not only play but learn useful arts that aid them in later life. The foundations for sound citizenship may well be laid there. If school boards, community organizations and operating companies pool the expense of such an arrangement, it will be found much more effective than merely providing a suitable space, some equipment and saying, "Let's see."

Benefits accruing from playgrounds are indirect and consequently difficult of accurate measurement. Even so, their influence may be none the less potent and far reaching. If the experience of the coal company above named had not been satisfactory, it is hardly to be supposed that it would have kept on building playgrounds.

People of today realize the advantages of a life spent largely in the open, particularly recreation in the air and sunshine. As a class, also, miners enjoy to the utmost outdoor sports and games. The Borough of Plymouth, near Wilkes-Barre, has a population of about 18,000. A year or so ago it acquired an old mule pasture lying nearly halfway between its high school and one of its grade schools. It cost $8,000 properly to grade this piece of ground and several thousand dollars more to equip it as a municipal playground and athletic field. Last year, however, the gate receipts to the various ball games and other athletic events held there totaled about $18,000, or roughly $1 for every man, woman and child in the borough!

In many localities the public playground and the public school are located side by side and together build strong, well-balanced Americanism. While a *Coal Age* editor was taking some of the photographs shown on pages 12 and 13 the sound of lusty young voices, raised in song, drifted out from the windows of a near-by school building:

"And the rockets' red glare,
The bombs bursting in air,
Gave proof, through the night,
That our flag was still there."

Truly, school and playground work together. Each educates youth in a way that the other cannot even attempt. The one builds mental acumen and high ideals; the other builds strong, healthy bodies and fosters a sense of fair play and good sportsmanship. In the great struggle of life both of these qualities are highly important.

The BOSSES *Talk it Over*

Too Many Bosses?

THINGS hadn't been going right that morning in the workings of Old No. 3. As Mac traveled at a dog trot toward his shanty on the Second Main, returning from the dip section, he turned over in his mind the mess he was in. A main-haul motor with its second load trip had stalled on the hill—probably a burned-out armature or something! There could be no coal on the bottom, for the only other big motor was not due there for another half hour. What would the super say?

In his abstraction Mac would have passed by his own shanty had not the sound of Shorty's voice within brought him suddenly back to earth. Mac believed that he had a bone to pick with the little electrician and was all on edge as he burst through the door.

"Hell's bells, Shorty, where have you and your gang been all morning?"

"I'm the goat, Mac, what's all the fuss now?"

"When I need you, Shorty, you're nowhere around. Where in h--- have you been? Ever since 10:15 Old Ironsides has been stuck on the hill, deader'n our abandoned workings! Another burned-out armature, I guess. Here it's nearly noon and no action! The company wants more coal and I promised 2,500 today. At the rate we're going we'll be lucky if we hit 1,800. We must get feeders strung to 10 East or we might as well look for another job!"

"Right you are, Mac, but what can I do? I'm sort of betwixt the Devil and the deep sea —and can't for the life of me figure out which is which. For instance, this morning the super laid for me at the lamp house and told me that the wiring on the West Main had to be fixed right away. That's where we've been this morning. You and the super are eternally shooting me with cross-orders, and when you two let up the outside foreman takes a hand. All the while the Old Gent looks wise and cusses the whole bunch of us, yet he won't settle the argument. So there you are!"

How would YOU settle this "argument"?
Should the mine electrician or master mechanic take orders from mine foremen or from the superintendent only?
What should be the division of authority, if any?
What is the responsibility of the general management in this matter?

All foremen and superintendents are urged to discuss these questions
Acceptable letters will be paid for

Do You Agree With Shorty or Mac?

IF THE coal industry is to adopt and follow more closely than ever before the methods that have made American mass production possible, we are inevitably forced to the conclusion that the foreman and the boss must play rôles of ever increasing importance. These officials occupy positions in any industrial organization that are analogous to those held by the sergeants and corporals of military units. They are really key men upon whose ability, zeal and training success or failure often depends.

For years many progressive coal companies have realized the importance of the foreman and boss. They have diligently sought and heeded their point of view. Others have carried this even a step further and have established training courses for these men—for skill in mining is only one of the attributes with which they must be endowed if they are to be of greatest value to themselves and to their employers.

Importance of Foreman and Boss

SO important are the foreman and boss recognized to be that many of the mining colleges have established short courses to aid them to a better understanding of their many and various duties. Beyond question these short courses and summer schools are doing much to help these men to help themselves and thus indirectly to benefit the industry. Round-table discussion is probably one of the most fertile fields for improvement yet discovered in the way of foreman training and education. Here every man has a chance to air his own views and to gain the views of his fellows. This is always stimulating and helpful.

The Case Method

RECOGNIZING the need for material that would be available for certain kinds of boss training and believing that a real contribution might be made through their efforts, the editors of *Coal Age* have been studying this subject for some time.

Several different methods of treatment have been considered. Final decision has fallen to what is generally known as the "case method" of presenting the chosen topic.

The editors will welcome constructive criticism of both the subject matter and its method of treatment, as it is their desire to present material of maximum usefulness, particularly in conferences of bosses.

The case method was chosen because it has the advantage of being simple, clear and definite. Foremen and superintendents will find their own problems stated and reflected. The first case appears on the opposite page, and depicts a condition that is all too common at many mines.

The NEXT *Topic*

Developing Ahead of Immediate Needs

How do you plan development ahead?
Should coal be taken when, as, and just because, it is cheap?
Should a reserve of development be kept ahead against the time of extra demand?

Each case will be followed by a series of specific questions that should serve to start the ball of discussion rolling. In addition a regular departmental box will carry the general subject or topic for future discussion together with a few more or less general questions bearing upon it.

Discussion Invited

IT IS hoped that these various questions will lead to the receipt by the editor of written discussion by foremen and superintendents that can be published in later issues. By the foregoing method this department of the paper can be made and kept a clearing house, an open forum, for live opinions on the subjects discussed.

Space rates will be paid for all letters accepted and published. In inaugurating "The Bosses Talk It Over" page *Coal Age* has neither the intention or desire to compete in any way with any of the established means or methods provided for foreman training. Hence no logical arrangement or continuity of subjects will be attempted. It will rather be the purpose to propound topics that can be taken up at regular conferences, thereby supplementing the material provided by the regular company or commercial educational courses.

Live Topics from Different Viewpoints

MAC and Shorty are real men and work in a real mine, although they do not go by those names either underground or on the pay-roll. Their viewpoints on many topics are frequently widely different, yet they are both open-minded when discussing any particular problem with which they are concerned. Perhaps you would like to have their views on some specific subject. All that it will be necessary to do in order to obtain them is to send the *Coal Age* editor a letter. He will then ask Mac and Shorty what they think about the matter.

Send Us Your Ideas

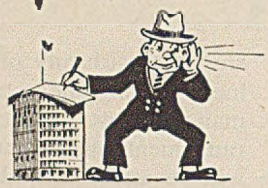
IN future issues this page will be devoted to printing readers' views on questions put forward in previous issues. More pages will be used if necessary.

As previously stated, all letters that are published will be paid for at regular space rates. It is hoped that you will be moved to express your opinion on at least some of the subjects discussed. In so doing, however, please state your ideas or experience briefly and to the point, as space is limited.

Names will be published unless writer requests use of special pen name.

Some men hesitate to put their thoughts on paper because they fear that they cannot express themselves in correct, polished English. *Coal Age* has a little leaflet containing a few suggestions on writing for publication, a copy of which may be had for the asking. In any case if you have an idea do not worry about the language in which it is clothed. Leave that to the editor—it is what he is paid for.

WORD *from the* FIELD



Wage negotiations between the union operators and miners of Illinois were suddenly broken off June 29, when the conference in Chicago adjourned *sine die*. The parley was resumed Wednesday morning after a week's recess. The operators refused flatly to continue negotiations on the basis of the Jacksonville agreement. Harry Fishwick, president of the Illinois union, said that the deliberations would have to be predicated on the old pact in view of the policy committee report of the international union at the annual convention in Indianapolis last January.

* * *

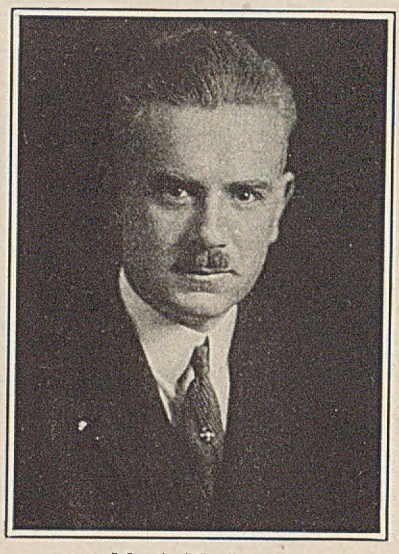
UNION OPERATORS AND MINERS of the central Pennsylvania field, failing to reach an agreement after negotiations lasting three days at the Bellevue-Stratford Hotel, Philadelphia, adjourned sine die June 23. The operators offered a compromise plan embodying a reduction of 24c. per ton on pick and machine mining, a cut of 15 per cent on yardage and deadwork and of $1.50 per day on day labor and 82c. per day on boys' wages. This was rejected by the miners, who made a counter proposal that the present agreement be renewed for two years, with the abolition of car pushing, a uniform deadwork and yardage scale and elimination of the penalty clause. The operators refused to accept this proposal. Charles O'Neill, president of the Association of Bituminous Coal Operators of Central Pennsylvania, announced that the mines controlled by members of the association would close indefinitely June 30, throwing into idleness about fifteen thousand men.

* * *

THE BRITISH TRADES UNION ACT passed the House of Commons last week by a vote of 354 to 139. Premier Baldwin's success in putting the measure through is attributed to drastic amendments, so that the right-wing Liberals led by Sir John Simon finally accepted it. The chief aims avowed by the Ministry in introducing the bill were: (1) To clarify the statutes upon trade unions; (2) to make political general strikes illegal; (3) to insure that no contribution to a political fund should be compulsory, and (4) to emphasize the fact that civil servants owe the state an undivided allegiance.

* * *

ROBERT LILLY, state mine inspector for the sixteenth district of West Virginia, has resigned to accept a position as safety engineer with the C. C. B. Smokeless Coal Co., effective July 1. Mr. Lilly, who was with the U. S. Bureau of Mines for three years, has had extensive experience in mine-rescue work in a number of coal fields. He was the first director of mine-rescue stations in West Virginia when J. W. Heatherman was chief of the State Department of Mines.



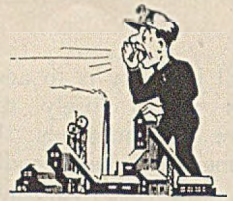
Mark M. Jones

Mark M. Jones has given attention to the problems and needs of several of the larger companies in the bituminous coal industry over a period of years. While he has been actively related to the management of industries generally for more than twenty years, he devoted his entire time over a five-year period and until recently to financial and organization problems pertaining to numerous concerns on behalf of the John D. Rockefeller interests. He recently established an office in New York as management counsel. Mr. Jones is the author of the article entitled "A Proposal for Stabilizing the Bituminous Industry," appearing on pages 24 to 28 of this issue.

THE WORKING FORCE of the Cascade Coal & Coke Co. operation at Sykesville, Pa., has been cut down to about a dozen men because of the delay in reaching a wage settlement between the union miners and operators of central Pennsylvania. In former years the mine employed as many as 500 men.

* * *

L. H. KELLY, vice-president in charge of sales, Pittsburgh Terminal Coal Corporation, Pittsburgh, Pa., will join the forces of the Continental Coal Co., Pittsburgh and Fairmont, W. Va., July 1. He will be in charge of sales. Mr. Kelly has been prominent in the Pittsburgh coal trade for a number of years.



JOHN SUTPHIN JONES, chairman of the board of directors of the Sunday Creek Coal Co., Columbus, Ohio, and well known in the operating and distributing ends of the industry in Ohio and Illinois, died at a hospital in Columbus on June 22. He was 78 years old and had had a varied career in railroading as well as in the coal business. He had been ill a month of chronic nephritis.

* * *

WALTER H. GLASGOW, who for fifteen years was assistant superintendent of the H. C. Frick Coke Co., resident at Scottdale, Pa., was appointed Secretary of Mines of Pennsylvania by Governor Fisher, on June 27. John Rees James of Scranton and John Ira Thomas of Johnstown were appointed deputy secretaries at the same time. Mr. James will be in charge of the anthracite districts of the state and Mr. Thomas will supervise the bituminous fields. Mr. Glasgow succeeds Joseph J. Walsh of Wilkes-Barre, who came into office under former Governor Pinchot. Mr. Walsh is now an anthracite mine inspector.

* * *

ELMER A. HOLBROOK, dean of the School of Mines and Metallurgy, Pennsylvania State College since 1922, has been chosen dean of the School of Engineering and Mines at the University of Pittsburgh, effective Sept. 1. He succeeds Frederick L. Bishop, who will devote himself to research and teaching as professor of physics at the university. He also will act as consulting engineer to several Pittsburgh firms.

* * *

CLASS 1 RAILROADS of the United States consumed 7,693,102 net tons of coal for fuel in locomotives in freight and passenger train service in April, according to a report by the Interstate Commerce Commission. This compares with 8,062,573 tons in the corresponding month of last year. The average cost per ton of this coal was: Eastern district, $2.76; Southern district, $2.16; Western district, $2.92; United States, $2.66. Compared with the figures for April, 1926, there was an increase of 8c. in the Western district; decrease of 5c. in the Southern district and 2c. in the Western district, and an increase of 2c. for the entire country.

* * *

THE PENNSYLVANIA COAL & COKE CORPORATION and subsidiaries, operating in central Pennsylvania, report for May a deficit of $56,045 after ordinary taxes,

depreciation and depletion but before federal taxes, against a deficit of $63,297 in the same month a year ago. For the first five months of this year there was a profit of $128,271 after charges but before taxes, against a deficit of $140,468 in the corresponding period of 1926.

* * *

AN AGREEMENT between the City of Norfolk, Va., and the Chesapeake & Ohio Ry. for a lease of the Virginian Ry. to the C. & O. seemed to be nearer, late last week. The city's municipal terminals and grain elevator are used by the Virginian and the interest charges on a port bond issue of $350,000 covering these properties affect the city's finances and tax rates. When W. J. Harahan, president of the Chesapeake & Ohio, testified recently before the Interstate Commerce Commission that his road had begun negotiations for control of the Virginian there were many protests from residents of Norfolk. Reports last week indicated, however, that the opposition had been overcome and that officials of the city were ready to negotiate with the C. & O.

* * *

DONK BROS. COAL & COKE CO., St. Louis, Mo., which has a mine at Maryville, Ill., having a capacity of 6,000 tons of coal per day, is utilizing some of the idle time caused by the suspension at union operations in a study of the various phases of mining. Thomas Chester, consulting engineer, Pittsburgh, Pa., lectured on mine ventilation at Maryville in the afternoon of June 20 and in the St. Louis office the same evening. R. Z. Virgin, Wheeling, W. Va., is conducting classes in other coal-mining subjects for the company.

* * *

ONE HUNDRED THOUSAND DOLLARS will be spent by the Peabody Coal Co. within the next few months on improvements at its four mines in the central Illinois field.

* * *

REMOVAL OF TRADE BARRIERS loomed as the dominant topic at the fourth meeting of the International Chamber of Commerce, which opened June 28 at Stockholm, Sweden. The Chamber proposes to take up the conclusions of the recent International Economic Conference at Geneva, Switzerland. It is expected that these will be approved and that the delegates, on their return home, will impress their responsible ministers with the need of legislative action to remove economic barriers. A large delegation headed by Owen D. Young represents America.

* * *

GOVERNOR W. J. FIELDS of Kentucky last week announced the appointment of J. T. O'Neal as Mayor of Louisville and his brother, Emmet O'Neal, as Sheriff of Jefferson County. Both claimed that they were rightfully elected to these offices in 1925, but were illegally kept out of office. The election was thrown out by the Court of Appeals. The O'Neal brothers, who are connected with the Emmet O'Neal Coal Co., and various other interests, were seated on June 27.

* * *

THE SUPREME COURT OF PENNSYLVANIA, in a decision by Justice Frazier, on June 25, upheld the action of the Court of Common Pleas of Columbia County in fixing its own valuation for taxation purposes on coal lands belonging to the Philadelphia & Reading Coal & Iron Co. in Conyngham Township. The company's witnesses in the lower court estimated the value of the land in question at from $51,900 to $65,900, while the county fixed it at $760,000 to $806,575. The trial judge placed the valuation at $456,315. Columbia County appealed, but the decree was upheld. This decision ends a case that has been in the courts for five years—since the triennial assessment that brought great increases in coal-land valuations. The opinion is sure to have wide effect as a number of other companies affected by the increase have appealed.

* * *

ANNOUNCEMENT WAS MADE last week by the Pittsburgh Coal Co. that 78,308 shares of common stock had been sold at a meeting of the board of directors last December. This was taken in some quarters to indicate that the battle for control of the company had ended in a victory for those now in power. The stock was sold "to a group of men long associated with the company and fully in accord with its present policy of operation," said a statement given out by C. E. Lesher, executive vice-president. "We have every reason to believe this stock was purchased for investment and will not be placed on the market for sale," the statement read.

* * *

L. W. ROBINSON, JR., assistant to the president, Rochester & Pittsburgh Coal & Iron Co., Indiana, Pa., has been elected a trustee of the Adrian Hospital Association, Indiana, Pa. He succeeds the late Dr. Walter S. Blaisdell, former coal operator, who died several weeks ago.

* * *

THE U. S. INTERIOR DEPARTMENT will open to entry on Sept. 21, through the Salt Lake City Land Office 23,367 acres of land in Grand County, Utah, in which numerous seams of coal, some 10 ft. thick, are exposed on the sides of many of the canyons. A few seams are exposed in the mountains along several of the canyons in another tract of 23,169 acres in the same county which will be thrown open at the same time.

* * *

THE LEHIGH COAL & NAVIGATION CO. has arranged to acquire outright and operate the anthracite properties of the Alliance Coal Mining Co., in Schuylkill County, Pennsylvania, and the Cranberry Creek Coal Co., in Luzerne County. These companies, which were heretofore controlled by the larger company through stock ownership, will be under the new status July 1. This action was taken, it was announced, with a view to greater convenience, simplification and economy in operation.

* * *

ACCIDENTS IN THE COAL-MINING INDUSTRY of the United States, according to the U. S. Bureau of Mines, caused the death of 178 men in May. Of this number, 127 deaths occurred in bituminous mines and 51 in anthracite operations. The death rate per million tons of coal mined during the month was 4.10, based on an output of 43,395,000 tons, as against 3.80 for the corresponding month of last year, based on a production of 47,113,000 tons.

* * *

A MOVEMENT STARTED by Emmett Searles, president of the Nelsonville (Ohio) sub-district of the miners' union, to bolt from the United Mine Workers and to organize a local union to be known as the Hocking Valley Miners' Union, seems to have lost momentum. A meeting scheduled for June 21, when the new union was to be formed, was attended by only a few persons and no action was taken. Equally unfruitful of fulfilment was the prediction that five mines would reopen under a modified scale some time last week. There was renewed violence on June 22 at Adena, however, when four automobile loads of miners engaged in a battle in which stones and other missiles were hurled, against about 200 men and women union sympathizers. The men were on their way to the mine of the Pittsburgh Coal Co., which was being put in shape to open on a non-union basis.

* * *

THE DEPARTMENT OF COMMERCE is taking steps to make a countrywide survey of commercial stocks of coal in the hands of consumers as of July 1, it was stated orally at the department last week. The figures probably will be made public about the middle of August.

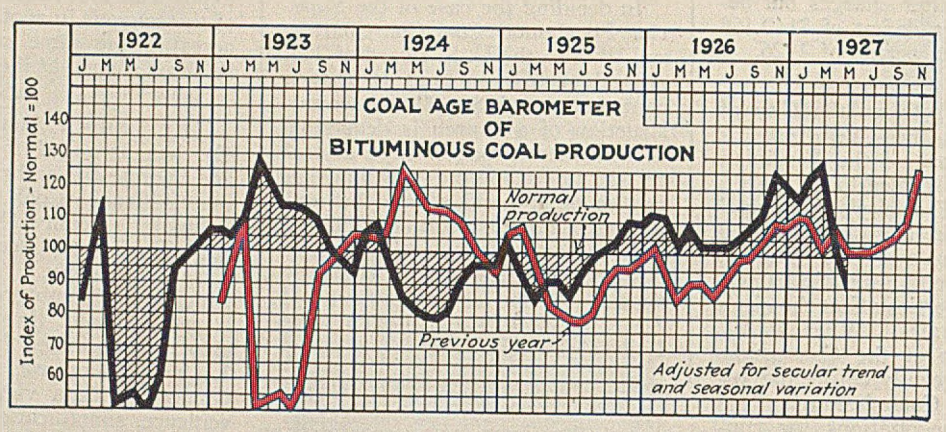
* * *

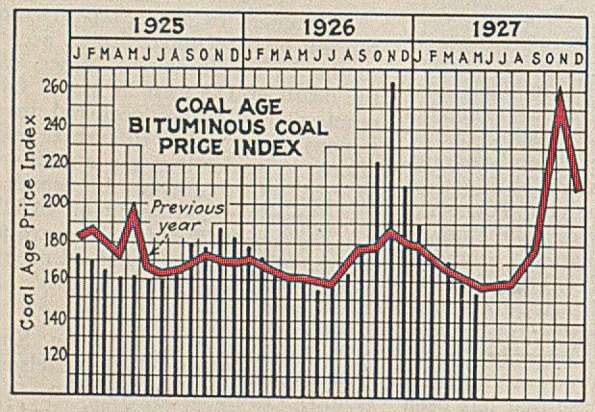
A NEW WASHERY, tipple and coal bins are being erected by the Alabama By-Products Corporation at the Barney mine, Cordova, Ala. The bins will be so located that coal can be loaded either into railroad cars or river barges. This property was purchased from the Barney Coal Co. last year.

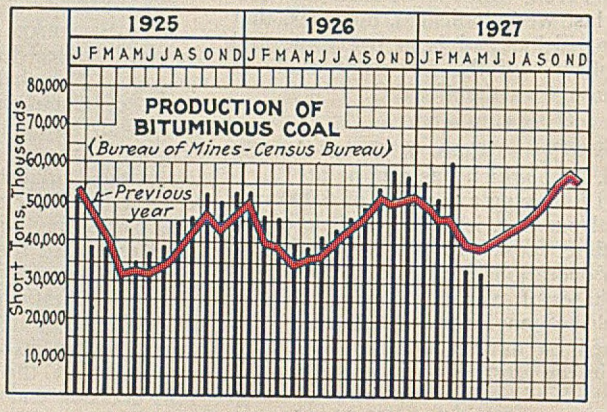
Contribution to Church A Business Expense

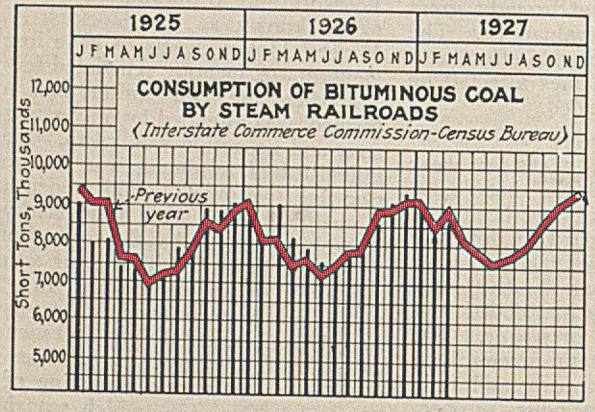
In deciding the case of the Superior Pocahontas Coal Co., Charleston, W. Va., the U. S. Board of Tax Appeals ruled on June 16 that a contribution of $1,000 for reconstruction of a church is deductible as a business expense. The cost of certain items of mining equipment, on the other hand, should be capitalized, said the decision, and not deducted as ordinary and necessary business expenses. The company appealed from an assessment of $19,229 for 1919 and 1920 by the Internal Revenue Bureau.

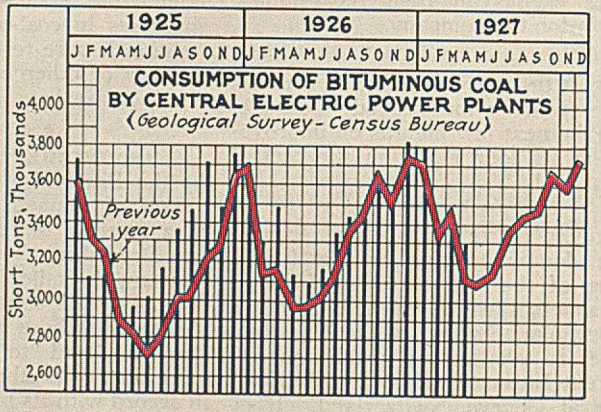
Indicators of Activity in the Coal Industry

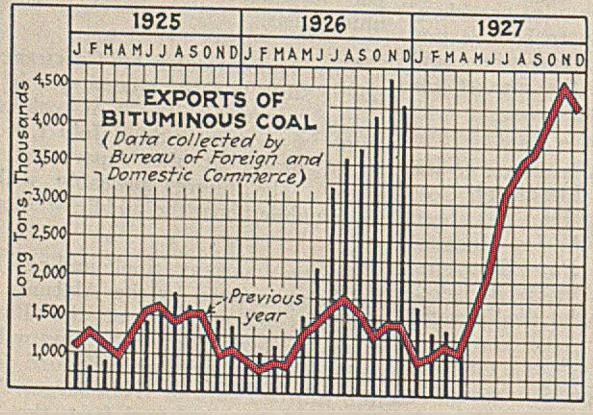


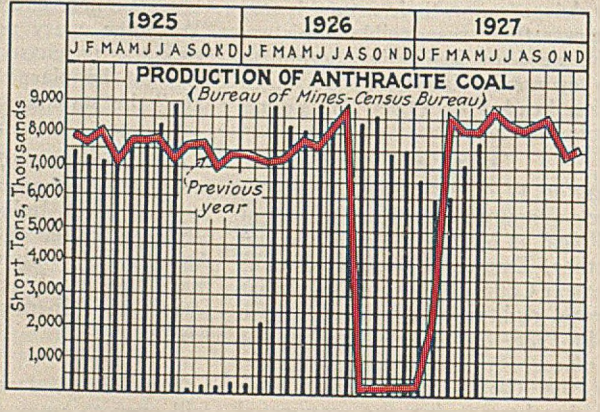












MARKETS *in Review*

SPOT trading in the bituminous coal industry of the United States last month was characterized by continued indifference on the part of consumers to the labor dispute which has been taking heavy toll of production in the Central Competitive Field, Iowa and the Southwest since April 1. Average weekly output in June showed a comfortable margin over the 8,000,000-ton mark, but the trend of prices and of spot demand was more indicative of midsummer dullness than buying by industries fearing a shutdown because of lack of fuel.

As a matter of fact, there are no signs of a shortage in any section. Figures compiled by the National Association of Purchasing Agents showed a decrease of approximately 5,000,000 tons in industrial stockpiles during May. It does not seem likely that June drafts upon storage reserves exceeded that amount. Unless, therefore, there should be an unexpected increase in the rate of consumption or some equally unanticipated decrease in the rate of production, industrial consumers are in a position to carry on well into the winter.

FOR the most part, industrial buying appears to be predicated upon the assumption that neither contingency will develop. Wise purchasing agents, however, are not allowing their stockpiles to diminish too rapidly, but are taking in additional coal whenever the eagerness of some operators forces a block of tonnage upon the spot market. In no place, perhaps, is this buying policy more noticeable than at Chicago, where the tactics of the industrial consumers have been the dispair of producers of western Kentucky coal.

The position of the anthracite side of the market during the month was one of weakness. After the May-end spurt of orders for the domestic sizes, placed to forestall the 25c. advance in prices on June 1, retail interest slumped sharply. At first the operators tried to keep up production activities by putting more coal into storage, but, as the month wore on, this policy was abandoned in favor of a sharper curtailment in the daily rate of output. While this helped the independent producers without storage facilities, there was no real strengthening in the market position of hard coal.

MERCHANT ovens in the Connellsville region had a hard time marketing spot beehive coke last month. Some recovery in spot furnace prices was registered in the later weeks in June, but there was no increase in actual demand for the fuel. To add to their woes, sharp differences of opinion as to the prices to be paid on third-quarter contracts arose. Most of the ovens insisted that $3.50 represented the minimum which they could accept and avoid loss, but buying interests who have been insisting for some time that wages should be further reduced, refused to pay more than $3.25.

From the standpoint of steady demand, the brightest feature of the bituminous situation last month was the lake trade. Average weekly dumpings of cargo coal at the lower lake ports were in excess of 1,100,000 tons. The cumulative total of cargo dumpings for the season to June 27 were 13,358,553 net tons, as against 9,443,049 tons for the corresponding period in 1926—an increase of 3,915,504 tons. Anthracite dumpings to June 19 totaled 594,438 net tons, as against 654,596 tons for the corresponding period last year—a decrease of 60,158 net tons.

Exports of bituminous coal in May—the latest month for which figures are available—totaled 1,368,467 gross tons, as compared with 1,258,298 tons in April and 1,516,755 tons in May, 1926. Anthracite exports in May were 304,661 tons, as compared with 200,771 tons the preceding month and 327,977 tons in May, 1926. Canada, as usual, was the largest customer.

ASIDE from West Virginia low-volatiles, with limited offerings of prepared sizes setting the pace, there was no real strength to the Chicago market last month. West Virginia and eastern Kentucky high-volatile coals dragged and only the reduction in tonnage due to flood conditions in part of the Kentucky field kept prices up. Western Kentucky struggled hard for business, with indifferent success. Trade in St. Louis territory was backward; Standard mines found it difficult to move track coal in competition with western Kentucky shipments.

CONDITIONS in the Cincinnati market were erratic. The decision of the Interstate Commerce Commission in the lake cargo case killed dreams of high-volatile shippers that prices could be advanced. Low-volatile coal, which opened strong, met with sharper resistance as the month wore on. Heavy production in western Kentucky caused price reactions at Louisville, with prepared coal bearing the brunt of the shock. Resumption of large-scale operations in eastern Kentucky had an adverse effect upon quotations on slack.

Neither Cleveland nor Columbus were particularly active. Buyers in both markets found non-union offerings ample to meet their current requirements. In the Pittsburgh district interest, of course, centered around the efforts to increase production made by the group of companies which have broken away from the United Mine Workers. Gains were made despite union opposition. The producers, however, found their selling problems almost as troublesome as their labor problems with northern West Virginia and the older non-union mines in western Pennsylvania fighting them for business.

THE second break in negotiations between union officials and union operators in central Pennsylvania came too late in the month to have much effect upon the market situation. Atlantic seaboard territory, which absorbs a large part of the central Pennsylvania output, has been showing little interest in the situation. Optimism at New York has not been backed by new orders, while Philadelphia has been indifferent to spot offers and Boston cold to all-rail shipment. New England has continued to favor West Virginia coals, but most of the movement has been on contract orders.

APATHY has ruled the Birmingham district coal market, but by-product coke has held its ground. There was some improvement in demand in the Kansas field last month, with shaft-mined lump advancing and strip-pit steam coal finding a ready market. The situation in the other Southwestern fields was unimpressive; a spurt in storage demand for Arkansas coal soon petered out. Weather dictated domestic buying in the Colorado field and steam-coal demand was uneven. Utah complained of poor business throughout the month, with a surplus of slack accumulating in the face of reduced running time.

The general level of prices was below that prevailing a year ago. This, however, was due as much, if not more, to the withdrawal of quotations on Illinois coals and the smaller tonnage from Ohio, Indiana and western Pennsylvania as to declines in non-union prices. *Coal Age* Index of spot bituminous prices on June 6 was 153; on June 13, the preliminary index figure was 154; June 20 it dropped to 152 and June 27 it was 151.

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

If you have a practical idea, a short cut method, or a new wrinkle in operating or maintaining a machine, here's the place to shout about it! *Coal Age* will pay you for your time and trouble and for the help it will be to other coal operators.

* * *

Depending on its possible value to the shop or operating departments (which look to *Coal Age* for new ideas from the field), and upon our ability to publish it in these columns, we will pay from $5.00 up for each idea.

* * *

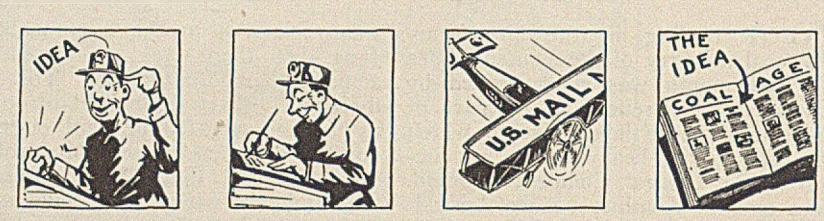
Here's your opportunity not only to win the recognition of your own officials for using your wits to lick a job, and to cash in on it, but also to exchange your ideas with others. For through this department of *Coal Age* others will contribute ideas which will be worth a lot to you.

* * *

So go to it and give this clearing house of ideas a chance to record your progressiveness.

* * *

Make your story short and snappy. We'll edit it if necessary. Don't stop to make finished drawings if illustrations are needed. Simple sketches will do. Our draftsmen will follow your ideas.



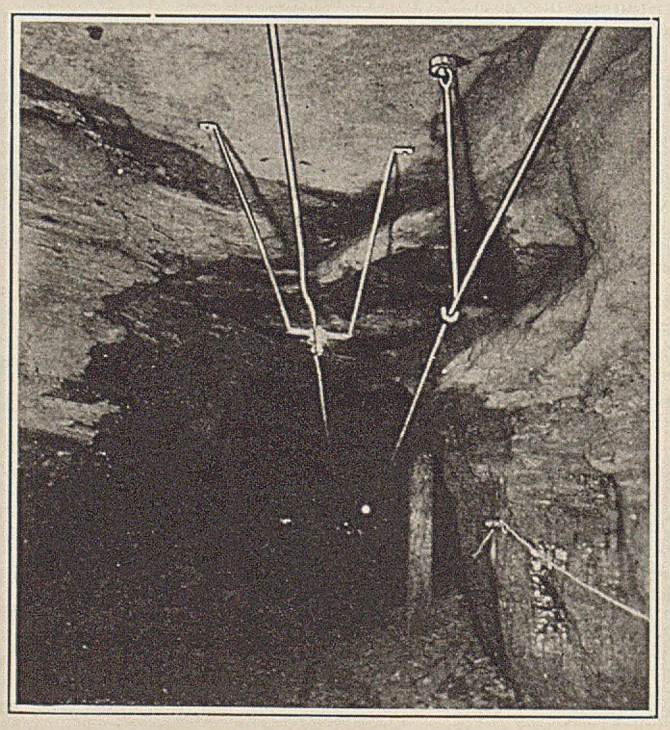
Because of Roof Hazard a "Weak Link" Is Included in Feeder Hangers

When a heavy fall strikes a feeder line something has to give way. If the supports do not fail the wire must break, or stretch and pull through the nearby suspensions. If the cable is stranded and is held by rather tight clamps it usually happens that many of the outside wires are cut or broken at clamps where slippage occurs.

In the Rogers Elkhorn Coal Co.'s mine at Virgie, Ky., a type of feeder suspension is used which drops the cable in case of a heavy fall and which does not damage the cable if it slips through the suspensions. This type of construction holding a 500,000-circ.mil feeder is shown in the accompanying photograph.

The combination consists of an expansion bolt, a standard hanger, a nut, and a suspension fitting made from a ¾-in. soft-steel rod. The rod is cut to length suiting the height of roof, one end flattened and punched for fastening to the hanger, and the other bent to an open hook.

The weakest point in this type of suspension is this hook in which the feeder cable rests. Under excessive weight on the feeder the hook straightens sufficiently to drop the cable without doing it any injury.

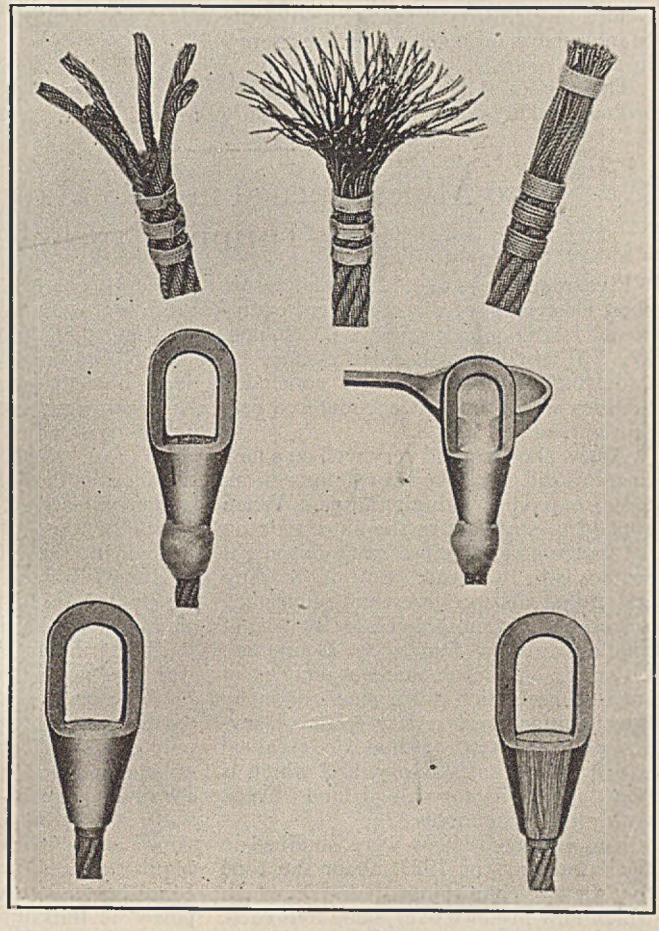


High Place on the Main Haulway

When a heavy fall hit the 500,000-circ.mil bare-copper feeder the hook straightened, thus releasing the cable instead of breaking it or damaging some other part of the suspension. The hook was restored to shape and put back into use.

Socketing Wire Rope Prolongs Its Life

It is recommended for shaft-hoist ropes that resocketing be done about six times during their life. This is necessary, says Walter Voigtlander, mechanical engineer, Chicago, Ill., because at the point of attachment, the rope is subjected to the severest strains of vibration and to the maximum corrosive elements. In general, ropes are not accorded the maintenance to which they are entitled. Operators are inclined to inspect them superficially, records are seldom kept and resocketing is neglected. Complete replacement of a rope at stated intervals, regardless of its apparent good condition, is recommended in some cases. Because of the expense, however, operators are accustomed to keep the line in service longer than the scheduled time; then they hesitate to resocket because they plan to abandon the rope in a short while.



Proper Method of Socketing

Wire ropes are entitled to adequate maintenance. This is particularly necessary at their attachments because they are here subjected to the severest strains of vibration and to the maximum corrosive action.

Such a policy may, and frequently does, lead to serious property damage and personal injury.

In socketing a wire rope, measure back from its end a distance equal to the length of the tapered basket of the socket. Tie the rope securely at this point with soft-annealed iron wire and add two additional tie wires below the first.

Open up the strands as shown in the upper left corner of the illustration and cut out the hemp core as far down toward the tie as possible. Unlay each wire and straighten so as to form a "brush." On large ropes, it would be necessary to use a small pipe over each wire to straighten or to approximately remove the curl from the wire.

If the wire is very greasy, hold the brush over a pail of gasoline, with the wires down, and wipe off the grease with waste or a paint brush dipped in the gasoline, then wipe dry. Dip the brush, holding the wires point down, into a pot of muriatic acid solution which is 50 per cent water and 50 per cent commercial acid. Insert to such a depth as not to immerse the end of the hemp core. Keep in the acid until the wires are clean. Still holding the wires downward, withdraw from the acid and knock the rope sharply with a piece of wood, broomstick or hammer handle. Place a temporary tie wire over the ends of the brush, taking care not to handle the cleaned wires either with greasy hands or with tools.

Insert the end of the rope into the socket, then cut the temporary tie wire. Next place the rope vertically in a vise and set the socket so that the wires come flush with the top of the basket of the socket when the wires are spread out, then seal the bottom of the socket with clay or asbestos as shown at the center and left of the illustration.

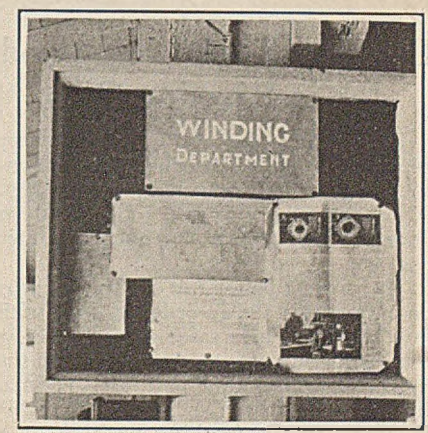
If the socket is cold, warm it moderately, pour with pure zinc, not babbitt, lead or other alloy. Tap the side of the socket with a light hammer while the zinc is still fluid, so as to jar the molten metal into crevices between the wires. When cool, remove the fireclay and the serving wires, and a joint as that seen in the lower left corner of the illustration will be the result. It will help slightly in the flowing of the zinc among the wires to put a small quantity of salammoniac crystals over the wires just prior to the pouring.

It is highly important that the zinc or spelter shall flow freely between the various wires and adhere firmly to each separate one. It should also adhere to the socket as well. It is for the purpose of assuring a proper junction or union of the two metals that so much care is exercised in cleaning the wires. Any foreign substance, but particularly grease or oil, adhering to these parts prevents close contact of the two metals and consequently a proper amalgamation of the zinc to the steel. Non-adherence or faulty adherence of the spelter to the wires may mean trouble and plenty of it.

Bulletin Board Displays Useful Information

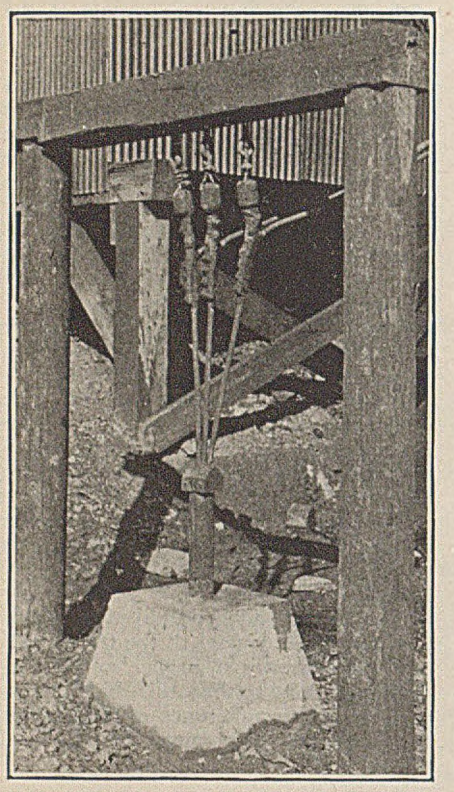
The use of bulletin boards for the posting of notices, accident records, etc., is not new. However, the material on such boards frequently is old and only of minor interest.

The Logan division of the West Virginia Coal & Coke Co., at Omar, W. Va., makes use of bulletin boards on which not only are notices posted but various other useful information as well. The board shown displays an organization chart, a wiring table and directions for handling equipment.



Bulletin Board at Central Shop

Borehole Suspension Of 220-Volt Line



This borehole, near the tipple at an Alabama mine, is 306 ft. deep. The 6-in. drill hole was cased all the way down with 3-in. pipe, concrete being filled in around it. The three No. 4/0 rubber-covered double-braid wires feed a 75-hp. pump motor. The strain is taken by bolted-type trolley wire dead-end clamps which are clamped directly over the insulation. The fact that the clamps do not stand exactly vertical indicates that slight slippage has put some strain on the ends leading up to the insulators on the tipple.

Bucking Tool Does Good Job in Riveting Gibs

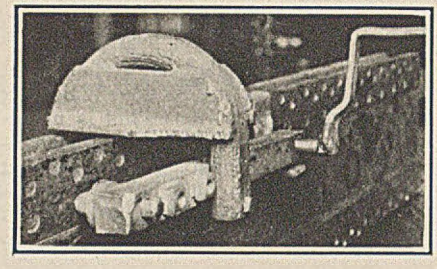
Failure to do first-class work on every repair job is responsible for self-inflicted penalties on many companies. Absolutely every repair job should be done in the most thorough manner possible.

To insure a better job of riveting gibs on cutter bars and in order to do it with less labor and in a safer manner, a new tool has been put into use recently in the central shop of a mine in West Virginia. In the accompanying photograph this is shown in the working position on a cutter bar.

Formerly, one man held a dolly against the head of the counter-sunk rivet while another man wielded the hammer. Very often the dolly would bounce and not return properly centered on the rivet head. This occasionally resulted in loose rivets.

Referring to the photograph, the yoke hooked over the cutter bar is the fulcrum for the bar which carries the dolly. The dolly is forced into position against the rivet by turning the crank which is welded to the heavy screw. The tool can be moved and adjusted to the next screw in a few seconds.

This device is almost as rapid as the ordinary dolly-bar, yet it practically precludes the possibility of loose rivets. The expense of constructing such a tool also is small.



Tool in Place on Cutter Bar

Two Mines Opened in 1923 Have Had No Tire-Turning Expense

Five or six years ago, L. D. Thompson, chief electrician of direct-current equipment, Island Creek Coal Co., Holden, W. Va., tried abrasive brake-shoes on gathering locomotives. He concluded the idea was good, but encountered certain difficulties.

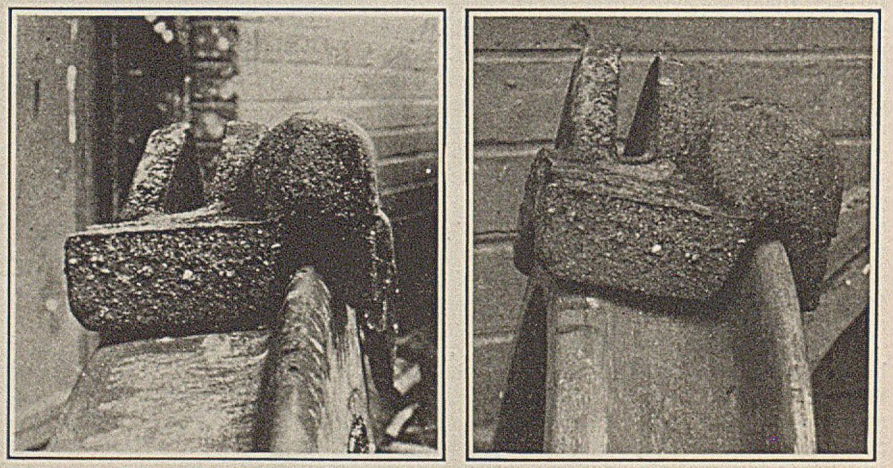
A new shoe worked very well on a new tire, but did not give satisfaction on an old tire having a high flange. When applied to such a tire the shoe rode on the flange and therefore made but slight contact with the tread. Both its braking and truing ability were thus reduced.

In collaboration with H. L. Bartels, of the Huntington Supply & Equipment Co., Mr. Thompson made a number of suggestions which were acted upon by the manufacturer. After trials of several designs a type of shoe was obtained which proved satisfactory, and which is now standard for all Island Creek gathering locomotives.

The perfected shoes were obtained in the latter part of 1923, about the time that the two shaft mines, Nos. 20 and 21, which now produce over 3,500 tons each, were opened. Because of the consistent use of the abrasive shoes at these mines no tire turning has been done for the locomotives working therein. The tires are worn to the safe limit of tread thickness and then junked.

Photographs made at the central shop show how the shoes fit on new and on badly-worn tires of the 6-ton gathering locomotives which operate principally on 25-lb. rail. The distinctive feature of the shoes is the high flange. The groove is approximately 2 in. deep and therefore clears the top of the flange of a new tire (shown at the left of the illustration) by about ¾ in. Although the flange is nearly 2¾ in. high (the clearance limit on the frogs used), on worn tires the shoe lies fairly flat as shown at the right. Another feature is the position of the abrasive inserts. They are arranged so as to keep the tire flange pointed at the center, and so as to cut only that portion of the tread which overhangs the 25-lb. steel.

By this means, the tread is maintained at a correct contour and both the regular and false flanges are prevented from becoming unduly high. Braking power is thus unimpaired or increased and no locomotive time is lost in truing up treads. This eliminates an appreciable amount of work and expense.



Showing the Fits on New and Badly-Worn Tires

Properly Designed Rods Increase Success Of Any Welding Job

Correct Method of Gas Welding a Steel Pipe Line

Since a large part of a finished weld made by any of the modern processes of fusion welding represents added metal or metal from the welding rod, the nature of this added metal and the degree to which it merges with the parts to be joined decide in large measure the success or failure of the weld. Just how much difference the rod itself makes in the speed of welding, strength and uniformity of results is interesting to note and is of great importance.

On a gas-welded steel pipe line recently completed in southern California, it was found that a slightly lower grade of rod slowed down the progress of the welders by nearly twenty per cent. This represented a totally disproportionate increase in cost. As to reliability of the completed joints, 600 lb. hydrostatic pressure failed to produce a single leak in any of the joints made with the better quality rod.

If all welding rods were alike, there would be neither danger from the use of inferior or unsuitable material, nor the opportunity for users to profit through recognition of the differences which do exist. To illustrate: If two pieces of cast iron are welded by the oxy-acetylene process with a rod cut from one of the pieces, the resulting weld will lack the strength obtainable with rod designed especially for the purpose. When melted, cast iron suffers oxidation and loses some portion of its original constituents. In its final form cast iron weld metal has a composition quite different from that of the rod. Hence the necessity for rods designed to give the right metal *in the weld*. Careful study of the changes taking place during fusion forms the working basis for the production of high grade rod. During manufacture the proper quantity of the more volatile elements is added in order to compensate for the several changes that always accompany the welding operation.

The bulk of modern oxwelding is done with five types of welding rod; namely, drawn or Norway iron, "high test" steel rod, cast iron, bronze and aluminum. The first of these (preferably copper coated to prevent rust) is used extensively for welding such materials as mild steel castings, structural steel, steel plate, and wrought iron and steel pipe—to mention but a few of its applications. Where still greater strength is desired, high test rod is meeting with great favor, since it works easily and produces joints with tensile strength usually a full twenty per cent higher than those which are obtainable with drawn iron rod.

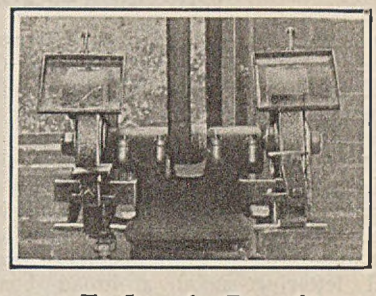
Cast iron welding rod finds its chief application to grey iron castings, from small tools to large machine parts of every description. Where the problems of expansion and contraction become serious and preheating difficult, welding with bronze rod is proving exceptionally satisfactory. Lower welding temperatures and the soundness of the welds which are produced serve to make the utilization of bronze particularly desirable for a rapidly increasing variety of work.

Good rod, of no matter what metal, should work smoothly under the flame, without much variation or noticeable sparking. Rods produced by well-known and unquestionably reliable equipment manufacturers cost a little more than those of uncertain origin. The difference represents insurance whose cost is practically insignificant when compared with the value of the completed operation and the strength and security of the weld obtained.

Welded pipe lines, like practically all other jobs completed in this manner, are usually much stronger and more enduring than those constructed by other methods.

Spectacles Are Placed On Emery Wheels

Realizing that it is easier to put spectacles on its emery wheels than to induce men to put them on their own persons, a large mining company of West Virginia, said J. J. Forbes at the National Safety Congress in Detroit, puts glass guards over the emery wheels. The average mine shop does not guard against these possibilities of accident so closely as they are watched in a large grinding shop, but accidents are, nevertheless, likely to occur. The small number of men exposed to the hazard and the infrequency with which the wheels are used make a management, more greatly impressed with the more numerous accidents of the underground workings, overlook this detail of safety. A machine repair shop should have all



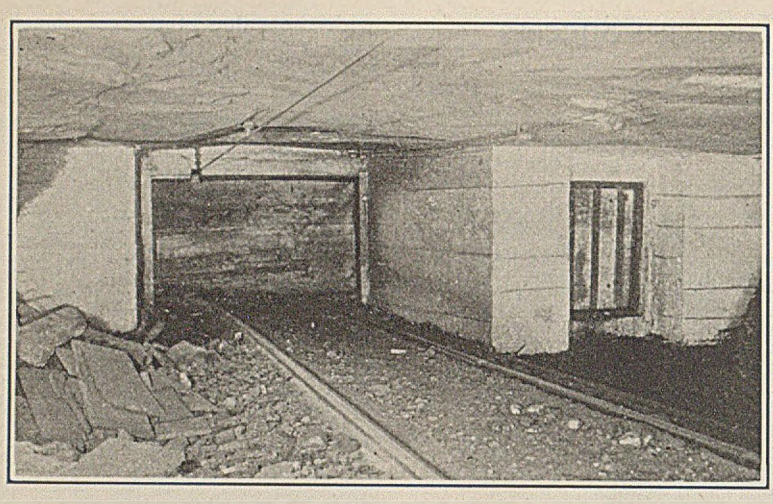
To Save the Eyes of Workmen

the safety protection that is afforded workmen in a shop that manufactures machines if time lost because of accidents is to be avoided.

Haulage-Door Air Lock Makes Walking Safe

Walking on haulage roads is always dangerous and there is an added danger in going through doors. To eliminate the latter hazard, a mine in Alabama has an air-lock manway built around a door on the main haulway, as shown in the illustration.

Concrete walls make a permanent air-tight job minimizing fire hazard. The small door at the right is that used by the men. This door opens into a passage about 18 ft. long having a similar door at the other end. The main haulage entry is wide, and the side used as a walkway is kept clear of all coal, rock and other materials which might



Air Lock Used at This Mine

induce a man to step off the walkway and onto the track.

Doors are weak spots in the ventilation systems. Track doors should be opened as seldom as possible. With an air lock it is not necessary to open them at all for pedestrians. Where there are two man-doors, as in this lock, there is less leakage and less risk that the air will short circuit, for two doors are not as likely to be left open together as either one would be alone.

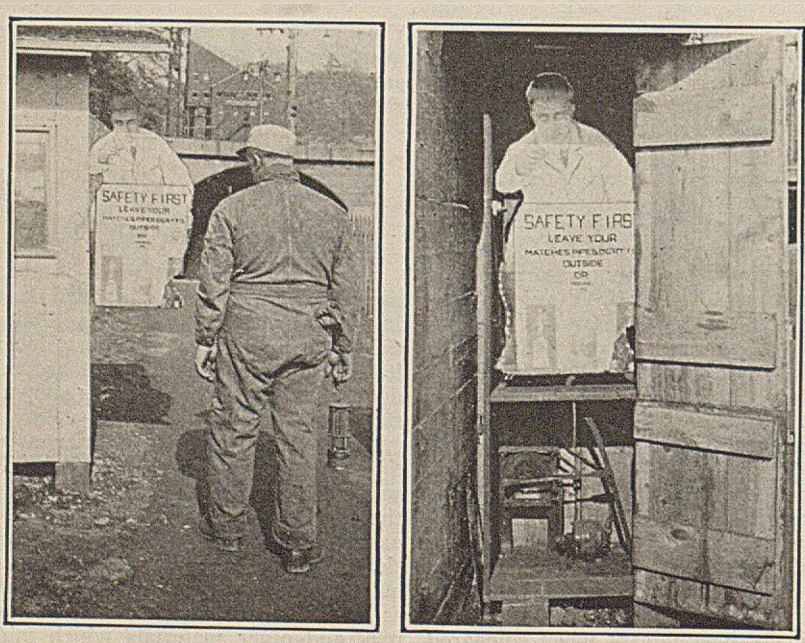
Mechanical "Jack-in-the-Box" Safety Sentry Challenges Miners for Matches

No worker can enter the Harmar mine of the Consumers Mining Co. without first encountering and passing a moving safety sign warning him to leave all his matches on the outside.

This device is an effigy of a man which bobs out of a booth and with an accusing finger confronts the passing miner. Across the front of the effigy, just under the arresting hand, in large bold lettering upon a broad board stands out compellingly the demand for "Safety First."

This safety sentinel is on a fixed post in a fenced lane leading to the main slope. At the left of the accompanying illustration is the sentry and the rough-board shanty which shelters his motive mechanism.

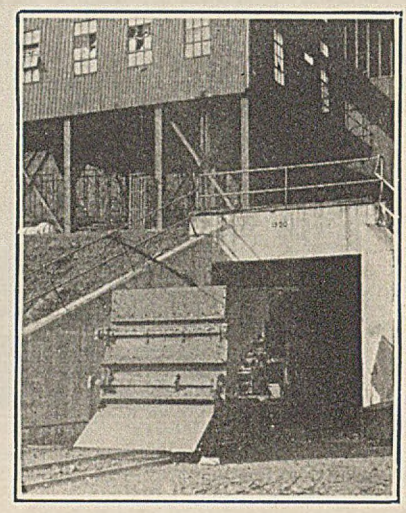
At the right the sign is shown fixed to the upper end of a pendulum arm which is pivoted at its lower end. This arm is swung back and forth by a connecting rod and a crank which is part of a small bevel-gear speed reducer driven by a motor through a belt.



The Sentry is on Guard for Safety

Slate-Loading by Gravity Proves Practicable

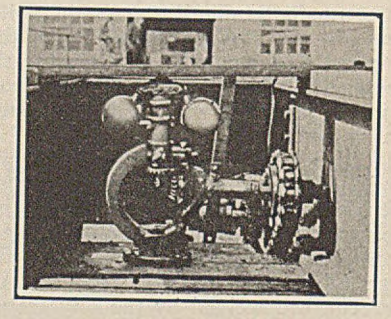
At a mine in West Virginia slate is dropped from the tipple through chutes to the storage bin which is installed slightly below ground level. A reinforced concrete tunnel provides an



avenue through which an electric slate larry may cross under the tipple tracks and also assume a loading position below the gate of the bin.

Self-Derailing Car Stops Runaway Trips

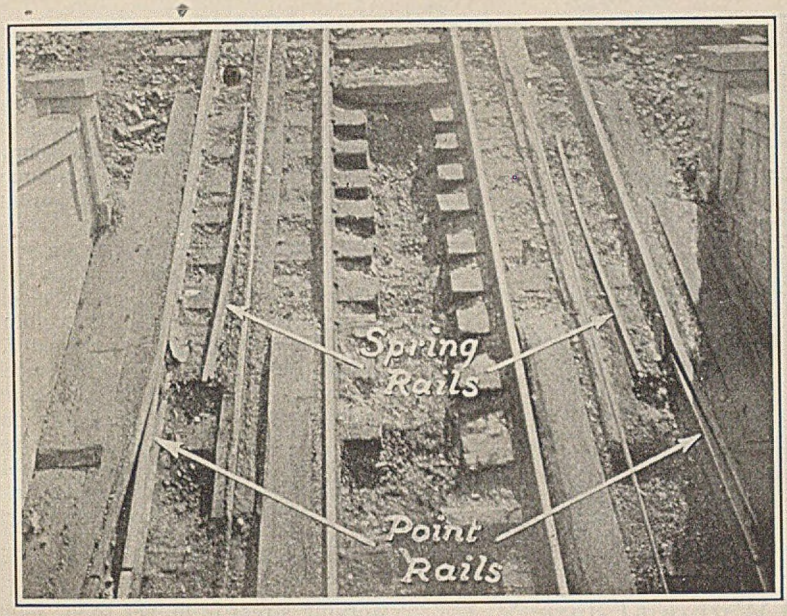
At a mine in Pennsylvania, according to J. J. Forbes, the man trip on the slope is provided with an automatic derailing safety car which precedes all the other cars and is immediately followed by a number of empties that will



Governor Derailer

take up the shock of derailment should one occur. The speed is regulated by a governor of the steam-engine type which in turn is connected to a car-wheel shaft by chain and sprocketing gear. The speed of the car can be set by spring tension so that it will release a drag which, when it falls, will derail the safety car.

Should the speed become excessive the safety car leaves the track, thus derailing all the cars long before maximum speed is attained by the runaway trip.



Derails at the Slope Portal

Wire Rope in Oil-Lubricated Pipe Operates Derails at Portal of Slope

In the upper picture the derail in the track at the right is in the normal open position and that at the left is being held closed by the dumper at the tipple. The wire ropes connected to the point rails work over horizontal sheaves concealed beneath the boards that are located between the outside rails and the walls.

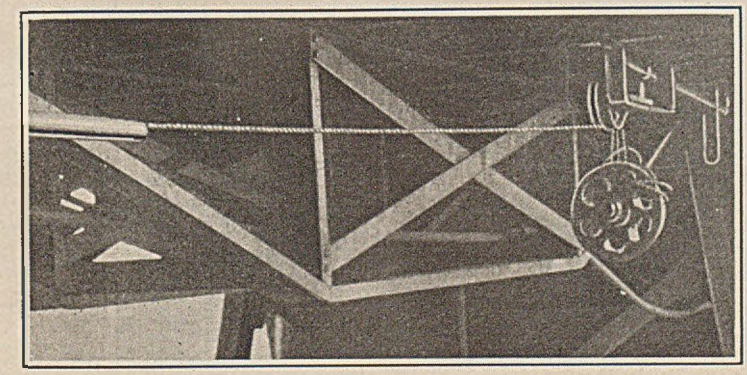
When empties are lowered down a slope on the same track that is used for hoisting the loads, it is difficult to provide derail protection. Such protection is required chiefly for the loaded trips because breaks are most liable to occur when the greatest stress comes on the cable.

At a certain mine in Alabama, where the trips are hoisted in balance on a double-track slope, and where the tracks are used for lowering as well as for hoisting, remote-controlled spring derails are installed on each track at the slope portal. These devices afford protection against loads which might break loose at the knuckle, which is a critical point, and also against runaways which might originate at the tipple or on the trestle leading up to it.

From the mechanical standpoint the method of remote control of the spring derails is interesting. To the point rails are attached the ends of two 1½-in. wire ropes which run to the tipple and terminate at foot levers near the controls of the rotary dumps. These ropes are carried through 1½-in. pipes buried in the fill alongside of the tracks.

On the trestle near the dump a tee is placed in the pipe and to this is connected a short riser. Once a week some oil is poured into this riser pipe. This lubricant works its way through the main pipe, keeping the wire rope well greased and free from rust.

As the empty trip leaves the tipple the derails are closed by the dumper, who holds the lever down with his foot. Upon release the derail springs back to the open position. Because the hoist is started only on signal from the dumper, there is little chance for him to fail to close the derail for a descending empty trip. The arrangement has long operated satisfactorily.



Wire Rope Entering Pipe Under Tipple Floor

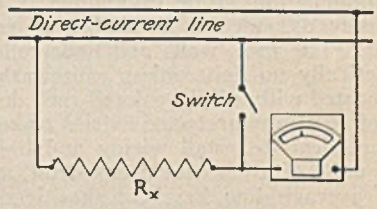
An Aid in Determining Resistance Formula

Occasions for measuring electrical resistance come but seldom at the average mine. For this reason the practical man sometimes finds himself at a loss in trying to recall the formula, especially the one for use in measuring a high resistance with a voltmeter only.

When two meters are used and the voltage drop across the resistance is determined while a known value of direct current is flowing through the resistance, then the calculation is simply an application of Ohm's law; in other words, the resistance is found by dividing the voltage by the current.

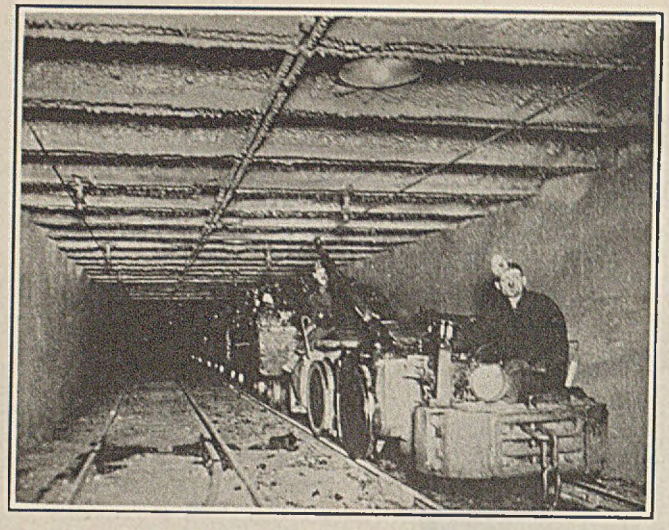
The other, or single-voltmeter, method can of course be used only if the internal resistance of the voltmeter is known. In most instances voltmeters of the better class have the internal resistance marked on the inside of the cover, or on the scale. The formula to be used is not easy for the practical man to derive, yet is so simple from the viewpoint of a laboratory worker that it is included in but few of the reference books that the practical electrician has available.

The accompanying sketch shows the connections for measuring high resistances by this single-voltmeter method. Let R_x represent the coil or resistor being tested, and R_v the internal resistance of the voltmeter. Let V_1 be the voltage of the line as read with the switch closed, and V_2 the voltmeter reading with the switch open; that is, with the meter in series with the unknown resistance. Then the formula is:



$$R_x = R_v\,[(V_1 \div V_2) - 1]$$

Although this method demands a rather steady line voltage, the accuracy depends principally upon the percentage of error in the voltmeter readings. The readings with switch open and with switch closed should be taken as near together as possible and should be repeated several times.



Lighting of Main Bottom of New Orient

Main Bottom Illuminated Without Glare By Placing Bulbs Properly

Glare of automobile headlights in country driving is a common example of the killing of the effectiveness of illumination by visible light sources of high brilliancy. The driver's headlight seems quite adequate so long as he faces no other bright light, but as soon as another car facing toward him has approached, the pupils of his eye contract to such an extent that he has great difficulty in seeing the road.

The same principle applies in lighting interiors. Large diffusing globes should be used, or the lamps concealed from the normal angle of vision by deep reflectors or by being hung very high above the floor.

Illumination inside of a mine is especially difficult for a number of reasons. The roof, walls and floor reflect practically no light unless whitewashed or coated with a light-colored rock dust. Roof falls in unprotected entries make it impractical to install wiring and lighting units of a permanent character, and the average low height makes it difficult to locate so that glare is avoided.

Large, diffusing globes would not be practical because of lack of space and danger of breakage. Scant height also eliminates the deep-cone reflector. In view of these difficulties the method of lighting the main bottom at the New Orient mine, in southern Illinois, is of interest. This method is shown in the accompanying photograph.

The lamps are so placed that a person of average height cannot see them if he is 10 ft. or more away, and when closer than that they are practically above the angle of vision. The 14-in. porcelain-enameled steel reflectors, of the shallow-dome type, are set with the rim flush with the concrete and in the center of the reinforced arches between beams. By this placement the beams hide the lamps from distant view.

The lamps are 100-watt, 220-volt, and are operated from an alternating-current circuit. The same voltage is used for lighting the office and other buildings on the surface, the object being to discourage theft of bulbs for use on the 110-volt house-lighting circuits.

Finding Right Pulley For Rubber Belt

This chart, devised by W. F. Schaphorst, tells almost instantly the proper diameter of pulley to use for any number of plies of rubber belting. It takes into account any working stress from 210 to 280 lb. per sq.in.

It also makes the problem simple by giving the three most common weights of duck in column A: 28 oz., 32 oz., and 36 oz., corresponding with 220, 237, 252 lb. per sq.in. working stress.

For example, if a given belt is made of 32-oz. duck and it is a 7-ply belt, what is the minimum pulley diameter?

Solution: Run a straight line through the point in column A corresponding with 32-oz. duck and the 7, column C, and the intersection with column B gives the answer as 18 in. minimum pulley diameter.

In other words, simply run a straight line through the working stress, column A, and the number of plies in column C, and the intersection in column B gives the minimum pulley diameter.

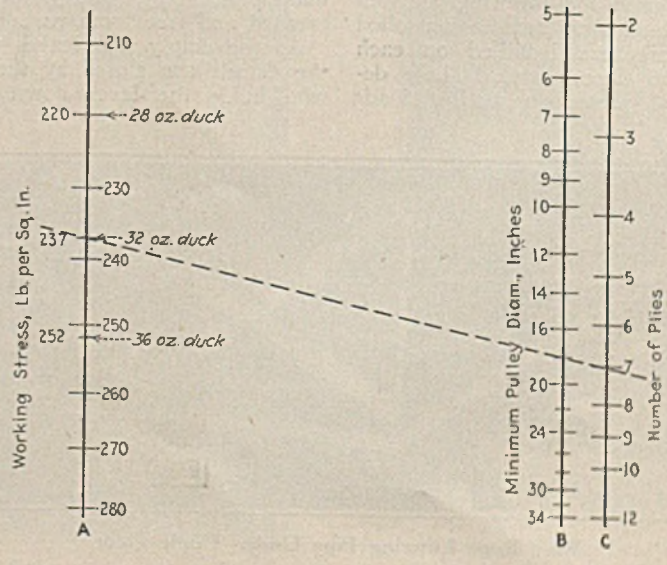
Because of the fact that rubber belting is always made up in plies, this matter of minimum pulley diameter is important. Extremely small pulleys must be avoided if at all possible. Thus, column B shows that no pulley smaller than 5 in. should ever be used with a standard rubber belt.

This chart is based upon the following rule: "Extract the cube root of the working stress in lb. per sq.in., multiply by the number of plies and divide by 2.4. The result is the minimum diameter of the pulley in inches."

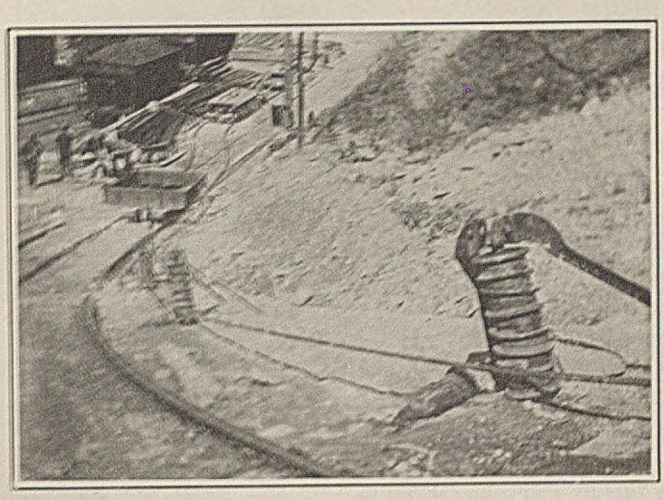
Or, vice versa, this chart may be used for determining the maximum number of plies when the working stress and the pulley diameter are known by simply running a straight line through the two known factors.

HOW PLIES BEST FIT WIDTH

Belt Width Inches	Number of Plies Minimum	Number of Plies Maximum
2	2	3
3	3	4
4	3	5
5	4	5
6	4	5
8	4	6
10	4	6
12	4	6
14	5	6
16	5	6
18	5	6
20	6	7
22	6	7
24	6	7
26	7	8
30	7	8
36	8	10
42	8	10
48	8	10
54	10	12



Spiral Rollers Control Ropes on Curves Of Hoisting Incline



Lower Section of Curve Showing Spiral Rollers

At mines where a hoisting incline is required for carrying supply material from the railroad up to the head house, the valley is usually so narrow that there is no room for a level landing yard at right angles to the railroad. This condition makes it desirable to curve the track at the bottom of the incline and terminate the same on a nearly level yard paralleling the railroad.

As indicated by the accompanying photographs, this is the arrangment at the mine of the Portsmouth By-Product Coke Co., at Freeburn, Ky. The material yard is at car-door level above the railroad and there is space for temporary storage of material piled where unloaded, and where it can be reloaded directly into the incline car. The arrangement is good, but difficulty was encountered in controlling the rope as the car rounded the curve.

The incline is on an average pitch of 35 deg. and the vertical lift is 636 ft. On the curve the pitch changes from near the average, to a few degrees. To hold the rope in place on this curve nine flanged rollers were installed with the axes vertical. Despite the natural tendency for the rope to rise above the rollers, the flanges held it in place when the car was being pulled up grade and around the curve.

But on lowering, the rope would move to the tops of the first few rollers, then miss the next roller by going over the top. The obvious solution was to install longer rollers, but this would have involved higher and heavier bracing. Instead, the smooth rollers were replaced by special rollers having spirals of ½-in. round steel welded around the wearing surface. This change eliminated all difficulty.

The direction of the spirals is such that the rotation of the rollers, caused by friction against the rope when the car is being lowered, works the rope to the bottom end of the roller and thus holds it low enough to be engaged by the succeeding roller. At each end of the roller there is a short space free of spiral. The rope runs in the bottom space when the car is descending, and in the upper space when it is ascending.

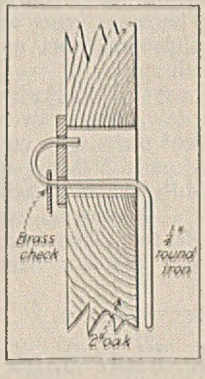
Although this idea of a spiral roller is new to many, it is one which was put into use years ago. One of these early applications was for sheaving the haulage rope on a slope where the knuckle of the loaded track is several feet higher than the empty track.

Hook Keeps Check Visible Yet Foils Tamperers

There are times when it is desirable to identify the loader of a car before the coal is dumped. When miners' checks are hung on the outside of the cars without being locked in some way the temptation to switch checks is sometimes too great for certain men. Placing checks on the inside well below the car top removes the temptation but has the disadvantage that for any car the loader's number cannot be determined until the coal is unloaded.

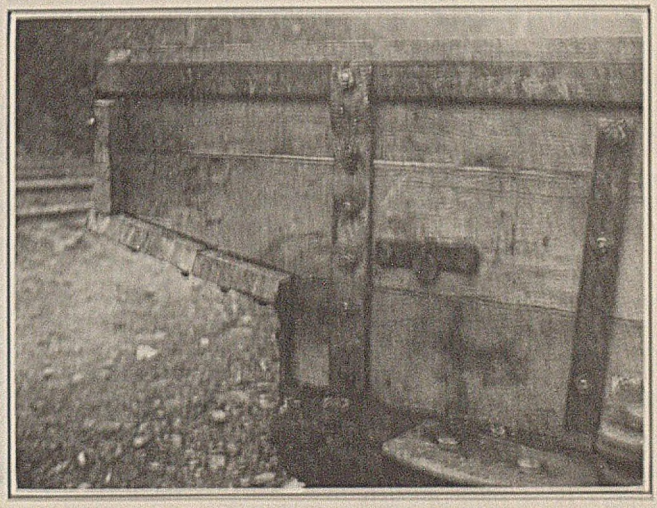
At the Sycamore Coal Co., near Williamson, W. Va., the mine cars are equipped with a type of check hook that keeps the check in sight, yet prevents removal so long as the car is loaded. The hook and method of attachment are shown in the accompanying photograph and sketch.

A hole 1 in. wide by 1½ in. high is cut through the wooden car end. On the outside over the hole is bolted a small piece of ⅜- or ½-in. steel. In this are drilled two holes, one above the other; one accommodating the body of the hook and the other the point. The hook is made from ½-in. round stock and is of such length that it extends down about 4 in. from the hole when set to hold a check. If the miner places a fair-sized lump of coal against the hook he can be doubly sure that the check will not be disturbed. After the car is dumped the check can be easily removed with one hand. The advantages of this method are obvious, as it eliminates much uncertainty, saves time and avoids arguments, for most mine managements "fire" any man who is caught shifting checks.



Hook Section

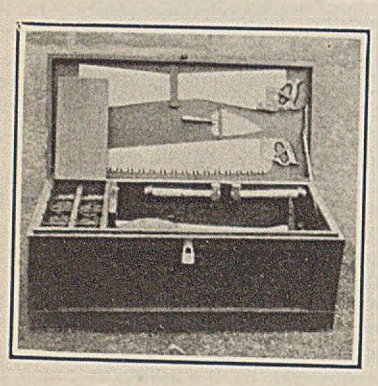
The check is removed by pulling it outward and downward, which tilts the hook rod so that a twist of the hand brings the check over the hook.



Check in Place on Car

Rescue-Work Tool Boxes Save Time and Lives

Emergency boxes are provided for rescue teams at the mines of the Davis Coal & Coke Co., of West Virginia, so that all the needed equipment in good condition can be ready to be loaded instantaneously into a car and transported to the place at which it is needed. Everything necessary for fire fighting that can satisfactorily be packed into a single box is so collected at these mines and is always ready for immediate action. It does not have to



Box in Readiness

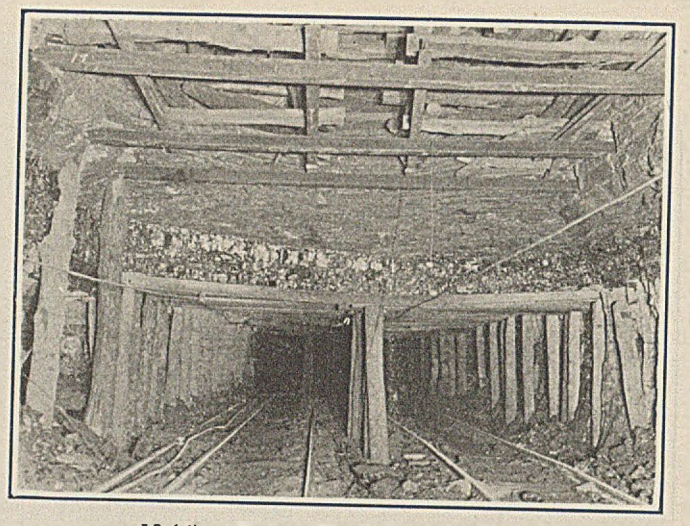
be assembled from different and often distant places. In a minute, therefore, a car can be started on its trip with nothing missing. The axes also are sharp, the saws are properly set and neither are coated with rust.

The box contains, says J. J. Forbes, a one-man crosscut saw, two trowels, three hatchets, two coal picks, two copper hammers, 30 lb. of nails, 500 ft. ¾-in. hemp rope, six flashlights, two hand saws, two bricklayers' hammers, two axes, two canal shovels, two water buckets, one box of chalk and six flame safety lamps.

Should Rock That Sags Be Removed?

In the Valier mine, which is located in the Franklin field of Illinois, is a two-track entry that has given much trouble to the management and put up to them the time-honored problem: When the roof gets bad, should it be taken down or kept up with crossbars? This time the latter scheme got the votes, for conditions clearly indicated this to be the better method and that for two reasons: The handling of so much rock as would be taken down over the two tracks would be extremely expensive; and the roof above that which was broken and sagging would still need support.

The coal bed at the Valier mine is the No. 6 according to the Illinois system of numbering. It is thick enough to permit of leaving about 2 ft. or more coal as top to support the roof, which



Holding Broken Roof Over an Entry

disintegrates rapidly and comes down in large masses. At the point shown in the illustration so much roof had fallen that 103 mine cars, each holding 5 tons, had already been loaded out when the photograph was taken from which the illustration was made.

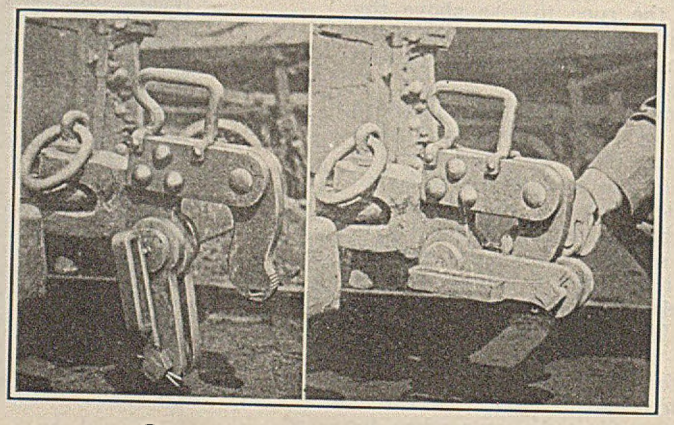
The span at this point is 20 ft., and the thickness of the disturbed rock over the top coal is about 7 ft. The two tracks will not be maintained permanently. One track will serve all needs after a few months. This will be put in the center with posts on either side of it under the 15-in. I-beams that are to be placed at 4-ft. centers along the roadway. This central track will then form a permanent road.

Many mines are confronted with a problem similar to that encountered at Valier, and its solution will depend upon local conditions. The choice of the course to be followed is a question of economics. Under certain conditions, it might be found advantageous to take down the roof; in other circumstances, it may be far cheaper to employ lagging, crossbars and legs to hold the roof in place as long as the roadway must be maintained. Under certain other conditions, the choices may practically balance and expediency may turn the scale. This places the obligation of making a nice selection upon the engineer or superintendent in charge of underground operations.

Automatic Cut-Off Safely Uncouples Mine Cars With Speed and Dispatch

The device shown in the accompanying illustration has been used by the Consolidation Coal Co. of West Virginia for more than six years and has demonstrated itself to be a safe and most effective method of uncoupling trips at the tipple.

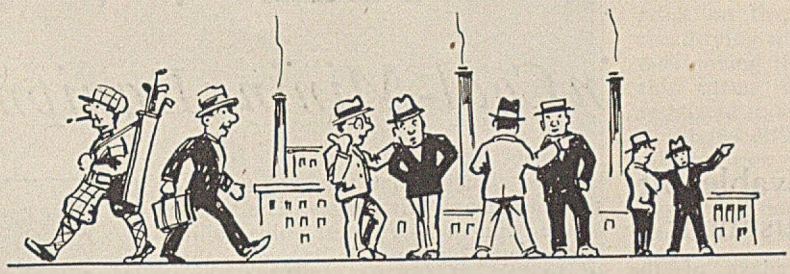
The automatic cut-off is arranged so that it will open when slack is made in the rope by the haulage engineer, yet will remain closed as long as there is the slightest pull on the rope. Note how the pull of a finger is enough to keep the device from uncoupling.



Open Closed

Automatic Cut-Off for Rope Haulage Shown in the Open and Closed Position

Among the Manufacturers



THE FOOS ENGINE CO. is the new name adopted by the Foos Gas Engine Co., Springfield, Ohio. At the last meeting of the directors J. F. Baker was elected president, and M. E. Baker was named secretary-treasurer. New department assignments include the following: Ray C. Burrus, sales manager; W. W. Schettler, chief engineer; George F. Noltoin, mechanical engineer. A new factory branch will be established at Tulsa, Okla. Garvey & Palmer, Inc., Pacific Coast representatives, have opened offices at Los Angeles, San Francisco and Seattle.

* * *

THE CHICAGO PNEUMATIC TOOL CO., New York City, announces the removal of its St. Louis office, service department and warehouse on July 1 from 813 Hempstead St. to 1931 Washington Ave.

* * *

THE HYDROTATOR CO. has opened a branch office and laboratory at Hazleton, Pa., to service the anthracite field and to conduct tests on small sizes of anthracite. Walter L. Remick, general manager of the company, will be in charge of the new branch office.

* * *

THE FALK CORPORATION of Milwaukee, Wis., manufacturer of herringbone gears, speed reducers, steel castings, Diesel engines and flexible couplings, has opened an office in Chicago at 122 South Michigan Ave. The office will be in charge of C. H. Thomas.

* * *

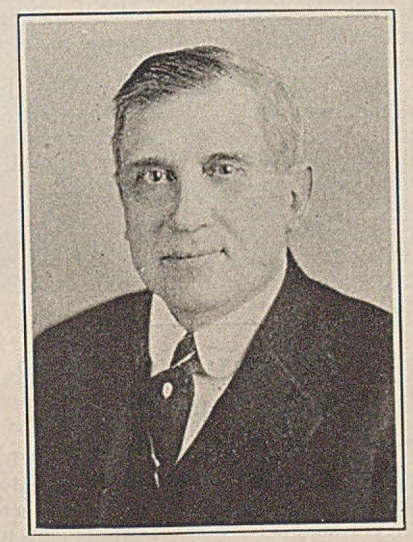
THE HYMAN-MICHAELS CO., Chicago, has appointed the Hofius Steel & Equipment Co., Seattle, Wash., as its representative in Washington and the Northwestern territory.

* * *

A COMPLETE MANUFACTURING PLANT is to be placed in operation June 1 by the Stephens-Adamson Manufacturing Co., at Belleville, Ont. From this branch factory there will be supplied the company's entire conveying machinery line for Canadian trade, in addition to a general export business.

Ebensburg Exposition Attracts Long List Of Exhibitors

EBENSBURG, Pa., will be the scene of Cambria County's third annual Industrial Exposition, July 4-9; held in connection with the Cambria County (Pennsylvania) Fair. One hundred and twenty exhibitors in various industrial lines have reserved space at the Fair Grounds. Charles M. Schwab is chairman of the board of directors of the fair.



Charles M. Schwab

Among the companies serving the mining industry that will be represented with exhibits are the following: The Elliott Co., Dravo-Doyle Co., Jeffrey Mfg. Co., Lorain Steel Co., General Electric Co., Goodman Mfg. Co., Brown-Fara Co., Bethlehem Steel Co., Ohio Brass Co., H. H. Robertson Co., Hercules Powder Co., E. I. duPont-de Nemours & Co., Atlantic Refining Co., American Mine Door Co., Suppes Foundry & Machine Co., Pennsylvania Electric Repair Co., Bertram-Tracy Co., Wm. McKee Co., Grasselli Powder Co., Harris Pump Co., Weinman Pump Co., Deming Pump Co., Southwark Foundry & Machine Co., Martin J. O'Brien Co., Crawford Machinery Co., Brookville Truck & Tractor Co., Phillips Mine & Mill Supply Co., Flood City Mfg. Co., Condron Bearing Co., Penn Machine Co., Timken Roller Bearing Co., Fort Pitt Mine Equipment Co., Gallatly Co., Peale Loading Machine Co., Mine Safety Appliances Co. and many others.

The exposition has increased in interest and scope to such an extent that it has outgrown its local character. In addition to the manufacturers' exhibits the School of Mines, Pennsylvania State College, will have a unique display. The U. S. Bureau of Mines also is taking an active interest. In order to entertain those not interested in machinery and equipment, the management has arranged a varied daily program.

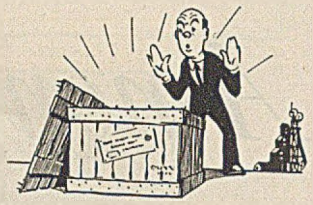
One of the principal features will be the annual first-aid meet for the championship of Pennsylvania on July 9. The contest will be open to mining and industrial teams.

WILLIAM B. SENSEMAN has been appointed Pacific Coast district manager for the Combustion Engineering Corporation, Raymond Bros. Impact Pulverizer Co., Ladd Water Tube Boiler Co. and Heine Boiler Co., all subsidiaries of International Combustion Engineering Corporation. The new consolidated offices are in the Subway Terminal Building, 417 South Hill Street, Los Angeles.

* * *

THE LINCOLN ELECTRIC CO. of Cleveland announces the appointment of the Wade Engineering Co., 1855 Industrial St., Los Angeles, Calif., as distributor of Lincoln products in California. This company maintains a branch at 69 Webster St., Oakland, Calif., both main office and branch carrying stocks of motors and welders as well as service parts. The Los Angeles branch is in charge of Henry N. Wade, who also is president of the company. The Oakland branch is under the direction of H. T. Lintott.

WHAT'S NEW



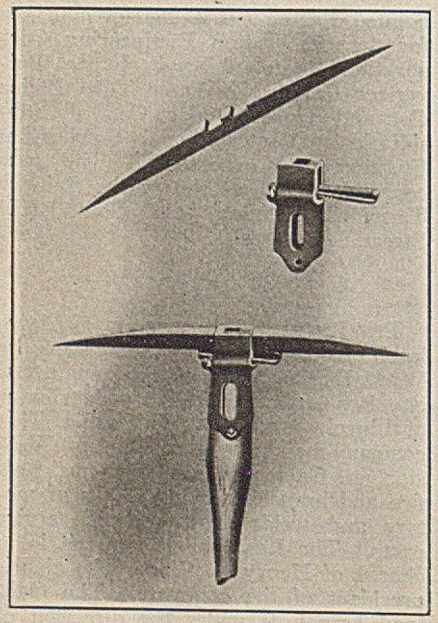
in Coal-Mining Equipment

Pick Has Removable Bit To Allow Adjustment

We hear much nowadays of the mechanization of coal mines and the substitution of mechanical power for the energy of human muscles. Although beyond question great strides have been made in this direction and still greater ones will be made in the future, there still remains in the mine one hand tool which probably will never entirely be supplanted. This is the miner's pick which is so useful and answers so many purposes that it will very likely continue as a part of the underground worker's equipment at least for many years.

Despite its great utility, however, and its almost universal use, the miner's pick as ordinarily constructed leaves much to be desired. The pick bar can never be fastened as firmly as might be wished to the handle. Furthermore, the handle near the point where it enters the pick eye is subject to hard usage and abrasion. It is at this point that the handle usually fails.

In order to overcome this difficulty, the Howells Mining Drill Co., of Plymouth, Pa., has recently placed upon the market the improved design of pick shown in the accompanying illustration. This consists primarily of a long and carefully designed eye at the end of which a detachable pick bar is wedged in place, the wedge being held by a removable key.



Something New in Picks

It is claimed that this construction possesses many advantages. The handle at the point of its greatest vulnerability is protected by the metallic eye so that its life is indefinitely prolonged. The result is that the miner will take greater care in fitting the handle into the socket so as to give the pick just the right "hang." The pick bar is made of the finest steel and when it becomes necessary to sharpen it, it is only necessary to remove the little key holding the wedge, drive the wedge back and slip the bar out of the socket. The handle may then be left in the mine and only the bar taken to the blacksmith shop for sharpening. Again, in the shop this bar may be far more easily handled than the ordinary pick. This makes for complete economy.

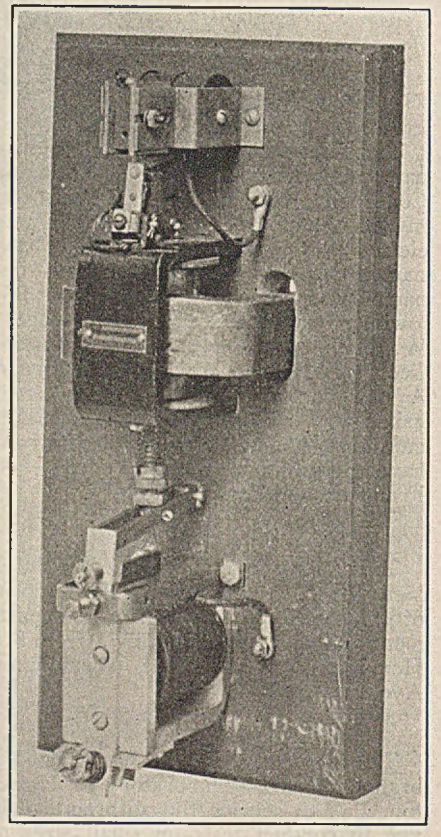
It is claimed by the maker that this design was worked out by a practical man who knew what the miner wanted in the shape of a pick. Furthermore, a number of these picks have been tried out in practical use underground over a considerable period of time, during which they have fully justified the hopes, expectations and predictions of the designer.

Step-Back Relay Affords Overload Protection

A new step-back relay introduced by the General Electric Co. of Schnectady, N. Y., is designed for use in direct-current magnetic control equipment to provide overload protection and to allow a suitable time delay before reset.

This relay is a combination of two more or less distinct parts. The upper part consists essentially of a normally-closed contact whose open or closed position is controlled by a coil in series with the motor armature. Loads in excess of the relay setting cause this normally-closed contact to open, thus dropping out the step-back and accelerating the contactors. This inserts sufficient resistance to limit the motor current to 125 per cent of normal full load with stalled armature.

The lower part of the relay prevents the overload mechanism from resetting until after a definite time interval. During this time the motor has an opportunity to become stabilized. If, after this definite time delay, conditions have again become normal and the motor current has decreased sufficiently, the overload mechanism resets and the control panel automatically accelerates the motor in the regular manner. However, unless the current decreases below a certain value, the relay will not reset. In this event, the motor will have to be disconnected from the line and restarted from rest.



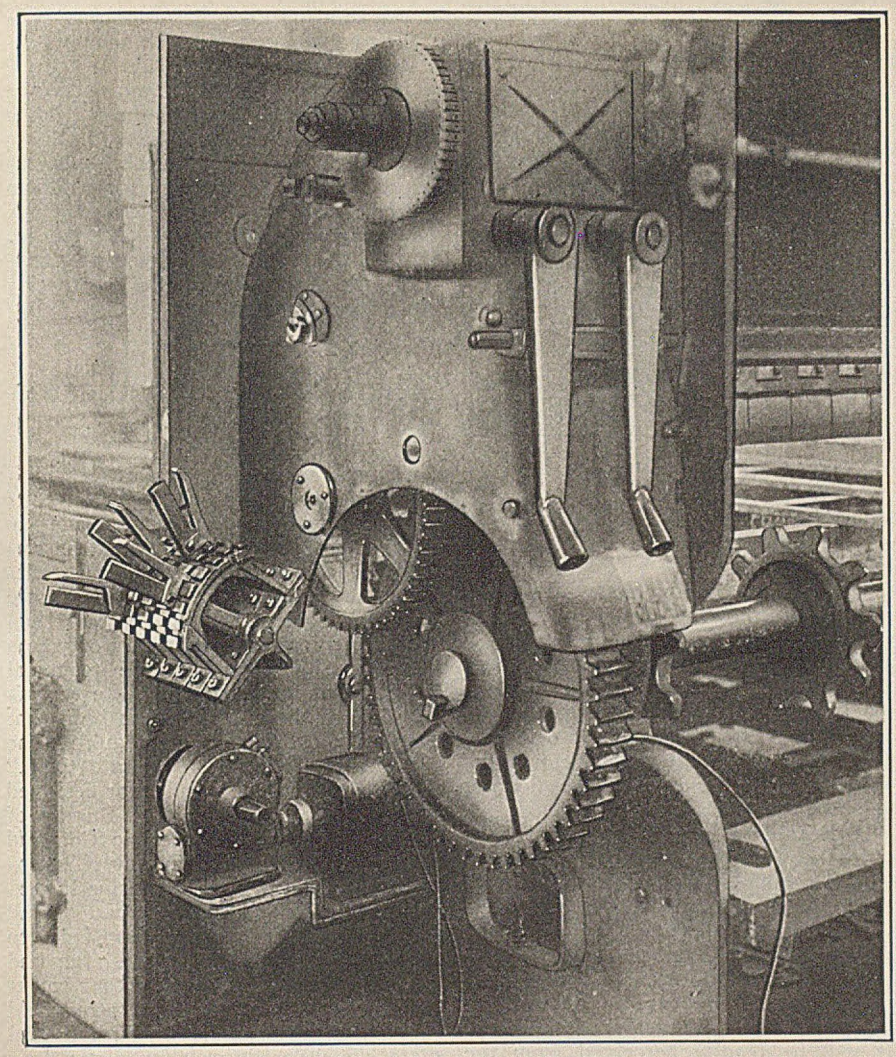
Picks Up Instantaneously

At present the principal use for the new relay is on marine equipment such as anchor windlasses and capstans. However, it is expected to be of value wherever it is necessary to maintain the torque and at the same time provide overload protection.

New Stoker Has Many Advantages

For years the users of fuel in large quantities have sought means whereby either inferior coals might be utilized or those of standard quality might be burned with greater efficiency. One of the latest devices having both of these ends in view is the improved stoker recently placed on the market by the McClave-Brooks Co., of Scranton, Pa.

This stoker, which is of the chain grate type, embodies, according to its



This Stoker Steps Up Efficiency

builders, many important improvements over its predecessors. The grate surface, made up of flat-top links, slides on straight bars extending from front to rear with the result that the entire surface is practically level. The fire thus gets less of a "hold" upon the individual links with the result that warping is practically eliminated.

Because of the design of the grate and its comparatively flat surface, the amount of fine ash sifting through it is small. Nevertheless, such siftings fall into trough-shaped compartments beneath the grate, from which they are removed to the ash pit by means of detachable-link chains actuated through a reduction gear by a small motor mounted on the front of the stoker.

The fuel hopper on the front of the machine is of ingenious design. Its ends are the cast side frames of the stoker itself; its rear wall is the fuel gate, which may be raised and lowered vertically by means of a ratchet lever on the side of the machine. This gate is covered and protected from the fuel on the front by cast plates and from the fire on the rear by fire tile. The method of attaching the latter is such that any tile may be removed or replaced in a few minutes without stopping the operation of the stoker. A gage is provided showing the thickness of fuel bed admitted to the furnace. The front of the hopper is a sloping steel plate stiffened with structural shapes. This also can be raised or lowered by means of a ratchet lever.

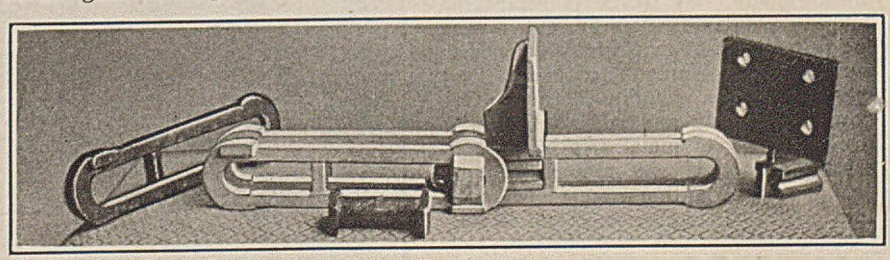
The chain grate is driven by means of a train of spur gears. On stokers of 400 hp. or over the spur-gear drive is designed especially for continuous operation and consists of a train of gears engaged with one another at all times. Three different speeds of grate can be obtained by the manipulation of two hand levers located on the front of the gear housing. These shift a spiral clutch on the main drive-shaft which is in contact with the clutches on the gears. This prevents stripping of the teeth. A special locking device, which is claimed to be absolutely fool-proof, allows only one speed change at a time. Markings on the gear housing indicate the direction in which the speed-changing levers are to be shifted, and a safety tension spring attachment is provided on the outer end of the main driving shaft to protect all parts of the stoker when in operation. Any sudden stoppage of the grate, due to any cause whatever, will react on the tension spring, allowing the driving mechanism to operate without moving the stoker. The tension of this spring is adjustable and can be regulated to a safe load on the sprocket. A simple oiling arrangement lubricates all bearings. All parts are accessible and can be easily removed or replaced. The gear housing is mounted against machined guides which are provided with setscrews permitting lateral adjustment so as to keep the last gear in correct pitch-diameter contact should it become necessary to shift the large driving gear when taking up slack on the stoker chain.

On stokers of less than 400 hp., a ratchet drive from an overhead eccentric shaft is recommended. Four speeds may be obtained with this arrangement by merely increasing or decreasing the throw of the lever arm. This drive is mounted on guides on the side of the hopper and setscrews are provided for lateral adjustment so that the pinion and the large gears are always in proper pitch-diameter contact. A special spring cage is provided on this type of drive as a safety feature. Thus, should the stoker mechanism become jammed in any way whatsoever, the tension in the spring absorbs the strain and prevents the driving shaft from functioning until the obstruction is removed.

Rivetless Chain Is Free From All Bolts

During the past decade several types of rivetless chains, employing various locking principles, have been developed. Heavy-duty chains of this variety, chiefly because of the ease and facility with which repairs can be made, have become justly popular. As now marketed, however, all such chains are dependent on bolted attachments such as those for conveyor flights, elevator buckets or car hauls. The most recent development in detachable chains and one which obviates the bolted attachment is the invention of George S. Atkins of Scranton, Pa., and is known as the Atkins rivetless chain.

This chain can be manufactured of either steel forgings or malleable or manganese steel castings, preferably in pitches of from 4 to 9 in. As here il-



No Bolts Are Used in This Chain

lustrated it comprises only a single link unit in paired assembly connected by a pin with a conventional rectangular head. Each link bears suitable pin-locking lugs top and bottom on opposite ends. In assembling, pairs of inside links are faced opposite to the outside links so that these lugs become spacers. This provides for inserting the base of a conveyor or other attachment between the inside links, interlocked with their walls and held against movement by their webs.

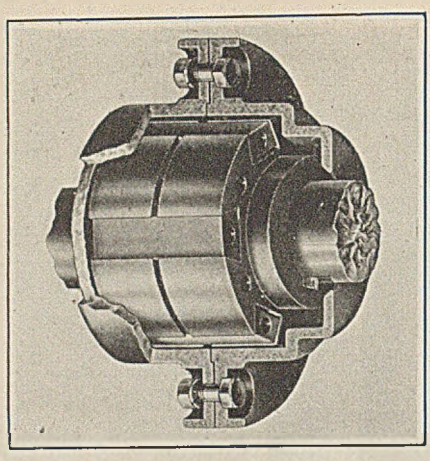
The chain requires only one die or pattern for links of a given pitch, a pin die and a single instead of right and left attachments. No bolts are necessary. This means low production and upkeep cost and rapid assembly or disconnection. The single carrier attachment allows cutting down the weight of this part at least 65 per cent, thus effecting a substantial economy in manufacture. It is estimated that on 9-in. pitch chain this lessens the weight of the chain 1 lb. per foot. No special sprockets are required, as this chain is designed to operate over standard round or octagonal-faced sprocket and foot wheels. The pins also may be designed to work on the outside-drive principle. If desired, pairs of attachments may be bolted to the inside links. The chain as a whole is interchangeable with certain other types.

Misalignment Corrected By Coupling

No matter how carefully a machine may be designed, constructed or installed, if motion and power are to be transmitted from the end of one shaft to the end of another, supposedly lying in the same straight line, three forms of misalignment are liable to be encountered. These are all well known to mechanical men and need nothing more than a mention here. They include parallel misalignment, angular misalignment, and a combination of the two. It is frequently desirable also to provide lateral flexibility commonly known as "float" to compensate for such conditions as a change of electrical center in a motor under varying loads, discrepancies in gear faces and the like.

In order to meet these exacting conditions, W. H. Nicholson & Co., 12 Oregon St., Wilkes-Barre, Pa., has developed and placed on the market the coupling shown in the accompanying illustration. This device is extremely simple in construction and has been designed to compensate for any "practical misalignment," by which is meant the small unavoidable errors present in even the finest class of machine work, and to permit a liberal amount of lateral float as well. This coupling, transmitting power efficiently and without noise, is made entirely of metal. It is self-contained, dustproof and requires no adjustment or attention except occasional lubrication. It is also machined all over and balanced.

It consists of two cast-steel hubs,

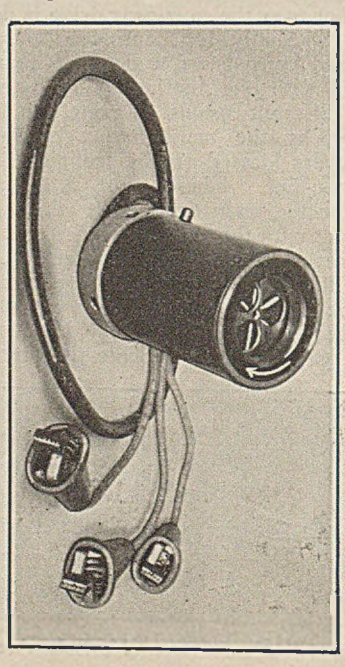


Coupling Construction

keyed to their respective shafts, in which dovetailed slots are cut, varying in number from three to five according to the size of the coupling. The dovetails receive floating steel keys. All of these working parts are inclosed in a cast-steel casing made in halves and bolted together with a gasket between them. The casing is secured to one hub and in addition to excluding dust and dirt and retaining the lubricant, it limits the lateral movement of the floating keys within their slots.

A definite amount of clearance is provided between each key and the slot in which it works. This accommodates an error in alignment between the two shafts equal to approximately twice the clearance. This amount varies somewhat with the different sizes of couplings, but in any case is sufficient to compensate for practical misalignment. It will be readily perceived from the above that when this coupling is in operation between two misaligned shafts, the keys have a slight rocking action during each revolution. This prevents wear from becoming localized and inasmuch as the casing is nearly half full of oil, a film of lubricant is maintained between the floating keys and the slots, thus preventing a metal to metal contact in transmitting the load. It also reduces wear to a minimum as well as being instrumental in permitting lateral float.

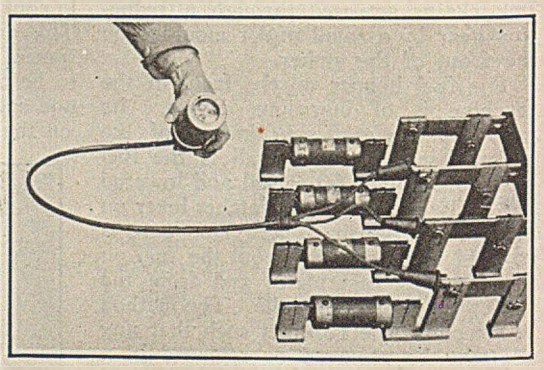
In action the floating keys are thrown out by centrifugal force into the dovetailed slots. When the load on these becomes sufficient to overcome the centrifugal force, the keys are forced down in their slots and drive on the bottom. No matter how loose these keys may be, the centrifugal force automatically controls them and keeps them properly seated and clamped.



Phase-Sequence Indicator Is Compactly Made

Demand for some means of determining phase rotation of power circuits after changes have been made in transformers or other parts of the circuit has led power company men to develop many devices for indicating phase rotation, some of which have been quite ingenious and not a few of which have been described in the technical press. The chief objection to practically all of these devices has been that they are too bulky or else require some technical knowledge to operate them.

The phase-sequence indicator designed by Otto A. Knopp, Chief of Bureau of Tests, Pacific Gas & Electric Co., and shown in the accompanying illustrations embodies in an inexpensive instrument simplicity, compactness, small weight and an extremely rugged device that can be carried by a line gang and operated by any lineman or other workman. It makes use of the rotating field of an electromagnet in a circular steel plate, which produces a magnetic drag in a copper disk mounted on a pivoted shaft. The whole is incased in a Bakelite tube about 2 in. in diameter and 4 in. long and is water-proof. A distinct advantage is said to be in the fact that the device may be operated on either two-phase or three-phase circuits ranging in voltage anywhere from 30 to 500 volts at commercial frequencies without any change in connections. It has three permanent leads which may be either numbered or lettered for phase-wire identification. Clips on the leads permit hanging the instrument like a drop light suspended by its leads. A switch sets the disk in rotation when the phase-sequence indicator is energized.



Wide Adaptability Distinguishes This Phase-Sequence Indicator