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Production Control and the Law

MORE DIFFERENCES of opinion are evidenced in industry thinking on production control than upon any other one of the seven major objectives, except labor policies, in the bituminous stabilization program suggested in the September *Coal Age*. The desirability of a reasonable balance between production and demand is universally conceded, but the methods by which that balance shall be attained are sharply debated. One group whole-heartedly approves modification of existing anti-trust laws; another cynically denies such modification would be of any help; a minority challenges both the efficacy and the soundness of any liberalization.

WITH the announced purpose of the Sherman law "to protect trade and commerce against unlawful restraints and monopolies," there can be no quarrel. At the time this act was passed, industry bursting into raw manhood, with social senses undeveloped and ethical concepts vague and muddy, needed some such corrective as the law implied. Even today, when business is more keenly aware that socially destructive policies spell industrial dissolution, few would ask that the wholesome restraints imposed by the anti-trust statutes be abandoned.

THE ATTACK today comes not from those who would foster unregulated monopoly or invite a revival of competitive practices offensive to enlightened business ideals. On the contrary, the strongest attack is launched by men who see in this body of law statutes twisted out of their original protective purposes into instruments of oppression. Fashioned as a shield to guard the weak from the jungle tactics of the powerful, these laws compel the small and the weak to participate in jungle competition destructive economically and socially indefensible.

SUCH A CLAIM, retort opponents of modification, distorts of the facts. What business should be permitted to do it can do now if it has the will; lack of genuine desire on the part of industrial leaders, not the law, bars effective action and constructive cooperation in remedying existing evils. The fancied prohibitions of the anti-trust statutes, says this group, are a smoke screen set up by business men who believe the lone wolf has the fattest hunting.

THIS SHARP CONFLICT in opinion in itself is one of the strongest arguments in favor of modification. As was strikingly emphasized at the conference on anti-trust laws sponsored by the New York University last month, despite the fact that the Sherman law has been on the statute books since 1890, there is nothing approaching unanimity of opinion either in business, the bar or the bench as to what can and what can not be done under this act. Members of the Supreme Court of the United States have disagreed in interpretation and application in almost half the cases involving the Sherman and related measures decided by that court. Certainly, where there is so much confusion of thought after all these years, clarification or modification is imperative. Even those who hold the law now permits reasonable production control can hardly object to a modification which does no more than give that same assurance to others still floundering in doubt.

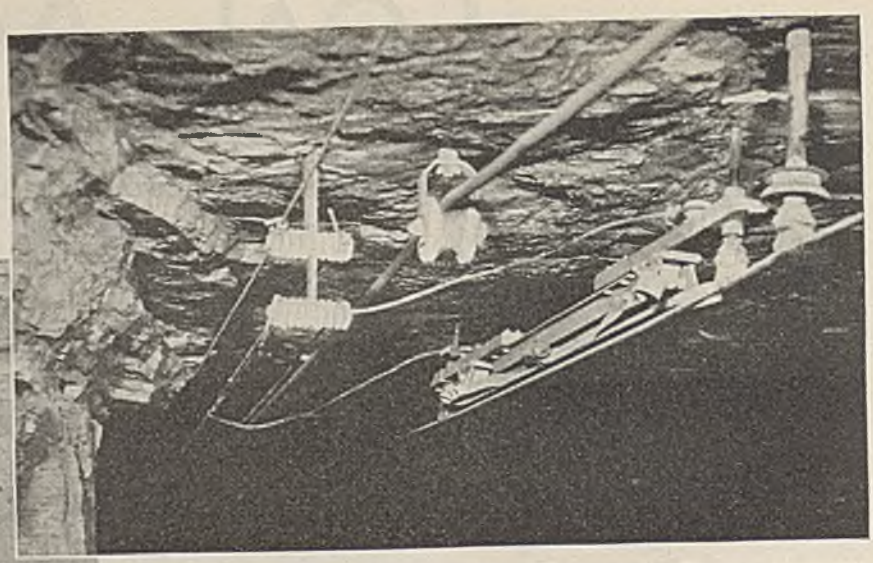


Fig. 2—Signal Buses and a Clearing Contactor

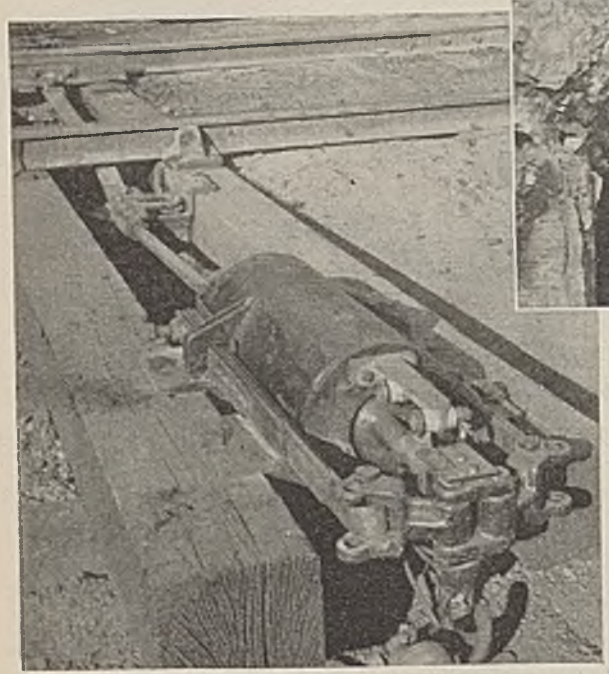


Fig. 1—Cover Removed to Show Plunger, Toggle, and Springs

Fig. 3—Two-Point Control of One-Track Switch

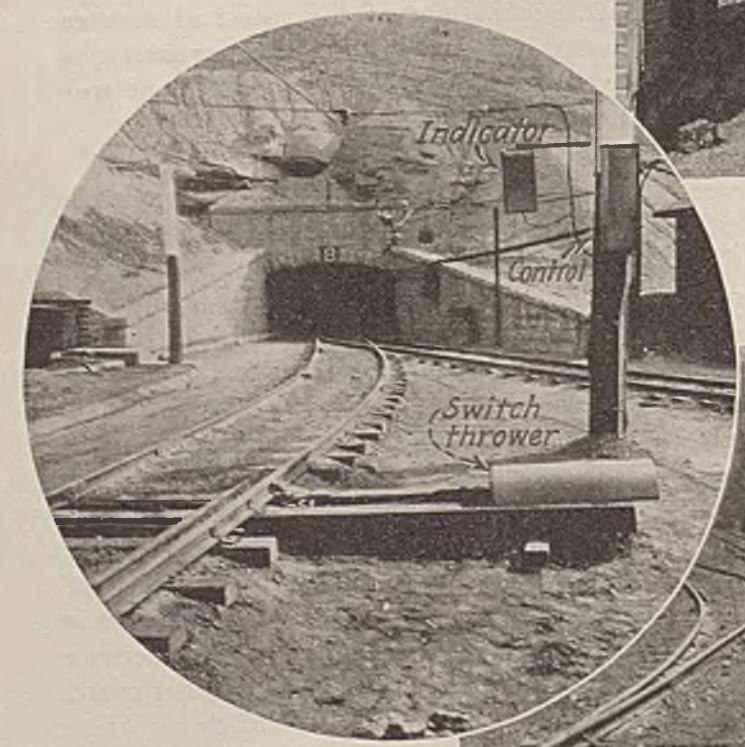
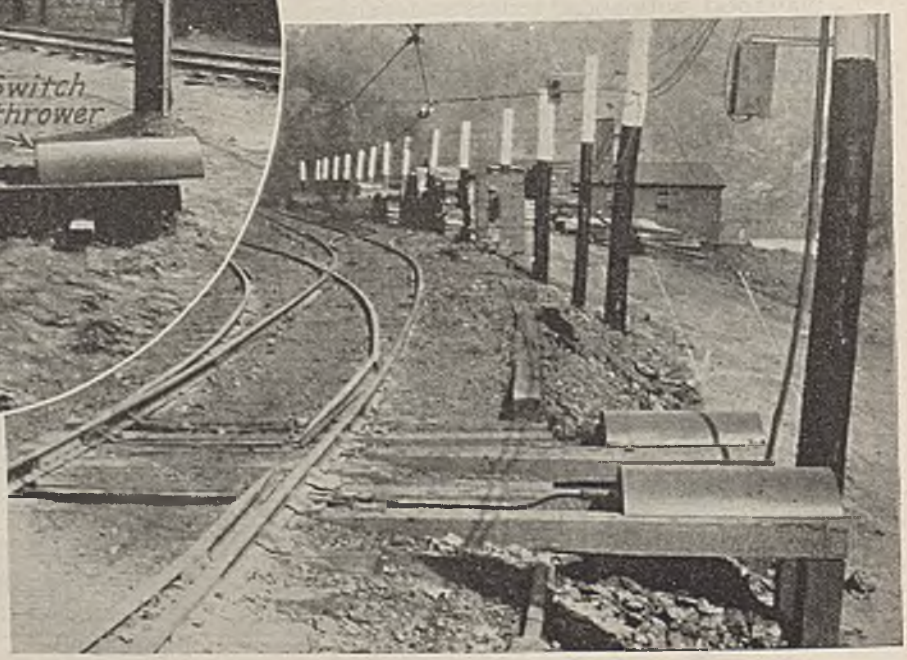


Fig. 9—Electric Switch Thrower at No. 8 Portal

Fig. 5—Two Electrified Track Switches in the Yard



SIGNAL SYSTEM + Yields Safety and Profit

Fig. 6—Track Switches Are Operated by Manipulation of the Controller Handle

WHAT is said to be the most extensive installation of automatic track signals and electric switch throwers in coal mines of this country is now in operation at the Fordson Coal Co., Stone, Ky. Safety was the principal consideration upon which the management based its decision to make an initial installation. Experience of about two years since the first mine was so equipped has demonstrated that the direct operating saving alone justifies the investment.

These mines, controlled by the Ford Motor Co. and located on Pond Creek branch of the Norfolk & Western R.R. about 12 miles from Williamson, W. Va., are drift operations in a comparatively level seam and produce normally, as a group, about 8,000 tons per day. The main haulage roads of Mines No. 3, No. 7, and No. 8 are completely equipped with the automatic signals and switch throwers, and Mine No. 4 is in the process of being so equipped. At Twin Branch, W. Va., another division, which produces about 2,000 tons per day, two sections of the main line in the No. 5 mine are similarly equipped.

With complete signal protection and automatic switching it was found unnecessary to have brakemen on the main-line locomotives, thus eliminating the most hazardous class of work. In the No. 8 mine, which has the most elaborate system, the increased efficiency of the haulage units made it possible to retire one locomotive. In this mine the wages of one motorman, three brakemen, and three trappers are being saved. At the comparatively high daily wage paid by the Ford interests this represents an attractive earning on the investment.

Equipment of a standard type which has proved its worth in street railway service and has been tested in coal mines, was selected. The signal equipment, operating from the 275-volt d.c. trolley without batteries, affords front and rear protection to the trains. Lamps of the signal and pilot indicators are set and cleared automatically as the locomotive trolley wheel engages contactors mounted close to the trolley wire. The throwing of track switches is not full-automatic, but instead is remotely controlled by the motorman. Without stopping, he selects and executes the switch position desired by bringing the locomotive controller to the "off" position or by leaving it on a current position as his trolley wheel passes through a special contactor.

Complete signal protection of a section of main line including a siding and three branch roads to active sections is illustrated in Fig. 7. Signal indicators, pilot indicators, and trolley contactors are shown in their relative locations except that the distances are compacted. The type SUD relay boxes and signal wires are placed on the drawing without regard to their actual locations. The directional clearing contactors on the branch roads are located a distance from the turnout somewhat greater than the length of the longest trip; this in order that an inbound locomotive will not "clear" the lights of the block it is leaving before the last car of its train has moved clear of the main line.

Blocks may be arranged to any length desired. One type SUD relay box is required for each point of entrance. Signal equipment is duplicated on the two sides of the passing track. This allows for moving equipment either direction on either track, which is of special advantage at night when one track may be blocked with slate. Signals for one way operation on each side were first installed, but later changed in favor of the two-way scheme.

The following paragraphs quoted from the coal company standards serve to explain the functions of the equipment and indicate the method of operation:

1. A DARK signal indicates a CLEAR block.

2. A RED signal indicates a train in the block, entered from some other point.

3. A GREEN signal pilot indicates a train in the block entered from that point.

4. An operator shall not overrun a red signal pilot indication.

5. An operator shall not operate on a green signal pilot indication set by a preceding train, but shall wait in the clear at the point of entrance until the preceding train has cleared the block, which will be indicated by the signal turning dark.

6. Operators shall not approach track switches or signal indicator stations at a speed greater than five (5) miles per hour.

7. On a dark signal indication, an operator may advance to the setting contactor of the block about to be entered and, upon obtaining a green signal pilot at this point, proceed through the block.

8. Should an operator receive both a green and red signal pilot on entering a block which indicates that a train has entered the block from some other point and has right of way preference over the train receiving both the green and red signal pilots; the operator receiving both the green and red signal pilots is to stop his train in the clear, using care not to run his trolley through the clearing contactor of the block in question, which would clear the signals in the block and leave the preferred train in the block without signal protection. Only after the preferred train has passed out of the block and cleared the signals shall the operator attempt to enter the block.

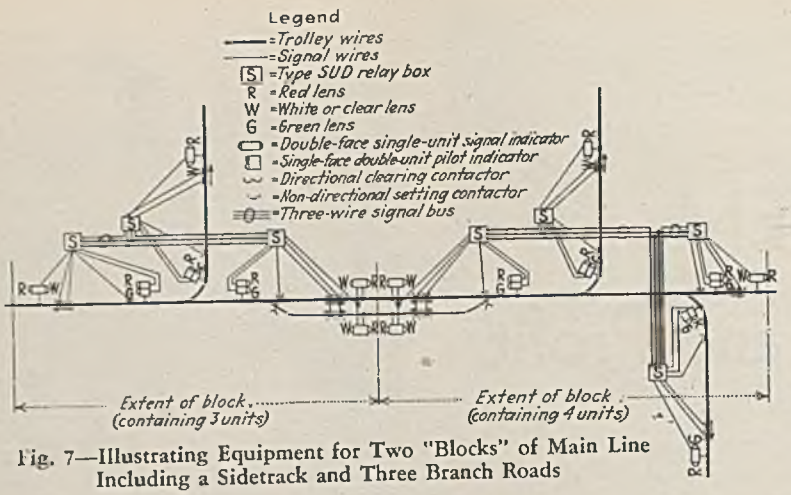


Fig. 7—Illustrating Equipment for Two "Blocks" of Main Line Including a Sidetrack and Three Branch Roads

9. On failure to obtain the proper signal pilot indication when entering the block, the operator is to stop his train and call the dispatcher for operating instructions. He is not to operate without the proper signal or telephone protection.

10. Block signals shall apply to locomotives, mining machines, mine cars, push cars, or any equipment that might block the track.

As indicated by paragraph No. 8 the signal system provides protection against simultaneous entrance of two trains into a block. By a change of connections either end can be given preference over the other entrances to the block.

The drawing of a three-unit block Fig. 8, is reproduced to show the equipment that is housed in the type SUD relay boxes and to indicate the internal connections. Numerals below the signal and pilot lamps indicate that these lamps are in the signal boxes listed by corresponding numerals. Contactors of the type SUD relay are oil-immersed.

Signal control circuits, including the three-wire buses connecting the SUD relays, are No. 12 B & S single conductor double-galvanized solid iron wire with triple-braid weatherproof insulation. The wires are supported on porcelain knobs mounted on roof or ribs, depending on clearance and local condition. At the left in Fig. 2 is a typical signal wire support. At the right hand, clamped to the trolley wire, is a directional clearing contactor. The heavy cable in the center is not a part of the signal system but is a d.c. power feeder.

In order to convey some idea of the installed cost of this type of automatic signal system, assume a hypothetical case of a two-mile main haul with one passing sidetrack and three junctions with branch roads. If three signal blocks are provided for protection of this layout, the labor and material will amount to about $3,000.

In all of the Fordson mines the gathering sidetracks are protected by signals, but for the most part these are of a simple hand-operated type. Installation of automatic signals to replace those of manual control is included in a tentative program of future improvements.

One of the solenoid-operated switch throwers with cover off is shown in Fig. 1. A toggle mechanism with heavy leaf springs assures a full throw of the switch points and exerts a force to hold them in position.

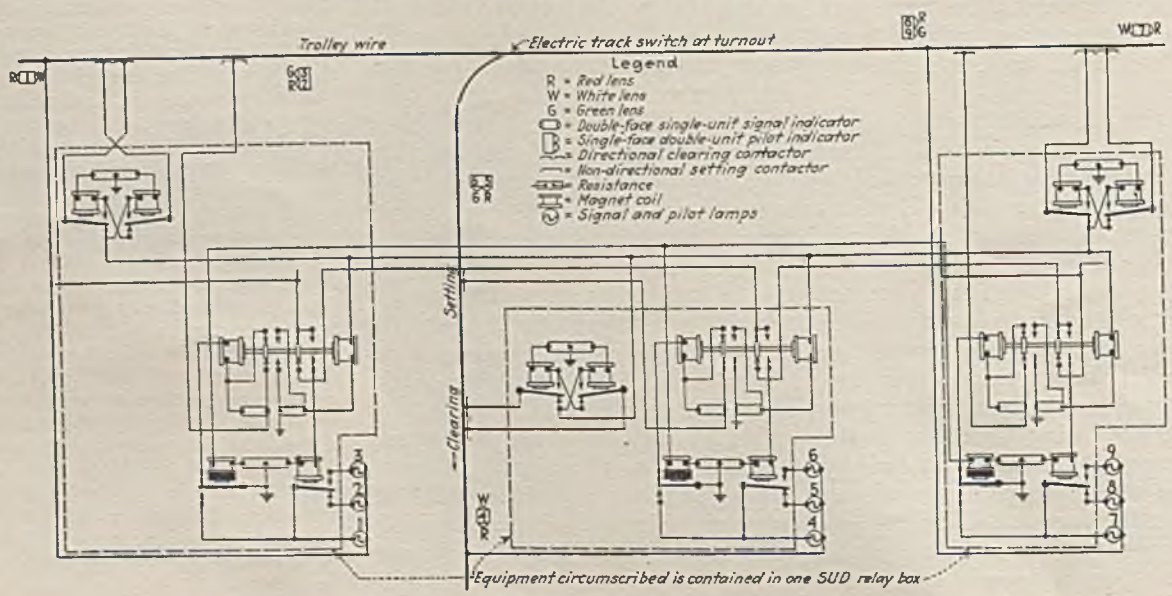
In Fig. 6 the locomotive trolley wheel is just passing through a switch thrower contactor. Whether the track switch is unmoved or is thrown to an opposite position depends on whether the locomotive is coasted through the contactor or is operated with power on. Interposed in the electrical circuit between the trolley contactor and switch thrower is a control box containing relays and a magnetic contactor with blowout. Terminals are provided for switch-position indicating lamps.

In Fig. 3, which is a view from near the mine portal and looking toward No. 8 tipple, contactors are in evidence on the trolleys above the two nearest tracks. These contactors are connected in parallel and serve to operate one track switch from two approaches.

Equipping underground haulways with automatic block signals and remote-control switch throws, as has been done at the Fordson mines, appears to be the next logical step for general acceptance as a means of increasing the safety and efficiency of coal-mine haulage.

The signal equipment in use was furnished by the Nachod & United States Signal Co., Inc., and switch-thrower equipment by the Cheatham Electric Switching Service Co.

Fig. 8—Wiring Diagram of a Three-Unit Block



PHYSICAL EXAMINATION + Would Reduce Accidents

By R. R. SAYERS

Chief Surgeon, U. S. Bureau of Mines
Washington, D. C.

IN A LIST of accident rates by industries, compiled by the National Safety Council from reports of member establishments, mining was second on the list in frequency (49.34 per 1,000,000 man-hours worked) and was first on the list in severity rates (8.94 days lost per 1,000 man-hours worked). Industries showing figures most comparable to mining for 1930 are woodworking and lumbering, with a frequency rate of 40.53 and a severity rate of 3.31; and construction, with a frequency rate of 51.57 and a severity rate of 5.49.

H. W. Heinrich, in his book on "Industrial Accident Prevention," calls attention to the inaccurate practice of referring to the cause of an injury as being the cause of the accident. A person is injured by a fall, the fall is the accident, but what we need to know, in order to prevent falls, is what caused the fall. Perhaps instead of calling the fall the "cause" of the accident, it would be better to call it the "occasion." The cause of an accident is what actually produces it or brings it about; the occasion is what, directly or indirectly, provides an opportunity for the causal agencies to act or serves to set them in motion. When a person is injured falling downstairs, the fall is the direct cause of the injury but not of the accident itself, which may be due to the physiological condition of the victim, who may have defective eyesight, epilepsy, or may be suffering from some other disability that causes him to fall when occasion presents itself.

In an analysis of 11,000 fatal and non-fatal cases, more than twice as many accidents were due to non-mechanical agents as were chargeable to machinery in operation. This emphasizes the importance of the human factor in accident prevention. Accidents have very largely been reduced where protective measures have been employed, but the number of accidents attributable to the human equation and caused by carelessness, indifference, and thoughtlessness are increasing and constitute today the biggest problem in accident prevention.

As the individual seems to be the most important factor in accident causation, information as to the means of correction must be sought by a critical examination of the human machine, so that its deficiencies as to structure or function will be revealed. This principle is applied to every complex device used in industry but is neglected with regard to the infinitely more complex device that guides the machinery.

R. R. Sayers

Study indicates that perhaps many of the accidents now attributed to the carelessness, indifference, or mental deficiency of the employee may be due to poor health or to undiscovered or unrealized physical defects. What is the connection between poor health and physical defects and accidents? The Hood Rubber Co. found that men rated as third class had nearly twice the accident rate of those rated as second class. These findings were obtained in spite of the fact that third-class persons had been placed in occupations involving low accident risk.

The relation of certain physical defects to accidents is apparent to anyone, such as loss of an eye, an arm, a leg or finger. Many employment man working under every lift he eye, but as they cannot see the inside of the heart they hire a crane man who is a menace to himself and every man working under every lift he makes. They turn down the man lacking two or more fingers and hire the man with active tuberculosis, while failing to take precautions to prevent the spread of the disease. They will hire a man with two eyes that appear sound, yet which are so defective that they do not enable their owner to see the largest letters on the test chart. According to F. N. Schrem, there are many more men applying for work in the average industry whose eyes appear all right and yet who are almost blind in one eye than there are whose eye defects are noticeable.

Most widespread of physical defects is faulty vision and, therefore, probably the one involved in the largest number of accidents. Studies in Pennsylvania have shown that mor than half of the total accident claims arise from injuries to the eye. There is no method for determining the percentage of accidents happening to other parts of the body that might have been avoided had the employees' eyesight been raised to the point of highest efficiency. The fraction of a second necessary for the normal, healthy eye to comprehend the circumstances of danger may be all that is needed to avoid a blow. In such an emergency, however, seriously defective vision is almost entirely helpless.

Abstract of article on "Relation of Illness to Safety in Mining," read before the National Safety Congress Council, at Chicago, Oct. 13.

R. S. Simpson has stated that about 70 per cent of our muscular activities are initiated in response to impulses induced by our sense of sight. This fact, coupled with the average defective vision may, in large measure, explain many accidents which, for want of a definite understanding of their causes, are at present ascribed to carelessness or heedlessness. In some plants where thorough examinations were made it was found that nine out of every ten workers had defects of vision and that only a small number were correcting these defects with glasses. In other plants between 60 and 80 per cent of the total number employed had defective vision.

In some mines in which the employees have been given a physical examination the percentage of eye defects seems to be lower than in other industries. In an examination of the eyes of 800 employees of three mines of the St. Louis Smelting & Refining Works and the National Lead Co., only about 20 per cent of the men had defective vision. In an examination by the U. S. Bureau of Mines of 1,098 miners, 21.4 per cent were found to have defective vision in one or both eyes. Twenty of 81 applicants who presented themselves for examination for certificates as hoisting engineers in Utah had defective vision.

Little material is available to show the connection between the physical condition of an individual and the accidents he may experience. However, in a study of accidents among motormen and bus operators, a canvass of the company's records showed that accidents did not distribute themselves impartially among the men by whom the cars were operated. Half the accidents happened to less than a third of the operators. In one group of 200 men of ample experience and maturity in the service, half of the accidents happened to only one-fifth of the motormen.

With a realization of the impaired physical condition of such a large proportion of industrial workers, the importance and economic value of health supervision in industry becomes increasingly apparent. The work of a plant physician should reach all departments and all activities of the organization. Coexistent with his curative and preventive activities should be a desire to see that men are placed at work for which they are physically qualified. The only method of attaining this end is through the physical examination of workers and of applicants for employment, to determine not only their physical condition but their mental attitude as well.

Such examination should disclose in each case whether the worker is fit for the job for which he applies or is occupying, or whether he should be given a different type of work because of some physical defect or weakness, or rejected if no suitable work is then available. More and more effort is being made to find work for all.

Physical examinations are frequently made of workers before transference to more hazardous or exacting jobs. This often will prevent a future accident or breakdown in health. In many cases a worker with physical defects or suffering from some diseased condition, often unknown to himself, is a cause of accidents to others as well as to himself.

Some of the sources of waste arising from the placement of all comers on jobs without any effort at a physical selection for their work are: (1) Labor turnover due to the employment of the unfit who later must be discharged because of inability to do the work or who are forced to stop work due to advancing disease. These latter have been a source of loss during the entire period of employment, on account of the gradual decrease in their efficiency. (2) Increased industrial liability to accidents of those who, because of their physical condition, are subject to frequent accidents. (3) Absenteeism due to illness and lost-time accidents. (4) Liability to long disability compensation of those who suffer accidents that ordinarily would not be serious but, because of coincidental physical conditions, cause prolonged disability or death. (5) Loss of services of those who are healthy through contraction of contagious diseases. The acute contagious diseases are more common, but tuberculosis and syphilis also cause great loss.

Employers should not make physical examinations with the sole idea of weeding out the unfit. It should be kept in mind that men must work, and it is the duty of the plant physician to place men to the best of their abilities. He should remember that if a man is, for physical reasons, a danger to himself, to his fellow man, or to the job, he should be adjudged unfit for the position. Other than this, a sincere attempt should be made to place all persons.

From an economic standpoint the worker is the one who pays the greater part of the enormous cost of industrial injuries. In spite of the compensation laws, the workers still bear four-fifths of the economic burden resulting from industrial injuries.

If, as has been estimated, 90 per cent of the accidents are due to the individual workers, and probably 90 per cent of these workers have physical impairment or defects ranging from moderate impairment (requiring some form of hygienic guidance or minor medical, dental, or surgical treatment) to serious physical impairment or defect (urgently demanding immediate attention) and that probably 75 per cent of these impairments or defects could be cured or benefited by treatment, it is of the greatest advantage to the individual that he find out his physical assets and liabilities.

In addition to the economic loss in wages due to accidents, mentioned above, the worker must count the hours of physical suffering and the inconvenience to himself and his family, as well as the possibility of permanent, partial, or total disability with a loss in his earning power. Probably in many cases the years of mental distress outweigh the years of pain and suffering incident to the immediate accident. It is impossible to evaluate the actual cost to an injured person of reduced earning power and inability to advance in position. But for the resulting handicap he might have been advanced far up the ladder of supervising responsibility.

In accordance with findings of physical examination, prospective employees may be classed as follows: (1) Those physically fit for any work. (2) Those physically underdeveloped, or with some slight anatomical defect; otherwise fit for any work. (3) Those fit only for certain employment when approved and supervised by the medical department. (4) Those unfit for any employment.

A large corporation employing thousands of men found that 7 per cent of those applying for work were physically unfit, but that by simple operations and other corrective measures 75 per cent of those rejected on original examination were sufficiently restored to normal to warrant their employment; thus the total net rejections were less than two per cent of all those applying.

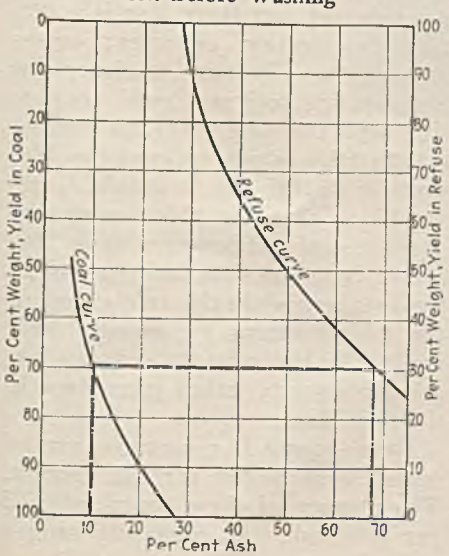
Abnormal conditions of the air, including the presence of dust and insufficient illumination, are two health hazards in the mining industry that may predispose an individual to accidents.

MIDVALLEY BREAKER + Embodies New Principles In Coal Cleaning

ONE of the outstanding examples of modern coal-cleaning methods is the Midvalley Breaker of the Hazle Brook Coal Co., located in the Western Middle anthracite field, not far from Mount Carmel, Pa. Mount Carmel is in Northumberland County, but the breaker is in the adjacent county of Columbia. Coal is being cleaned by four systems—the Chance sand flotation, Hydrotators, Deister Overstrom diagonal-deck tables, and Wilmot refuse jigs.

Coal is brought to the breaker head up an incline which, underground, follows closely the inclination of the heavily pitching seam, which runs from 35 to 40 deg. to the horizontal. Above ground the coal travels over a structural-steel plane on an inclination of 35 deg. On reaching the breaker head the coal is dumped over a chute into a hopper. In the chute is a rock gate, by which the contents of cars of rock can be diverted to a rock chute. This chute is located under the incline by which the cars are brought to the breaker, thus making the expense of a second trestle unnecessary. Coal is fed from the hopper to the bull shakers under the control of a push feeder which consists of a plate pushed to and fro by two cranks which are actuated by a belt-driven shaft.

Fig. 1—Washability Curves for Mixed Rice, Barley and Silt Before Washing

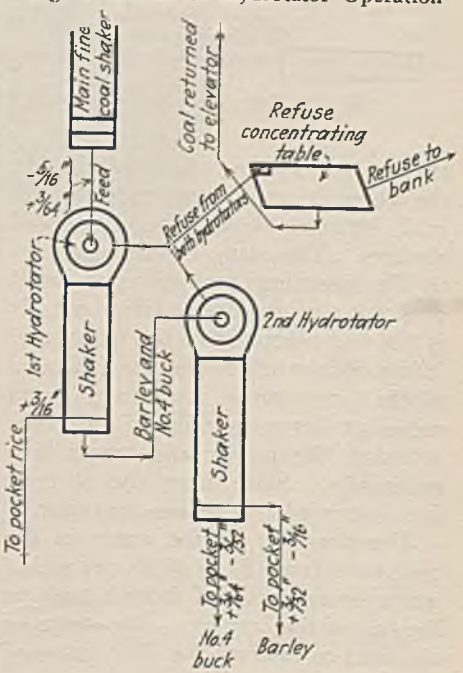


On the bull shakers the coal is sized into broken-and-over and egg-and-under, the openings in the screen being of $3\frac{7}{16}$-in. diameter. The larger coal goes to picking tables and is cleaned by four men. Thence it is led to 34x36-in. crusher rolls, where it is reduced to broken-and-under. All the coal that will go through a screen with holes of $3\frac{7}{16}$-in. diameter is then removed as egg-and-under, and passes to the stream of coal of that size from the bull shakers. The broken coal then goes to 34x36-in. egg-coal rolls, where it is reduced to egg-and-under, after which it joins the rest of the coal of that size. The entire product then goes to cone-feed shakers which separate the pea-and-over from the buckwheat-and-under, the former going to the Chance separator and the latter to tables and Hydrotators.

All the pea, nut, stove, and egg coal is washed in a single Chance unit of 13 ft. 6 in. diameter. The coal leaving the top of the cone goes over a desanding shaker, all material under $\frac{5}{16}$ in. going to the 15-ft. diameter sand sump, and all above that size to the sizing shakers which deliver egg, stove, nut, and pea, which pass to the loading pocket. The small quantity of fine coal which goes through a $\frac{1}{3}\frac{7}{2}$-in. screen passes to elevators which carry coal of many sizes. These deliver it to the aforementioned cone-feed shakers, which again separate it with the fine coal from other sources for delivery to the Hydrotators and Deister Overstrom diagonal deck tables.

Refuse from the Chance cone, which includes practically all heavy impurities, such as sand rock, slate, and most of the bone, is screened into three sizes: (1) egg-and-stove; (2) nut-and-pea (plus breakage), and (3) material under $\frac{5}{16}$-in. diameter. The first two are washed separately in Wilmot Type D refuse jigs. The fine material and sand go to the 9-ft. sand sump. The coal end of the egg-and-stove refuse jig goes to 24x34-in. rolls and is crushed to nut-and-pea. The coal end of the nut-and-pea jig goes to 18x30-in. rolls and is crushed to pea-and-buckwheat. The product from both sets of rolls, together with

Fig. 2—Detail of Hydrotator Operation



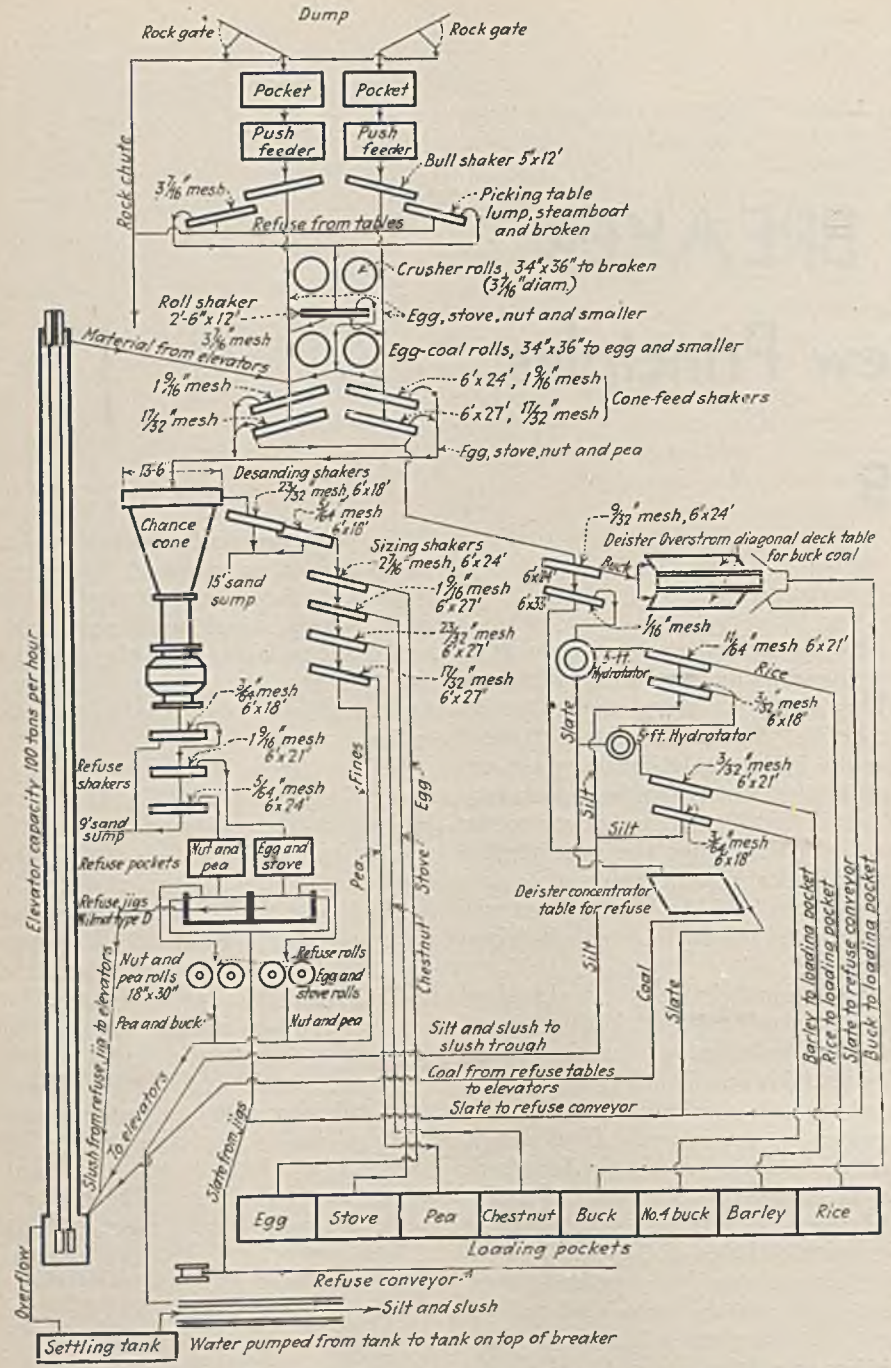


Fig. 3—Flow Sheet Showing Sand Flotation, Hydrotators, Tables and Jigs

the slush from the refuse jig, goes to the elevator and is returned to the coal stream above the cone-feed shakers. The same elevator handles the lip screenings and any condemned coal that may require re-treatment. It is the only elevator in the plant, and it has little work to do, the coal as a whole proceeding downward from mine-car dump to railroad car, thus reducing the power and repair bills materially. Slate from the Wilmot jigs is carried to a refuse conveyor.

The pressure of the water in the cone runs from 30 to 40 lb. per sq.in., water being provided from a tank on the top of the breaker. The steam or air used to operate the slate gates of the Chance cone is admitted by an electrically operated cam, air being used during the summer, when no steam is available, and steam in the winter. The use of steam in cold weather prevents freezing of the valves. A Barrett-Haentjens chrome-iron sand pump has been used to replace the former cast-iron pump. Out of the chrome-iron pump 2,500 hr. of service was obtained, whereas a cast-iron unit would last only three or four weeks at longest; yet the former at the end of the 2,500 hr. was by no means spent, but was kept as a spare for emergency use.

As already stated, the fines passing through a $\frac{5}{32}$-in. screen go from the cone-feed shakers to the Hydrotators and Deister Overstrom tables; but for this, further sizing on a $\frac{9}{32}$-in. mesh screen is necessary. The oversize, which is buckwheat, goes to two Deister Overstrom tables. Slate from this table goes to the refuse conveyor and clean buckwheat to the appropriate loading pocket.

Undersize from the aforementioned screen falls on a $\frac{1}{16}$-in. mesh screen, the oversize going to a 5-ft. Hydrotator, which thus receives rice, barley, and No. 4 buckwheat. The coal end of the Hydrotator passes over a double-deck shaker, and the rice, or plus $\frac{3}{16}$-in. coal from the top deck, goes to the loading pocket. Barley and No. 4 buckwheat from the second deck are recleaned in a second Hydrotator and are separated into their respective sizes after cleaning. The slate ends of both machines go to a Deister Concentrator Co. table for recleaning, from which table the coal end is sent back into the breaker feed, and the slate end is sent to the refuse bank.

This composite system of cleaning has long been recognized in metal concentrating plants when separating minerals from gangue. In such concentrators a combination of two or more methods is used to obtain the desired results. It is only at a comparatively recent date that any of the anthracite operators have recognized the possibilities of such a method. In the past a choice has been made of a single one of several possible methods, with no thought of a combination of some two or more systems of separation.

In the Midvalley breaker the two methods of cleaning the small sizes supplement each other. The principle used in the Hydrotator is that of hindered settling. A very close specific-gravity separation is made giving a low-ash coal, but there also is a certain classification of sizes; consequently there is some tendency for the oversize coal and good bone to sink with the slate. On the concentrating table which recleans the Hydrotator refuse the principle is reversed in that the above-mentioned oversize coal and bone are easily separated from the slate and returned to the breaker, while the refuse end of the table contains surprisingly little coal. The Hydrotator, because of its greater capacity, takes precedence in the flow sheet.

In one month 24 consecutive cars of barley were tested for ash content. The average of these contained 10.2 per cent ash. A composite sample

of barley slate was made from daily samples and was analyzed once a week; it showed an average for the four weeks of 68.6 per cent ash. These analyses were made by the Hazle Brook Coal Co. without any knowledge that they were to be used except in the daily routine. From a composite sample of feed the chart (Fig. 1) was made showing the coal and refuse data as made from float-and-sink tests.

It can be seen how closely the theoretically possible results correspond with the actual. Starting with a 10.2 per cent ash coal (Fig. 1), the vertical dotted line intersects the curve at a point showing 69.5 per cent recovery of coal. The horizontal dotted line intersects the refuse curve at a point showing 68 per cent ash in the refuse, indicated by the vertical line at this point. The actual refuse, as already stated, ran 68.6 per cent ash. The operation was practically automatic. Neither the slate gates of the Hydrotator nor the operating conditions of the Deister Overstrom concentrating table needed regulation after they were properly adjusted. The part-time services of only one man were needed for the entire installation.

The wash water of the entire breaker goes to a settling tank, from which water is pumped to a tank at the top of the breaker. The underflow from this tank, containing silt and slush, is taken to a settling pond which has been constructed by dumping cars of mine rock and breaker refuse around its periphery.

A motor-driven belt drives the line shaft, which in turn actuates the bull shakers, the pusher feed, the one elevator, and the crushers. The crushers are connected up by a rope drive, because the distance between centers is long and a belt would interfere with other machinery. The breaker which cleans and prepares 1,000 tons daily employs three men on the dump, four men on the picking table, a boss in charge of this table, one picker for the removal of discolored coal, one cone tender and two helpers, one man operating the two Hydrotators and the two No. 1 buckwheat tables, one man supervising the refuse tables and jigs, three men loading coal below the breaker (one being a car cleaner and the other two loaders), two breaker cleaners, one man taking care of the condemned coal and the lime neutralizing plant, four men on refuse bank, one refuse locomotive engineer, one repair man, one oiler, one inspector, and one breaker boss—29 men in all. The refuse is handled by six Western cars and one locomotive.

To neutralize the water, 1,000 to 1,300 lb. of hydrated lime is used daily, as most of the water used in the breaker is pumped from the mine. This lime is fed in measured quantity to the water by a Gauntt feeder manufactured by the H. J. Savage Co. The breaker is boarded and battened. To keep the plant warm six large hot-air heating units have been provided by the American Blower Corporation, and two small units. These keep the entire plant warm in the coldest of weather.

Midvalley Breaker

NATIONAL SAFETY COUNCIL

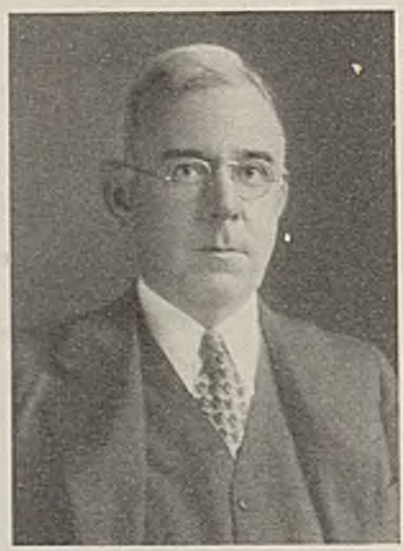
+ Lays Stress on Individual's Proneness to Accident

THAT the true cause of many accidents is not carelessness or ignorance or occupational hazard but the physical condition of the workman, was the gist of the paper by Dr. R. R. Sayers, chief surgeon, U. S. Bureau of Mines, at the Twentieth Annual Safety Congress of the National Safety Council which met at Chicago, Oct. 12-16. An abstract of the article may be found on pp. 573 and 574.

In opening the meeting of the mining section as chairman, Oct. 13, R. N. Hosler, superintendent, Coal Mining Section, Pennsylvania Compensation Rating and Inspection Bureau, Harrisburg, Pa., said that one-seventh to one-eighth of the entire labor cost is accident expense. This is an operating problem and must be solved as such. Excellent records made in mines of all kinds and conditions proved that bad roof need not result in a high accident record. His conclusion was that natural local conditions have so little to do with accidents that safety can be obtained in the face of adverse conditions equal to that attained where conditions are favorable.

Daniel Harrington, chief safety engineer, U. S. Bureau of Mines, Washington, D. C., reported on accident statistics for W. W. Adams, accident statistician for the same organization. His findings are embodied in the report of the Bureau known as Serial No. 3126. Mr. Harrington, in making his report as secretary, said that if the present record for 1931 to date were continued through the year the fatality record for coal mining would be 400 to 500 less than that of any other year during the present century. To date only one state, Indiana, had failed during the present year to lower its accident record.

Frank B. Dunbar, general manager, Pickands, Mather & Co., Mather, Pa., read a paper on "Discipline in Relation to Accidents." He declared that safety discipline was more important than low coal cost, and low coal costs are not possible without safety discipline.



Waldo H. Comins

At the afternoon session, the officers for the new year who had been nominated at the morning session were elected unanimously. They were as follows: General chairman, W. H. Comins, local manager, National Lead Co., St. Francois, Mo.; first vice-chairman, Thomas E. Lightfoot, engineer for accident prevention and compensation, Koppers Coal Co., Pittsburgh, Pa.; second vice-chairman, F. W. Alt, chief safety engineer, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.; third vice-chairman, Mr. Dunbar; fourth vice-chairman, P. M. Arthur, director of personnel, American Zinc Co. of Tennessee, Mascot, Tenn.; secretary and news-letter editor, Mr. Harrington.

The drift of the paper by William Conibear, assistant superintendent, Cleveland-Cliffs Iron Co., Ishpeming, Mich., on "Education Process in Accident Prevention Work" was that men could not be trusted to educate themselves as the results of their own experiences. Experience, he said, might be the best teacher, which is at least debatable, but it is also the dearest and the slowest.

In response to C. W. Gibbs, general manager, Harwick Coal & Coke Co., Pittsburgh, Pa., Mr. Conibear said that educative processes were supplemented at the Cleveland-Cliffs mines with all the aids dramatizing safety. A flag flies at every mine whenever not a single man is absent because of a lost-time accident. Every man in every mine that goes a year without a lost-time accident is given a gold button.

Much has been said about the excellent mining record in 1931. It has been ascribed to the fact that discipline has tightened during the depression in the coal industry, but Milton H. Fies, vice-president in charge of operations, De Bardeleben Coal Corporation, Birmingham, Ala., in his paper on "The Safety Plan of the National Coal Association" said that in other years of depression fatalities had increased. The irregularity of operations had hitherto acted unfavorably to safety.

If the United States produced more tons per fatality that was because tons were more easily produced. That factor had little to do with safety. It was largely due to more favorable operating conditions. If there is less blood on our coal, he said, there is more despair in the hearts of the miners. It did not lessen their hard fate when the fatalities per ton went down if the record per man-hour rose. Mr. Harrington remarked that the Empire mine of the De Bardeleben company at one time had run two full years lacking one day without a lost-time accident and was well on its way toward establishing another record.

At the Wednesday afternoon session, A. C. Callen, professor of

C. W. Bergquist

mining engineering, University of Illinois, Urbana, Ill., discussed the "Inspection of Electrical Equipment in the Mining Industry" and declared that the matter of such inspection had been generally overlooked in mining. Pennsylvania had at one time four electrical inspectors and now had only one.

Laws, said Prof. Callen, greatly needed extension to cover electrical hazards. Only the bituminous law of Pennsylvania filled the requirements of adequate legislation, but he believed that, even in the absence of further legislative enactment, with a correct yet broad interpretation of the powers already conferred on inspectors, enough authority lay in existing laws to permit them to insist on safe electrical installation and maintenance. Some state inspectorates are doing so now; notably Alabama. W. B. Hillhouse, chief, department of mines, Birmingham, Ala., has indicated to his inspectors what corrections in electrical installation and maintenance his men are justified in demanding.

In the discussion of the paper, Mr. Harrington said that his inquiries in the last four years had shown that out of 897 fatalities caused by explosions throughout the United States, 74.8 per cent had resulted directly from electrical ignitions. In Alabama in 5½ years 71 men had been killed by contact with wires, but during the present year, no electrocutions had occurred, because of Mr. Hillhouse's active campaign for safer electrical conditions.

G. N. McClellan, safety engineer, Butler Consolidated Coal Co., Wildwood, Pa., said that in his mines a machine which stalls must be moved outby the last crosscut before inspection. If it can't be moved, inspection of the machine must await the arrival of the assistant foreman. When he has tested the place for gas and found the place clear, the inspection may be made.

George Martinson, safety engineer, Pickands, Mather & Co., Hibbing, Minn., presided over the question box "What Are the Advantages and Disadvantages of Physical Examinations Before Employment and at Six- or Twelve-Month Intervals During Employment?" Mr. Martinson said we are slowly emerging from the time when the foreman insisted that he should do his own hiring, because "he knew a strong back when he saw it." Later the men objected to physical employment, but latterly the principle had been generally accepted on the Iron Range. J. J. Forbes advocated physical examinations. Why should anyone give a man with a leaky heart a timber job?

O. F. McShane, industrial commissioner, Salt Lake City, Utah, said that no man found by the doctors needing rehabilitation is entitled to a job if he refuses to receive treatment, but he should be treated free.

At Thursday's session of the mining section, O. U. Simpson, safety inspector, Alabama By-Products Corporation, Dixiana, Ala., read a paper by W. B. Hillhouse, chief, department of mines, Birmingham, Ala., entitled "Prevention of Fatalities From Roof Falls." Mr. Hillhouse showed that in 1927 there were 61 fatalities from that cause in the State of Alabama and that in 1931 up until Aug. 1 (seven months) there were 5 fatalities. In the first of the two years mentioned, there was one fatality to 330,999 tons, and in the second, one to about 1,300,000 tons. "Systematic timbering," said Mr. Hillhouse, "has become general practice throughout the state." He added that longwall mining in Alabama had been remarkably free from roof-fall fatalities, due entirely to the employment of regular timbering crews and to continuous supervision by the wall foreman.

K. S. Hughes, colliery superintendent, Hudson Coal Co., Scranton, Pa., said that with his company there had been fewer rock falls in longwall than in other mine workings. Because the places traveled forward more rapidly with scraper mining than with hand mining, the roof did not have time to slack and fall. With steel jacks, the placing of supports had to be systematized, and this in itself made for safety.

Mr. Dunbar declared that no roof could be trusted except when propped. Kettle bottoms often fell out at points where, prior to the fall, the underside of the roof was so undisturbed as to give no evidence of their presence. In fact, where the roof is good is just where accidents happen; the miner takes care to prop a bad roof. At his mines all cap-pieces are delivered duly wedged, thus saving many accidents from the mishandling of axes. A man is not allowed to use an axe with a long handle. The handles must be cut down so as to be not over 18 in. long. Mr. Dunbar's standard for cap-pieces required that they be 1 in. thick, 4 in. wide, and 12 in. long.

W. H. Cameron

Mr. Hughes said the Hudson Coal Co. had a plan for every seam, but on every plan the company was careful to order that, though the instructions must be followed, more timber than ordered must be used if either miner or foreman deemed it necessary.

Mr. Comins led the discussion on the question-box problem "What Is the Best and Safest Method of Illumination in Mines?" Mr. Harrington said the U. S. Bureau of Mines had an expert lent by the U. S. Health Service and an engineer from the Bureau studying that subject. They had ascertained many things; among them that the coal miner in his ordinary work is receiving only one-twentieth to one-thirtieth of the light regularly afforded a clerk in a Washington office.

At the banquet it was announced that C. W. Bergquist, superintendent, public relations, Western Electric Co., Chicago, was re-elected president for the ensuing year. W. H. Cameron also was re-elected managing director.

SECOND OF A SERIES OF ARTICLES ON
BEST METHODS IN MECHANICAL LOADING

HAULAGE PROBLEMS + In Mechanical Loading

By K. E. CAINE
Mining Engineer
Joy Manufacturing Co.

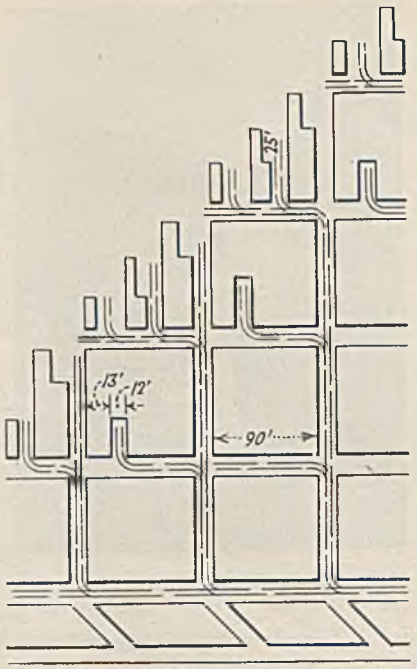


Fig. 1—Slabbing Permits the Loading of Cars in Trips

A PROMINENT railroad executive recently made the statement that the wheels on rolling stock were made round for the purpose of moving cars; that when they were standing still, no productive results were being obtained. Had the significance of this simple statement been fully realized, in coal mining, mechanical loading undoubtedly would be far ahead of its present status of achievement. For without a steady supply of cars to the machine territory, maintained by accurate dispatching for the avoidance of traffic congestion and attendant delays, car wheels *will* stand still and machines *will* stand idle when they should be moving in productive work.

If capital investment in machinery is to be kept at an economic minimum, and every dollar spent for rolling stock is to continue productive, avoidable delays cannot be counteranced. But not always can the vagaries of an old haulage system easily be reconciled to a new order of operation involving perhaps a change of layout and, for economic reasons, continued use of the equipment at hand. Transportation readjustments present a big problem and should be considered accordingly.

Stripped of its details and ramifications, the problem of transportation in mechanical loading boils down to one major objective: to reduce or eliminate completely the delays caused by the shifting of cars. The problem is faced everywhere in this country, because the room and pillar system is here almost universal and because the use of conveyors as takeoffs from loading machines has not yet been developed. Soon, there will come this development of equipment and methods for continuous loading, which is the necessary next step in the progress of mechanization. In fact, experimental work is now being done along these lines.

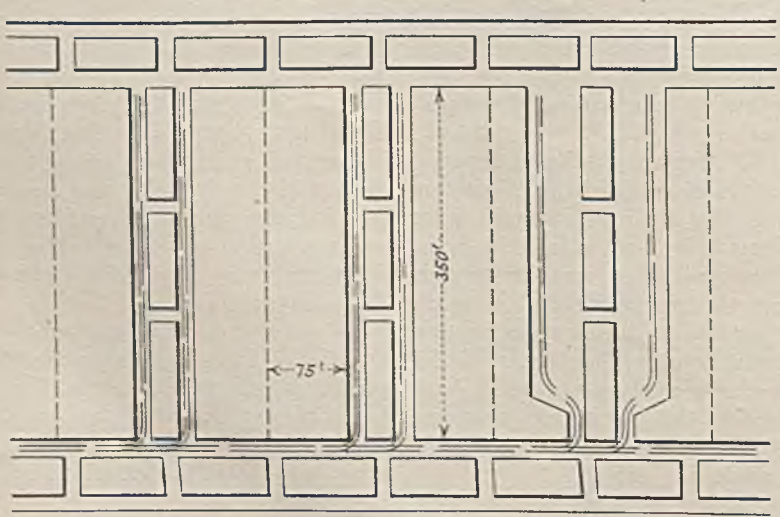
When track is eliminated from rooms it can be reasonably expected that a machine unit will average from 700 to 1,000 tons per shift. Then the production records of today, gratifying as they are, will appear small indeed.

Meantime, the mines must continue, as they have in the past, to make the most of the equipment and methods available for use. In this the progressive plants have done remarkably well, considering the limitations within which they have been compelled to work. Yet there is a possibility of improvement in individual cases, borrowing from the experiences of others. The writer has kept this possibility in mind in preparing this article, which will devote considerable space to reviewing the methods used by various companies.

In retreat work the time required for changing cars can be reduced to a minimum by slabbing along the open end of pillars, where a roof span can be maintained to allow for track outby the shot coal. By this arrangement (see Fig. 1) cars can be filled one after another in trips of three or four.

At the mine of the Gay Coal & Coke Co., West Virginia, a modified

Fig. 2—Gay Modified Longwall Layout Is Ideal for Haulage in Mechanical Loading



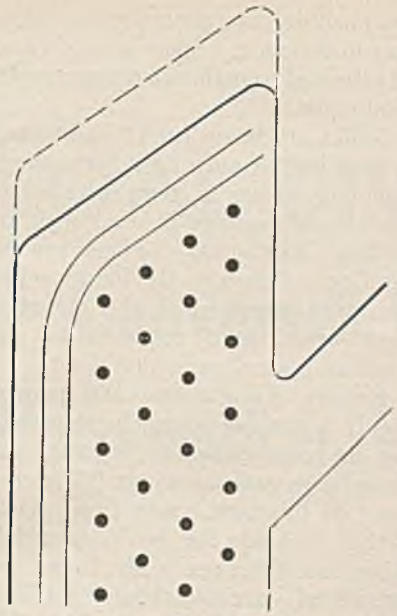


Fig. 3—When the Face Is Angled, Two Cars Can Be Spotted at the Machine

longwall method that was developed after much experimentation proved highly successful with machine loading (see *Coal Age*, Vol. 6, pp. 677-680 and pp. 745-750). A sketch of the layout is shown in Fig. 2.

An interesting development was made recently at an operation of the Perry Coal Co., Illinois. At this property mechanical loading with mobile machines was thought impracticable for a long time, because a 1-ton mine car, running on a 19-in. track gage, is used. The problem was met by carrying the track up each rib and across the room face and loading the cars continuously, using the machine for spotting them and mules for gathering. In development places, the cars are loaded two at a time, a method that has been expedited by constructing the discharge boom of the loader 24 in. longer than standard. The record production for one 8-hour machine shift is 394 cars.

It is possible, as indicated in Fig. 3, to load a trip of two or three cars by cutting room faces on a 45-deg. angle. But roof conditions must be better than average if this practice is to be followed. Also close attention must be given to the cutting operation if the angled face is to be maintained, the tendency of the cutters being to square the face after the first few cuts.

When driving straight rooms, a satisfactory method is to lay the track off center, and first load the coal directly ahead of the track to the back of the cut. Slide rails can then be extended to solid coal and the remainder of the cut loaded into a trip of two cars.

At the Valier (Illinois) mine of the Valier Coal Co., experience showed that one loader could be operated at a high tonnage rate in a battery of ten rooms. As the panel already developed comprised eighteen to twenty rooms on each side of the room entries, four loading units could be worked in each panel, provided the haulage could be arranged. This led to the development of the panel layout shown in Fig. 4, which incorporates three instead of two entries. Cars to and from the two loaders operating on one side of the panel are handled through the center entry without interfering with the two machines on the other side. This scheme doubled output from each panel.

The driving of three entries instead of two also simplifies and reduces the cost of panel development. Three entries, with the crosscuts and room necks turned therefrom, provide ample territory for one machine.

In Indiana, at the operation of the Standard Coal Co., a system called the "checkerboard" has been developed for mechanical loading. Its advantage is that it provides two working places in each room. This system gives high haulage efficiency in the loading out of crosscuts. Track need not be laid in these places. All the coal can be loaded direct into the cars on the straight room track, as indicated in Fig. 5 (for further details, see *Coal Age*, Vol. 35, p. 85).

Most mechanical mines develop their mains on a multiple-entry system, because the plan materially reduces the cost of this work. Not only are more places available for the loader but haulage is accordingly simplified. Loads and empties can be stored in the immediate vicinity of the face without blocking the movement of cutting machines or drills. As a rule, the mains are developed by four or five entries, somewhat as shown in Fig. 6.

Production from machines on entry development should not, in most cases, differ more than 15 per cent from that coming from machines in rooms. The only real reason for a difference is the increased number of moves between places in entry work. This, of course, does not apply where rock must be loaded in entries and gobbed by hand in rooms.

Time study cannot be neglected if the most is to be gotten from equipment and methods. As an illustration, there may be lingering doubt as to whether the expense of laying track through room crosscuts is justified. Studies made in a room with and without crosscut track will resolve this doubt.

Assume that the car-change time will be reduced one minute, and that each 6-ft. cut will yield 15 carloads. If it costs 15c. per minute to operate the loader, the saving in shifting fourteen cars will be $2.10, the last car loaded not being subject to this saving, because it is pulled to the entry and the loader moved. If the crosscuts are turned every 90 ft., then seventeen cuts (including breakthrough tonnage) will be removed with the aid of this crosscut track at a gain of $35.70. If it costs $15 to lay the track in question, the net saving will be $20.70.

One of the delays in the operation of the loading machine attributable to haulage is the time lost while the gathering locomotive goes to the sidetrack for empties. It was thought for a long time that these trips to the sidetracks could be made while the loader was moving between working places. But in most instances these movements cannot be coordinated.

A solution to this problem has been found in the use of relay motors for handling the cars between the main-line sidetracks and the immediate

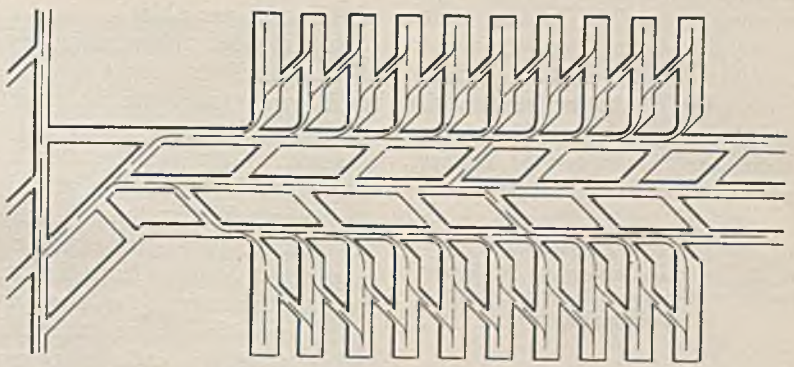


Fig. 4—This Three-Entry System Allows Four Loading Machines to Work in One Panel

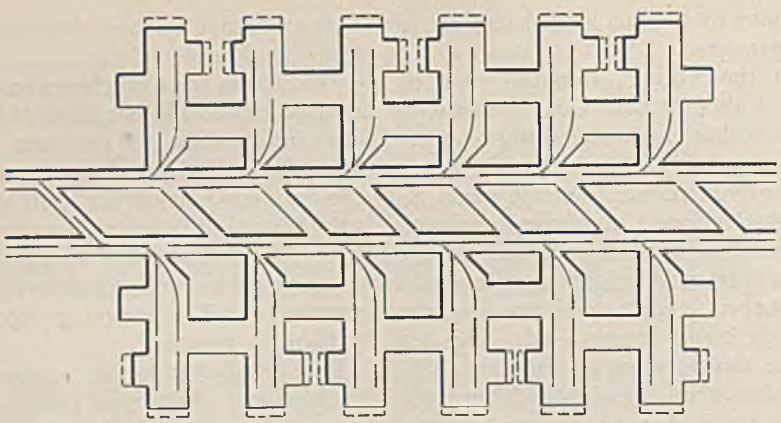


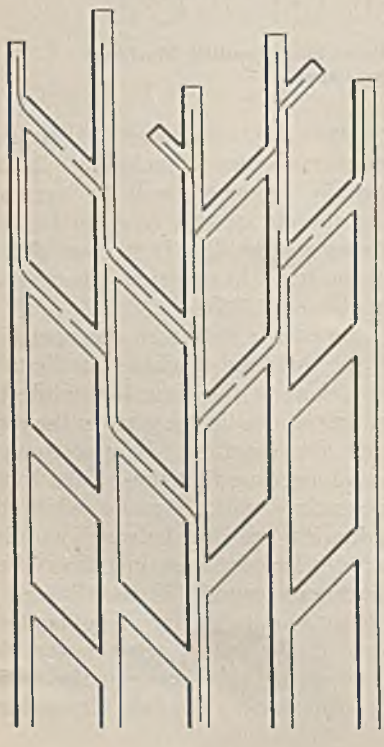
Fig. 5—The Checkerboard Layout Facilitates Haulage

vicinity of the loading operation. This has also eliminated the congestion which occurs when a number of gathering locomotives attempt to get in and out of one parting.

A standard should be set for the number of cars to be used in each section. This practice aids in keeping the cars on the move. It can be put into effect simply by requiring the relay motorman to leave the same number of empties as there are loads available at the face.

Seldom can one relay locomotive serve more than four loading units. However, that depends upon such factors as the length of haul, grades, size and speed of the locomotive, size and type of mine car, number of cars available, and the speed of loading. In general, the 8- to 9-ton trolley-and-reel locomotive is most suitable for this work.

Fig. 6—Because Mechanical Loading Makes the Driving of Multiple Entries an Economy, It Is a Boon to Ventilation



Some interesting experimental work has recently been done in southern Illinois to prove the effectiveness of two gathering locomotives with one loading unit. It has definitely proved that the production of the loader can be increased materially and the operating cost reduced in inverse proportion by the adoption of this practice. Where the scheme is followed, loading units have been able to produce average outputs in excess of 400 tons per shift.

But for this plan to be feasible, mining conditions must be such that track connections can be made economically between rooms at each crosscut. Cars are handled singly. While one locomotive is at the face, the other takes its load to the entry or adjacent room, leaves it, couples to an empty, and waits in the crosscut nearest the face. As soon as the first locomotive passes this crosscut switch with its load, its companion unit backs its empty car to the machine. Cars can be changed in 30 seconds by this scheme.

Only one brakeman is needed. He remains on the entry to throw the switches and to couple and uncouple cars. Because the cars are handled singly, he is not needed at the face to assist the crew in spotting the cars.

Mules are being used successfully for haulage with mechanical loaders in some cases. However, it is not as a rule practicable to use animals where the cars have a capacity in excess of 2½ tons. Again, physical conditions must permit the laying of track through room crosscuts. In practice the empty cars are pulled into the room adjacent to that in which the machine is loading, as far as the last open crosscut. The animals pull the loads from the face and men push the empties, as delineated in Fig. 7. Two drivers and two men for pushing cars generally are necessary in this case. Spare animals must be provided to maintain uninterrupted production.

Mules are being used to advantage in spotting cleanup cars for rock or machine cutting in territories where mechanical haulage is used with the loading machines. This practice eliminates delays to the loader which would be incurred if the gathering locomotives were required to spot these additional cars.

Battery locomotives are proving highly adaptable to mechanical loading in room-and-pillar layouts, particularly in gaseous mines. The chief asset of this unit, aside from safety, is that it avoids the delays caused by cable interferences. Steel ties and fabricated steel turnouts facilitate trackwork and are winning their rightful place in the modern mechanized mine.

The last, but one of the most important considerations is the size of the mine car. Disadvantages attending the use of the small car can be largely mitigated by improvements in mining methods. What the correct size should be, only study will determine. Not until conveyors come into common use as the connecting link between coal-mining operations and haulage will a general formula be applicable to all conditions. This formula will read: The larger the car, the better.

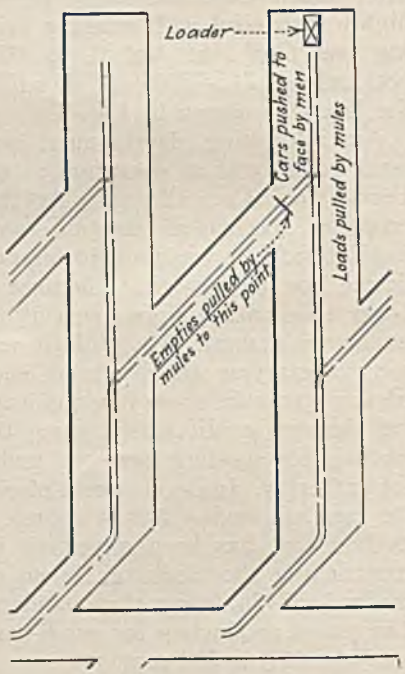


Fig. 7—If Mules Are to Be Used, This Is the Best Way

The third article in this series, dealing with face preparatiin in mechanical loading, will appear in an early issue.

COAL DIVISION, A.I.M.E.

+ Canvasses Production Control, Preparation, and Safety

SPEAKING at the fall meeting of the Coal Division of the American Institute of Mining and Metallurgical Engineers, at Bluefield, W. Va., Oct. 9, Dr. R. V. Wheeler, head of the Department of Fuel Technology, University of Sheffield, and director of the Mines Research Board of Great Britain, said that the British Coal Mines Act of 1930 is a step toward nationalization of British coal mines and that two important ends have been accomplished: (1) A minimum price has been established; (2) the price of coal to public utility companies has been increased.

Dr. Wheeler's paper was titled "British Coal Industry Law Reviewed." In this he discussed the provisions and workings to date of three divisions of the act which are of major interest: (1) production, supply, and sale of coal; (2) reorganization of the coal-mining industry; (3) hours of work. Under the first head, regulation of output, the fixing of standard tonnages and the enforcing of quotas has proceeded without serious difficulty, but the fixing of minimum prices has proved a slow and difficult process.

John T. Ryan, chairman of the board, Mine Safety Appliances Co., Pittsburgh, Pa., who recently returned from Europe, said that the act has accomplished three purposes, which some day we shall have to put in operation here: It has established a minimum selling price, fixed a wage rate, and set up production quotas in accord with demand. Our problem should prove less complicated, because of the small proportion of export coal.

Dr. Wheeler said that the effect has been to wipe out the sales and production control agreements that operators in certain districts had already established. Competitive selling continues as before, but this competition is on the name or reputation of the coal. In England, no local or national tax has been levied on undeveloped coal land.

E. L. Greever, attorney, Tazewell, Va., expressed it as his opinion that this country needs some sort of revi-

Dr. R. V. Wheeler

sion of the Sherman Act, or at least to free itself from the construction which has been placed on the meaning of that act by the Courts. George S. Rice, chief mining engineer, U. S. Bureau of Mines, Washington, D. C., suggested that this might be insufficient, because low wages and low prices existed long before the enactment of the Sherman law. The operators were then quite free to combine for the regulation of prices, yet failed to do so.

Other features on the one-day program were a description of the "Low-Volatile Coal Field of Southern West Virginia," by Howard N. Eavenson, consulting engineer, Pittsburgh, Pa.; "Growth of Coal Preparation in the Smokeless Fields of West Virginia," by T. W. Guy, consulting engineer, Charleston, W. Va.; "Are Mine Accidents More Frequent in Low-Volatile Than in High-Volatile Mines," by R. F. Roth, Fairmont, W. Va., speaking for West Virginia, and R. N. Hosler, coal-mining section, Pennsylvania Bituminous Coal Mine Rating and Inspection Bureau, Harrisburg, Pa., speaking for the Pennsylvania bituminous coal fields; "The International Conference on Mine Safety," by Mr. Rice; "Coal Evaluation and Preparation," by Thomas F. Downing, Jr., consulting mining engineer, Philadelphia, Pa.; and a discussion of "Proposed Safety Code for Mine Ventilation," led by T. G. Fear, general manager, Consolidation Coal Co., Fairmont, W. Va., acting in the absence of A. W. Hesse, chief engineer, Buckeye Coal Co., Nemacolin, Pa., chairman of the subcommittee. Because of Mr. Downing's absence his paper was presented by title only.

John J. Lincoln, vice-president, Crozer Coal & Coke Co., Elkhorn, W. Va., and president of the Pocahontas Coal Operators' Association, presided over the morning session, and Mr. Eavenson presided in the afternoon. One hundred and nfty men and twenty-four women registered for the meetings.

In his paper, consisting largely of statistics and illustrated by maps and graphs, Mr. Eavenson took 23 per cent as the maximum volatile content for coal to be classed as low-volatile. He placed the total production to date at 1,047,448,000 tons, and the remaining coal over 3 ft. thick at 4,748,752,000 tons. From the mining standpoint the reserves consist largely of thinner and lower quality coal, and the next fifteen

years will see the end of many of the early plants which were opened in the thickest and best of the seams.

According to figures presented by Mr. Guy in his paper, there are now in the smokeless fields of West Virginia 73 mechanical cleaning plants belonging to 54 companies. Of these plants, 52 are in the Pocahontas field and 21 in the New River and Winding Gulf fields. The 73 plants produced 42.5 per cent of the 1930 smokeless output. Air equipment is used exclusively at 12 plants, wet concentration alone at 45 plants, and combinations of the two at 16 plants. At plants cleaning slack coal, five are using the wet method and twenty the air method.

Mr. Guy also showed that in 1910, fourteen plants in the Pocahontas field using washers prior to 1911 did 14.7 per cent of the business, and in 1930 they did 15.3 per cent; that in 1910, all the other plants did 85.3 per cent and in 1930 did 84.7 per cent. During that time one of the fourteen mines was worked out and abandoned. Forty-seven plants having cleaning equipment in 1930 produced in 1929 52.5 per cent of the tonnage, and in 1930 53.3 per cent of the tonnage. All other plants in 1929 produced 47.5 per cent of the tonnage, and in 1930 only 46.7 per cent. Similarly in 1929, the 17 mines having, in 1930, washers cleaning nut, pea, and slack did 18 per cent of that business, and in 1930 did 20 per cent. All other mines did 82 per cent of the nut, pea, and slack business in 1929, and in 1930 only 80 per cent, showing a gain in proportion of the total business done in every case where washing equipment was provided, and a decrease in proportion where it was not provided.

L. N. Thomas, vice-president, Carbon Fuel Co., Carbon, W. Va., deplored the lack of coal standards and said that there is no good reason why the sizes and shapes of screens and the percentage of undersize should not be standardized. Why cannot the industry set up some standard for impurities in prepared sizes and for the percentage of ash in slack? Mr. Lincoln said that about two years ago much effort was made to standardize the screens of the smokeless fields, but what is needed is a standard for the coal as loaded into railroad cars.

Urgent need for a standard of what is clean coal was further expounded by J. B. Morrow, preparation engineer, Pittsburgh Coal Co., Pittsburgh, Pa. He said that there were already standards and that the consumer was making them. It was well known to technical men that absolutely "clean coal" cannot be prepared if the operator is to stay in business, for "clean coal," as the consumer would define it, is a product without a particle of extraneous matter.

R. N. Hosler

Mr. Rice asked where the cut in gravity will be made between coal and refuse, adding that what is classed as refuse in one territory may be classed as coal in another. Mr. Eavenson replied that the committee might find it necessary to make a separate standard for the West.

In his paper, Mr. Roth presented for the 10-year period 1921-1930 twelve graphs showing that total accidents, and accidents in each of the various classifications, per million tons, were higher in the low-volatile territory of West Virginia, taken to include Fayette, Greenbrier, McDowell, Mercer, Raleigh, Webster and Wyoming counties, than in the remaining counties, all classed as high-volatile. The graphs are based on lost-time accident data furnished by the State Department of Mines.

The Pennsylvania bituminous experience reported by Mr. Hosler and based on compensable accidents per million tons, indicates that the high-volatile areas have no advantage over the low-volatile in that state.

R. M. Lambie, chief, Department of Mines, Charleston, W. Va., said that the hazard in the smokeless fields of West Virginia is greater because of the much more complete recovery of pillars, mining of seams above one another, and the irregularity of the gradients. Mr. Fear presented Consolidation Coal Co. figures showing a lower accident rate in the Pocahontas mines than in those of the Pittsburgh seam, demonstrating that the experience of his company reversed that indicated by the Roth graphs.

P. C. Thomas said his experience indicates no difference between the safety in low-volatile and high-volatile mines. He believes exposure, as influenced by the number of non-productive men in proportion to loaders, is a factor and said that data based on lost-time and compensable accidents are not comparable. Mr. Rice urged that statistics be based on exposure and be classified by occupations as well as by hazards.

In a report of the International Conference on Mine Safety Research, Mr. Rice indicated that the conference was a success, and this was indorsed later by Dr. Wheeler, who said he was impressed with the friendly relations between the delegates from France and Germany, which augured well for cooperation in research.

W. H. Young, Coal Division, U. S. Bureau of Mines, Washington, D. C., exhibited wall charts showing relative tonnages and destinations of coal from several fields. The work of this character now being done is the first since that by C. E. Lesher in 1917-1918.

In the proposed safety code for coal-mine ventilation, read in part by Mr. Fear, the suggestion was made that the quality of the mine atmosphere at any point be made the basis of regulation rather than any arbitrary separation into intake and return air. The weight of opinion also seemed to favor the idea that the allowable limit of combustible gas in a working split should be lower than 1.5 per cent. One operator said that the limit suggested might be acceptable for mines equipped solely with "permissible" equipment, but was too high in a mine where trolley locomotives are used.

Carl Scholz, consulting engineer, Charleston, W. Va., and Mr. Lambie spoke briefly of a suggested move to organize a chapter of the coal division at Charleston, and Mr. Lambie was appointed temporary chairman of the proposed organization.

The meeting was concluded with an address by Dr. S. P. Burke, director of research, West Virginia University. Projects started include a survey of properties and structures of West Virginia coals, a study of their combustion, and of the origin and generation of gases in extremely gassy mines.

AIRPLANE PROPELLER FANS + Installed in British Mines; Evasé Stack Studied

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

BY far the most important development of mine ventilating practice of recent years has been the application of the air-screw fan. Propeller fans of ordinary design have been used in a small way at mines for a long while for inby purposes such as the airing of dead ends and the like; and a few—in Britain, not more than four or five—have been installed as main ventilators. They never received serious consideration for the latter purpose, owing to the low efficiency of the usual type.

Not deterred by the accepted opinion as to the unsuitability of the propeller to the purpose, F. A. Steart, manager and agent of the Northfield Collieries, Natal, decided to investigate the matter from the ground up. He shrewdly surmised that, to overcome an appreciable resistance efficiently, a number of propellers would need to be placed in series, just as a number of impellers are required for a turbine pump to raise water any appreciable height; and, moreover, that the blades would need to be designed on scientific principles.

Taking advantage of the mass of experience and experiment that has resulted in the design and construction of aircraft propellers, he obtained a number of them, mounted them on a single horizontal shaft about 9 in. apart and set them to work within a concentric steel casing of cylindrical shape. Providing the latter with an *evasé* chimney (which at first was admittedly of imperfect design) he then found the fan, driven at 770 r.p.m., gave gratifying results. In his own words,[1] "The idea hitherto universally believed that propellers are incapable of producing pressure is erroneous; propeller fans consisting of air screws placed in series are not only capable of passing large volumes of air against ordinary mine resistances, but are also capable of doing so with good efficiency."

These early tests were carried out at Northfield about nine years ago, and since then the air-screw fan—gradually improved—has been the main ventilator at that colliery.

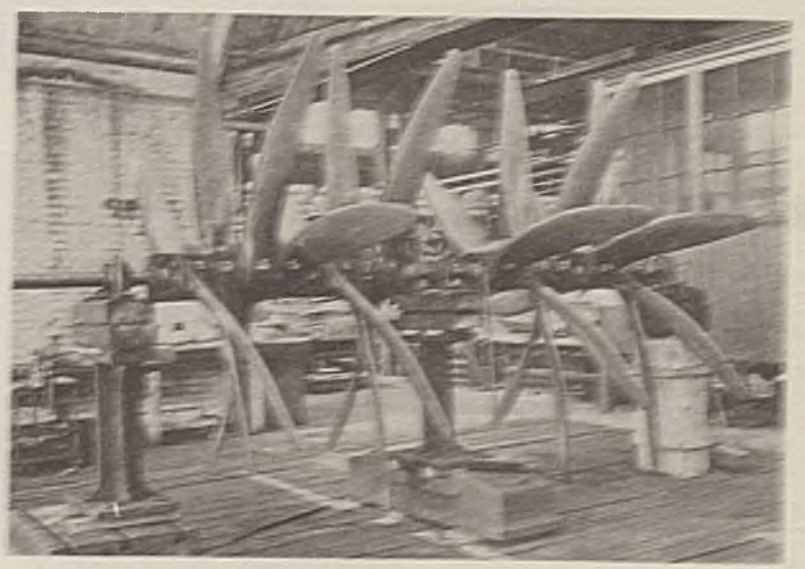
The first fan was constructed of six double-bladed Curtiss aircraft wood propellers, of 100-in. diameter and 65-in. pitch, set with an equal angular spacing. Later, ten banks were introduced to deal with depressions up to 9 in. of water.

Subsequently Mr. Steart proved that four-bladed screws were better suited to his purpose, and that their adoption enabled him to cut down the required number of banks by one-half. Four-bladed propellers have been adopted in all the recent Steart fans. Mr. Steart also thoroughly explored the feasibility of employing metal blades, and now these are often, but not invariably, used.

Realizing the importance of provid-

[1] *Transactions Institution Mining Engineers*, LXVIII, 1924; p. 319.

Fig. 1—Runner of 14-Stage Air-Screw Fan for Grange Colliery, Yorkshire, England



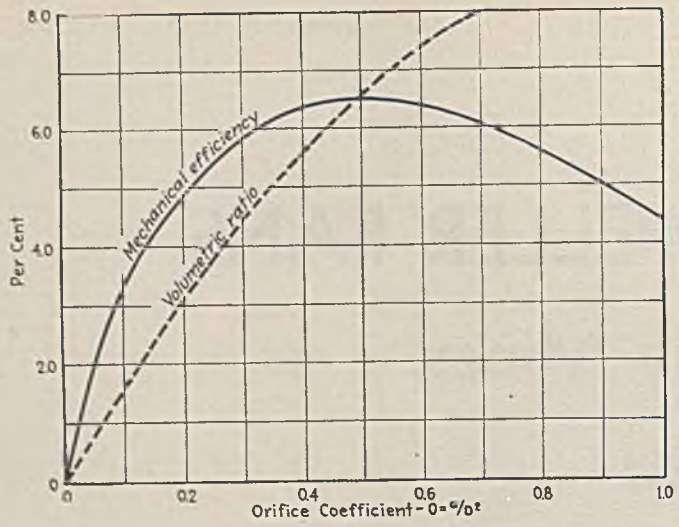


Fig. 2—Characteristic for Air-Screw Fan, Pitch : Diameter = 0.7

ing a variable pitch for the screws, he designed a mounting consisting of a boss, keyed to the shaft, and having four sockets, spaced 90 deg. apart, which receive the turned stems or shanks of the blades. The latter may be adjusted in the sockets to give any desired pitch and then firmly clamped in position. This form of mounting, improved lately by Messrs. Walker Bros. Ltd., of Wigan, Lancashire, England (the sole makers operating under Steart's license), generally is adopted.

South African coal- and gold-mine operators were not slow to appreciate the advantages of such simple and flexible equipment, and several Steart fans are in successful operation in the Union of South Africa. At my suggestion, Prof. Douglas Hay, agent of Messrs. Newton, Chambers & Co., Ltd., decided to install a Steart fan at that company's Grange colliery, South Yorkshire, England. The fan was made by Messrs. Walker Bros. to my specification; the colliery company carried out the erection of the casing, chimney, etc., and the plant was put into commission in June, 1928, since which date it has supplied the mine ventilation. The long series of tests performed on this, the first Steart fan in Britain, justified Prof. Hay's courageous choice, and demonstrated the validity of Mr. Steart's conclusions.[2]

The fan at Grange colliery is of 10-ft. diameter. The equivalent orifice turned out to be much less than was anticipated and it soon became apparent that a smaller diameter—say, of 7 or 8 ft.—would have been preferable, as the air-screw fan is no exception to the rule that, other things being equal, the most suitable diameter is directly proportional to the square root of the equivalent orifice. As originally installed, the Grange fan had fourteen banks of double-bladed aeroplane propellers, each of 7 ft. 4 in. pitch; it was provided with a plain cylindrical casing ending in an *évasé* chimney, and was driven by a belt from an a.c. slipring motor. Fig. 1 is an illustration of the fan runner in the maker's shops; it shows the fourteen screws and their spacing along the shaft.

Subsequently, the fan was fitted with eight double-bladed screws of 4 ft. 6 in. pitch, and is running continuously at 400 r.p.m. The motor also was moved nearer to the fan shaft, and a Lenix belt drive substituted for the original plain belt, with beneficial results.

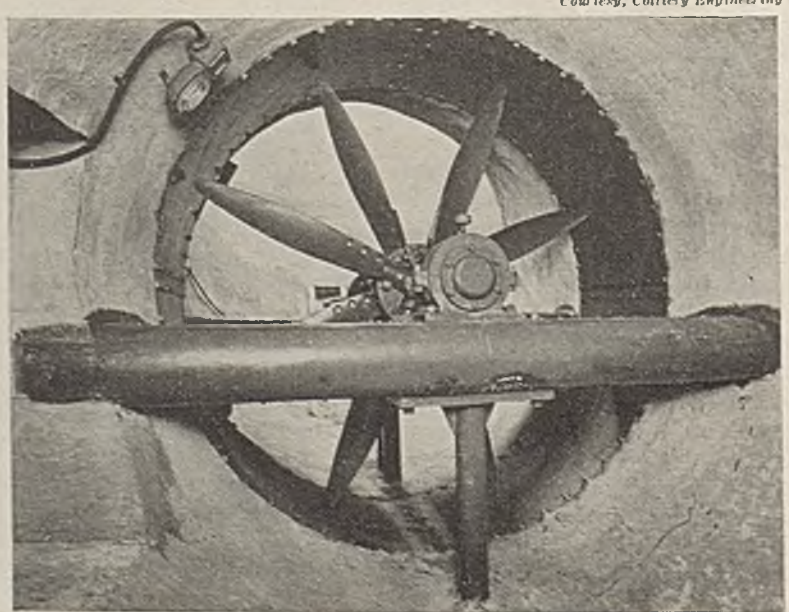
The characteristic curves for a Steart fan having three banks of four-bladed propellers are reproduced in Fig. 2, the ratio between pitch and diameter in this instance being 0.7. Instead of the *N* curve of Fig. 5 in article on p. 481 of the September issue of *Coal Age,* the "volumetric ratio" curve is here introduced. The two are closely akin; they are equally serviceable; but as the volumetric ratio is a conception more easily grasped in regard to propellers it is the better criterion to apply. The volumetric ratio is the relation between the volume actually delivered per minute and the volume that would be delivered per minute if the propellers had no slip.

For example, a slipless fan of this kind, of 8 ft. 4 in. diameter and 5 ft. 10 in. pitch, revolving at 720 r.p.m., would discharge $720 \times \pi R^2 \times$ pitch = 230,000 cu.ft. of air per minute, and, if the actual discharge were 100,000 cu.ft. per min., the volumetric ratio would be 100,000 ÷ 230,000 or 0.43. The maximum mechanical efficiency of a Steart fan is generally obtained (as Fig. 2 indicates) when the volumetric ratio is about 0.65. By a coincidence, the optimum mechanical efficiency shown by these curves is also 0.65. It has, however, to be remarked that the tests from which the graphs were derived were made with a fan unprovided with a suitable *évasé*. With a properly designed chimney the peak of the efficiency curve would have lain above the 70 per cent line.

Let us make use of the characteristic curves of Fig. 2 to ascertain the principal factors for a fan of this

Fig. 3—Propeller Fan at Cefn Coed Colliery, Glamorganshire, South Wales

Courtesy, Colliery Engineering



[2] *Transactions Institution Mining Engineers,* LXXVI, 1928; p. 101.

description intended to move 180,000 cu.ft. a minute against an equivalent orifice of 32 sq.ft. At the locus of maximum efficiency (see Fig. 2) O, or the orifice coefficient $= a \div D^2 = 0.5$; therefore $D = \sqrt{(32 \div 0.5)} = 8$ ft., and the pitch $= 0.7 \times 8 = 5.6$ ft. From the ordinary equivalent orifice formula, if $a = 32$, and $Q = 180$ (thousands), the water-gage, h, $= 4.6$ in. On this performance, the horsepower in the air is 130, and at 65 per cent efficiency, the shaft horsepower is 200.

The volumetric ratio is 0.65; hence, if the screws had no slip, the volume discharged would be 180,000 ÷ 0.65 = 277,000 cu.ft. per min. Therefore the fan requires to be revolved at

277,000 ÷ (area of circle, 8 ft. diam.) 5.6 = 980 r.p.m.

To sum up: a delivery of 180,000 cu.ft. per min. against a water gage of 4.6 in. (equivalent orifice, 32 sq.ft.), would be provided by a Steart fan having three banks of four-bladed propellers of 8-ft. diameter and 5.6-ft. pitch, running at 980 r.p.m., and requiring 200 fan-shaft horsepower. This fan would function at the locus of maximum efficiency, and the mechanical efficiency would be at least 65 per cent.

The Steart air-screw fan possesses four important advantages over the centrifugal fan, these being as follows:

1. The fan and housing are simpler and cheaper. Prof. Hay, in the article cited, estimates the saving in this respect at roughly 50 per cent.

2. The air current can be reversed by the simple expedient of reversing the direction of rotation of the fan. Air-reversal doors and passages are not needed, all that is required in this connection being a simple reversing switch. When the Grange fan is reversed, about two-thirds of the normal quantity of air is obtained, this being sufficient in the circumstances. Owing to the manner of shaping the blades, the fan is not so efficient, when running in the reverse direction; but this is of negligible consequence, as the machine is so seldom called upon to operate in that manner.

3. Driving the fan from an electric motor is simplified by its high rate of revolution.

4. As we have already seen, the centrifugal fan—excepting the Guibal and Walker types, which are provided with shutters—has one adjustment only: namely, that of speed. It is an inflexible machine. The latest Steart fan, on the other hand, is amenable to adjustment in three ways; the speed, the number of propellers and the pitch of the propellers are capable of alteration singly or in combination.

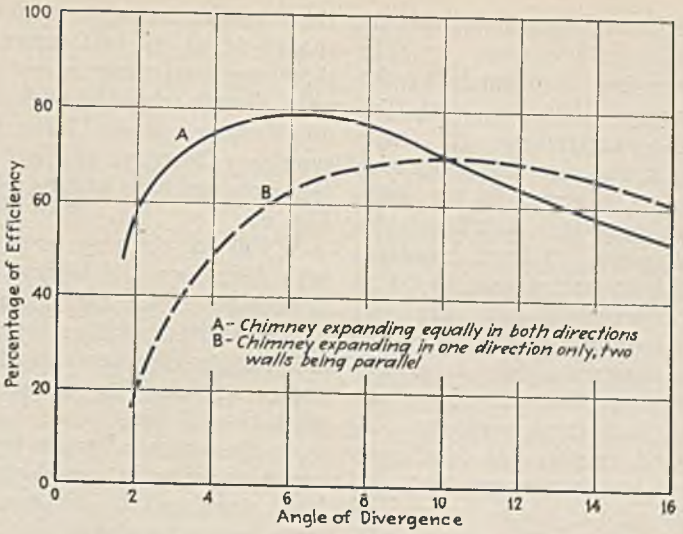


Fig. 5—Relation Between Angle of Divergence and Efficiency of Evasé

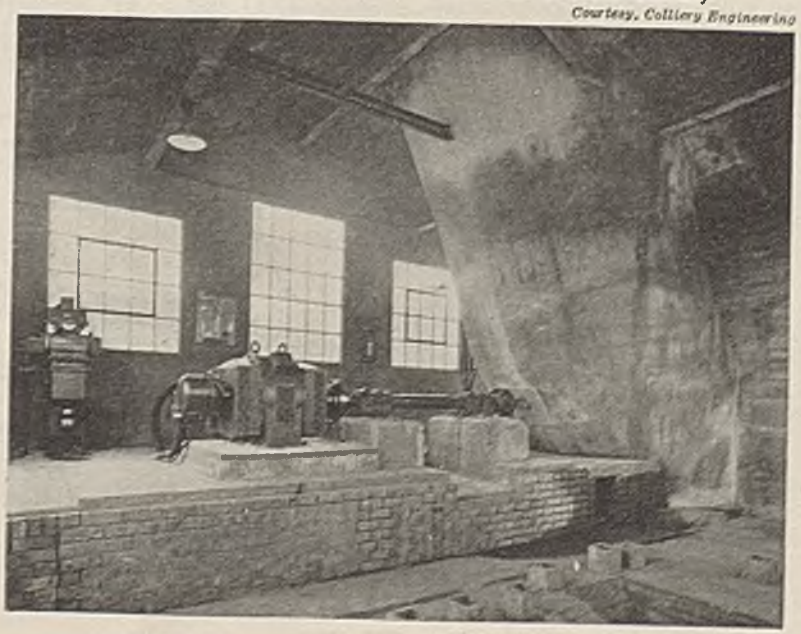
Now the resistance against which a mine fan operates is constantly changing. It changes in consequence of variations in the temperature and therefore in the density of the air entering the mine; in addition, it changes as the mine develops. A strong natural ventilation, such as is prevalent in winter, reduces the resistance the fan has to overcome; whereas on a hot summer day that resistance is much increased.

Again, in the initial stages of development, before the arterial roads have been enlarged to their full section and before the currents have been split, the resistance is likely to be high. Subsequently it falls to a minimum, and then slowly increases as the workings become more extensive. Thus the Steart fan can be readily modified and made to deal efficiently with a wide range of resistances. For a large equivalent orifice (low resistance) a few banks of screws are enough, but for a small orifice a greater number gives better results.

Alternatively, an increase of resistance—whether seasonal or permanent—may be met by diminishing the pitch and increasing the speed of running. The fan of Fig. 2, for instance, gives its best performance when $a \div D^2$ is 0.5. If the equivalent orifice should, at some time or other, fall to half its original value, the fan's efficiency sinks to 54 per cent. But if the pitch: diameter ratio be then reduced from 0.7 to 0.5, the effi-

Fig. 4—Motor and Fan Shaft With Evasé at Same Colliery

Courtesy, Colliery Engineering



ciency can be restored to at least 61 per cent.

Reference has been made to the *évasé* chimney. When correctly designed, the expanding or *évasé* chimney of a fan, first introduced by Guibal, is, as I stated in my 1923 article,[3] an important means of improving efficiency. I have, however, no hesitation in stating that, so far as my own observation goes, the majority of existing *évasés* at mines are not well designed and, in consequence, perform their duty in an unnecessarily ineffectual manner.

As is well known, this duty is to convert into pressure energy as much as possible of the kinetic energy of the air entering the chimney from the fan casing. An *évasé* which expands at too large an angle will fail in this object, because the air stream will refuse to fill the chimney: it will emerge along one side or at one corner, the remainder of the section being occupied by re-entrant currents; and, as a means of converting kinetic into pressure energy, the efficiency of the chimney is low. Still more obviously, a chimney that does not expand at all must also have a low efficiency, the only benefit it can claim being that of modifying the air pulsation in a slight degree.

Therefore it follows that, between these extremes, there must be some angle for an *évasé* which will provide a maximum efficiency.

Some years ago, Dr. J. N. Williamson (now at Leeds University) and I set ourselves the task of ascertaining this optimum angle of expansion. We made a long series of experiments with diverging ducts of many kinds, subsequently publishing our results and recommendations.[4] The conclusions of the research may be summarized as follows:

1. Under the most favorable conditions, an *évasé* may operate with the efficiency of 80 per cent. That is to say, it may convert into pressure energy the proportion of the kinetic energy in the air which it receives. (see Fig. 5, curve *A*).

2. An *évasé* expanding equally in both directions (that is, in the direction parallel to the fan shaft and in the direction at right angles to that shaft) is, at its best, more efficient than one expanding in one direction only, though when the angle of divergence exceeds about 11 deg. the latter type may be more efficient than the former (compare curves *A* and *B*, Fig. 5).

3. For a chimney expanding in both directions, the highest efficiency is obtained when the angle between opposite sides is rather under 7 deg., and such a chimney should have an angle not less than 5 deg. and not more than 9 deg.

4. The optimum angle for a chimney expanding in one direction only is 11 deg., and for an *évasé* of this kind the angle should lie between 8 and 14 deg.

5. Tests on a square-sectioned *évasé* having the best angle of 7 deg. showed that most of the energy loss took place at the narrow end. The shape of the *évasé* at its throat and the conditions under which the air enters are, therefore, deserving of especial attention.

6. Though the efficiency increases with the length of the chimney, a practical limit of length is soon reached. A serviceable rule is to make the sectional area at the wide end four times the sectional area at the narrow end.

7. Even an ill-designed *évasé* is better than none.

Though not especially relating to fans, the following corollaries may be added:

(a) The loss of energy at an obstruction, such as a regulator, occurs not so much at the orifice as on the discharge side of it.

(b) In a passage of irregular section, loss of energy takes place not so much at constrictions in the sectional area as at places where the passage suddenly widens again.

Most of the original Guibal *évasés* were properly proportioned, and it seems more than likely that that astute designer was well aware of the angles of optimum efficiency, though I have not been able to trace any account of his experiments in that connection. Curiously enough, in an old treatise on "Heat" written by Prof. E. Peclet[5]—an odd place for a description of tests of this kind—there appears an account of a number of experiments carried out on ducts of toylike dimensions, and these, like our own larger-scale tests, indicate a maximum degree of effectiveness in a funnel expanding uniformly at 6 or 7 deg.

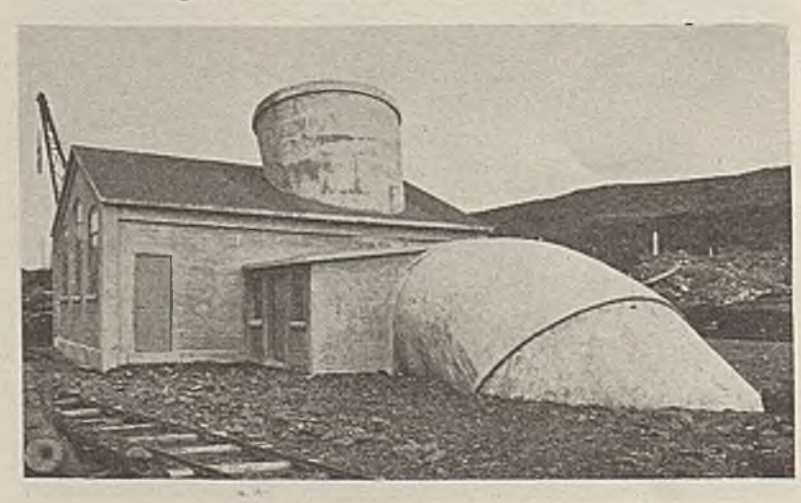
It is not unlikely that Peclet's work influenced Guibal and his successors on the Continent of Europe, as most French and Belgian fans down to the present time are provided with well-shaped *évasés* having angles of from 7 to 9 deg. The best British makers also, guided probably by the results set forth above, have, during the last few years, done much to bring their *évasé* design into line with the Guibal tradition; they realize, much more fully than formerly, that an improvement in this regard is the simplest and least expensive way of increasing the efficiency of the fan plant. In this country, more often than not, the fan maker installs the fan, but the mining company builds the housing and *évasé*. The companies (or their engineers) are becoming more critical of the design of the latter; they rightly object to an unnecessary waste of power, which, in both meanings of the phrase, is equivalent to casting money into the air.

[3] "Developments in the Theory of Centrifugal Fans," *Coal Age*, Vol. 23, 1923.

[4] *Transactions, Institution Mining Engineers, LXVIII*, 1924, p. 323.

[5] *Traité de la Chaleur*, 3d edition, 1861: book 3, p. 351.

Fig. 6—Fan Drift and Evasé at Cefn Coed Mine



STABILIZATION

+ And the Anti-trust Laws

TO WHAT EXTENT do the federal anti-trust laws prohibit an effective balancing of production with demand and the elimination of demoralizing, anti-social price competition injurious alike to capital, labor, and the public? This question becomes a focal point for discussion as plans for the stabilization of specific industries and for business at large receive active consideration. While this body of law has been most sharply challenged in its relation to developments in the natural-resource industries, attack and defense are by no means confined to the industries within that group.

The American Bar Association suggests that the Sherman law be amended by conferring upon the Federal Trade Commission the power to approve in advance restraint of trade agreements voluntarily submitted. Agreements so approved and acts done in carrying out such agreements would not be subject, under the proposed amendment, to the criminal, forfeiture, and threefold damage provisions of the present statute. This proposal, originating with the commerce committee of the association, was indorsed at its Atlantic City meeting, Sept. 18.

Two suggested changes have been submitted to its membership for a referendum vote by the Chamber of Commerce of the United States. One proposal, suggested by the Chamber committee on continuity of business and employment, asks:

"1. That the anti-trust laws should be modified so as to make clear that the laws permit agreements increasing the possibilities of keeping production related to consumption;

"2. That modification of the anti-trust laws should include provision for government supervision, in order that agreements which are not in the public interest in stabilization of business operation and employment may be nullified; and

"3. That businesses desiring to combine should have opportunity to ascertain from a suitable government authority whether or not the proposed combination will be in violation of the anti-trust laws."

The second proposal, made by the committee on natural-resource industries and limited in its application to those industries, recommends "that a tribunal of officials of the federal government familiar with natural-resource industries should be authorized to permit agreements for curtailment of production in such an industry during the continuance of a condition of overproduction found by the tribunal to be injurious to the public interest."

In the seven-point program for the stabilization of the bituminous industry presented in the September issue of *Coal Age* (Vol. 36, pp. 469-472), the declaration was made that modification of the Sherman law to permit joint agreements among operators on production policies and on prices offers the most direct route to the attainment of production control. "Modification which imposed burdensome restrictions as the price of this relief, however, could be as destructive as the ills which the change in the statute was intended to cure. There are too many dangers inherent in the proposal, frequently made, to set up an independent government commission empowered to pass in advance upon the legality of suggested concerted actions to make that solution acceptable.

"The bituminous coal industry should insist:

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

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

In suggesting that the proposed modification be broad enough to permit price agreements, such agreements were made subject to the proviso that no producer under such agreement "should be allowed to establish or maintain a minimum price less than the cost of production of his coal." To protect the public, it was further recommended in the *Coal Age* program that "agreements for the parceling out of territory as between different producing districts" should be prohibited.

Reactions to these proposals, both within the coal industry and in general industry, reveal four distinct schools of thought. One school is whole-heartedly in favor of modifying the law and insists such liberalization is essential. A second school of thought opposes any change; opposition is based upon the fear that any change would mean more government regulation. The third school of thought also looks with disfavor upon suggestions of change, on the ground that relaxation of the stringent provisions of the law would inevitably lead to abuses of power by business.

Those adhering to the fourth school of thought join with those who believe that the price of modification would be more regulation. The major premise of their opposition, however, is the theory that the law does not condemn all combinations and restraints and that, therefore, cooperative measures to balance production with demand and thereby free industry from "the unreasonable restraints" of unbridled and ruinous competition are permissible under the present statutes.

These conflicting opinions all found voice at the conference on the relation of law to business held at New York University, New York City, Oct. 26-27. Charles O'Neill, chairman of the committee on government relations of the National Coal Association and vice-president of Peale, Peacock & Kerr, Inc., addressing the conference as the spokesman for bituminous coal, declared the crying needs of the soft-coal industry were expanding markets and lower freight rates. "I do not know," he added, "of any assistance that government can give aside from the judicious enforcement of the present laws to the end that all industries, including coal, shall receive fair consideration from sheltered, or monopolistic, industries that inadvertently, or otherwise, levy tribute by excessive charges.

"Permission to control production alone would not solve our problem. Excess capacity, competitive fuels, and other sources of power would continue to absorb the available markets and intensify competition among producers. The survival of the fittest will continue to be the order of the day until coal consumption begins to substantially increase or enough mines and enough capital have been liquidated to bring available supply

measurably nearer the current demand.

"The National Coal Association, through a representative committee, is making an effort to devise some effective method by which the industry can cooperate in solving its problems. At the present time, opinion seems to be that much could be accomplished under present laws, if the individual companies had a real desire to work together. The necessity to control production, if some way can be found to do it, is very great. The interest of the public would be served if the present unrestrained production were checked, and the coal industry would be much better off.

"I question very much if the industry could ever agree upon a plan of restriction, even if all questions about the law were resolved in favor of legal collective action. The complexities arising out of the different grades, sizes, and qualities of coal from the great number of mines would be almost insurmountable. However, the effort will be made, if the National Coal Association can find what it believes to be a workable plan, and, if such a plan requires legislation, it will ask Congress to consider the proposal."

In the opinion of C. B. Ames, vice-president and general counsel, the Texas Co., who spoke for the petroleum interests, the anti-trust laws interfere with legitimate economic development, not because of the substance of the law but because of the uncertainty of application in the minds of many honest and intelligent men. "This uncertainty," he added, "could be removed by the simple expedient of providing some federal agency which would have authority to give approval to proposed agreements when, in the opinion of such agency, the agreements are not in violation of the law."

That business men are uncertain what may be done was a point emphasized again and again in the conference. W. B. Compton, secretary and general manager, National Lumber Manufacturers' Association, who suggested the temporary suspension of the anti-trust laws during the present depression, stressed it. Rush C. Butler, chairman, commerce committee, American Bar Association, and Oscar Sutro, vice-president and general counsel, Standard Oil Co. of California, both hit the doubt the law raises in men's minds. Cornelius F. Kelley, president, Anaconda Copper Mining Co., scored the law on this point.

"The time has come," he said, "when American industry asserts that it must be freed, under proper regulations, from the artificial restraint of laws that result in a compulsory overproduction of basic commodities, the calamitous drop in prices to levels below the cost of production, and in a demoralization of markets that make it impossible to endeavor with confidence to undertake a rehabilitation of trade." Clarification of the law, he declared, would not be a complete cure, but it would constitute the greatest single help.

Business, continued Mr. Kelley, charges: (1) That the Supreme Court's interpretation of the Sherman law is not in accord with the intent of Congress as indicated in debates prior to the enactment of the measure; (2) that the law fails to meet the ordinary requirements of a penal statute in that it fails to prescribe with reasonable certainty the elements of the offense condemned; (3) that the law prevents business men from taking reasonable steps to meet abnormal conditions and so prolongs periods of depression. As further proof of uncertainty, he pointed out that the Sherman law and related statutes had been passed upon in 95 cases by the Supreme Court of the United States and that the court was unanimous in its opinion in only 53 of these cases. The Supreme Court had reversed or modified the decisions of the lower courts 48 times.

Mr. Kelley declared that business should avoid the extremes of repeal and general regulation. He proposed that the law be amended to bring the Department of Commerce, an agency friendly to business, into the picture. Under his proposal, agreements to limit production would be filed with the Secretary of Commerce and such agreements would be exempt from the provisions of the anti-trust law until the agreements were condemned by the Secretary. Upon written complaint "of any person," the Secretary would be empowered to ascertain whether any such agreement had unduly enhanced prices or was otherwise injurious to the public. The decision of the Secretary would be subject to court review. Combinations and mergers, under the Kelley plan, would be subject to a similar procedure.

In presenting the proposal of the American Bar Association, Mr. Butler insisted that it is impossible to catalog the facts constituting an unreasonable restrain of trade, because "they vary with time and circumstance." Questions involved in a controversy under the Sherman law are "economic rather than legal." The suggested amendment does not repeal or modify the law or give the Federal Trade Commission judicial power; it "goes no further than to give relief from its provisions to those whose contracts are given advance approval. So long as business acts in good faith with governmental approval, it should be granted immunity from criminal proceedings."

Such a change, instead of meaning more government in business, would, he argued, take the government out of business. It would mean effective self-regulation by industry and would make possible more effective trade association. Giving the Federal Trade Commission the authority suggested was not a questionable move from the constitutional standpoint. This view was indorsed by other speakers who supported the American Bar Association plan.

Walker D. Hines, formerly president of the Cotton-Textile Institute, and William S. Donovan, former assistant to the Attorney General, were the leading advocates of the theory that the law permitted cooperative effort to balance production and demand. Not every restraint in diminution of competition is unlawful, said Mr. Hines. Balancing production with demand to avoid demoralization in markets and the "most insidious restraint" created by unbalanced demand, he contended, is in clear promotion of the purpose of the law.

Although critical of the American Bar Association proposal, Mr. Donovan was ready to concede that "the administration of the anti-trust laws should be changed so as more nearly to conform to the purpose for which they were enacted. That purpose was not to conduct a series of raids upon industry. Business too often is shackled by a fear that prevents it from attempting measures legitimate in themselves, but which have not been passed upon by the courts. Industry should not submit to a counsel of despair or of futility and fly to the bosom of the government for relief. If it believes that a particular measure of defense is economically sound and right, then let it take its position and submit to the decisions of the court. The court is alive to changing conditions and it is only by the advance to new ground that the law can be interpreted and developed in meeting the needs of our changing industrial civilization."

MIRRORS

. . . of the Mines

Aiding the Coal Industry—Another Plan

THE plight of soft coal the past few years has given cause for the advancement of plan after plan for raising this great basic industry from the slough of despond. Newspapers and magazines have been flooded with panaceas for the cure of its ills. Coal operators, engineers, and politicians have vied with each other in airing their views. The more ideas the better. Out of all these ideas something of value may develop.

Behind many of the plans for the stabilization of the coal industry lurks government control. Such control has always seemed incompatible with our democratic form of government. We have in the past depended largely on each industry to solve its own problems. Yet government control is coming to be accepted by many as the only solution of the coal problem.

Any artificial control will, of course, work a hardship on some of those engaged in the industry or owning coal properties. However, the present chaos is working a hardship upon practically every operator of coal mines. Any plan of relief must be designed for the greatest good to the greatest number.

Looking back over our experience during the War, it is seen that the equitable prorating of tonnage to the different mines was accomplished by the control of railroad-car allotments. The schedule of allotments, except in special cases, was based on mine capacities. Why could not similar control be exercised in the present emergency?

Our problem now is not to produce a maximum tonnage equitably distributed over the mines in operation. It is to curtail production to a point that will stimulate prices, to distribute this tonnage fairly among the operating companies, and to guard against an extreme that might result in a runaway market or in an actual fuel shortage.

Suppose, for example, that we put into effect a plan like this: The number of railroad cars of coal produced over a period of, say, eight weeks immediately preceding the inauguration of the plan is taken as the base 100 per cent production rate. Each mine's car loadings during the same period determines its basic rate. It shall have allotted to it each week only so many cars based on its pro rata share of the total. It shall be permitted to load out its allotment in these days or six days, or in whatever time its own management deems most advantageous. If it becomes necessary to decrease or increase the country's production rate, the allotments shall be changed pro rata to meet the need.

The object of this plan is to curb production artificially to such a point that prices will be stimulated. Therefore, the production rate should be set to start with at a figure calculated to rapidly reduce stocks of coal on hand to a reasonable quantity. It should then be raised to meet the current demand.

During the operation of this plan, no mines which have been shut down will be permitted to reopen. No new mines shall be developed. No new railroad sidings or branch lines to serve mines shall be constructed.

The working out of mines operating under this scheme, together with possible increase in the country's coal requirements, would gradually bring the mines up to a full-week working schedule, at which time the opening of new mines would be permitted or the plan would be abandoned, as conditions at the time might indicate to be the most expedient.

It is recognized, of course, that this scheme does not affect mines shipping by barge or those producing electricity or otherwise using their output at the pit mouth. However, such operations are too limited as compared to the whole to have any serious effect upon the working of the plan.

The federal agency vested with the authority to carry out this program might be an independent commission, or possibly a branch of the Interstate Commerce Commission. The plan, it would seem, should be susceptible of easy, quick, and positive control.

Fairmont, W. Va. M. L. O'NEALE.

* * *

Operating in 1931 With Ideas of 1913

THE coal industry has come a long way in the past decade, but we have done comparatively little of which we can be justly proud. We have had a virgin field for improvement, yet in ten years we have accomplished what we should have done in two, and that a long time ago. We are all swelled up with pride over our mechanical improvements, but it is alarming to know how few of all the fields have installed mechanical equipment in any great quantity.

And, of course, our argument against mechanization is that age-old, moss-covered gag that it will throw too many men out of work. That, you know, was one of the biggest things the telephone companies had to contend with when they began the installation of the dial phones. Picture the change: They are now hard-pressed to keep enough operators to work their lines. New industries will take up the employment slack, as did the automobile for the wagon, the radio for the phonograph.

Do we cooperate with our competitors? We do not. Do we make any palpable effort to assist our competitors? We do not. If one of our competitors were to come to us with a helpful hint, would we take it? We would not. Why not? Because each of us down deep in his heart believes his is the most efficiently operated mine in the district, and we cannot have any improvements unless they come from ourselves.

When a new foreman or superintendent comes on the job who has the curse of an education to bear, do we help him and take his ideas? We do not. Why not? Because he got his ideas out of a book; we got ours from hard work and actual experience; our old Daddy told us that this is the way it should be done; so no bookworm is going to mine coal for us by what is on page 361. Do we ever give a thought to the fact that his precious books were written by men whose knowledge of the mining industry may be so much better and broader than ours that we are simple beginners in comparison.

It isn't that all college-trained men are perfect and capable of stepping into any position in any mine. No, no! Lots of them need many a good bump to get the sofa dust off the seat of their pants. But when it comes to downright hard, efficient mining and knowledge of mining conditions, your college man, or your trained man, will stand head and shoulders above all the "family miners" you can get.

Another thing: what kind of cooperation do you give your state and U. S. Bureau of Mines men? Say you, "What the heck! They get their jobs through pull and politics, and what do they know about mines?" Buddy, they know plenty about mines that you and I could both do with. These men get their jobs through an examination that discovers just what they know about mining and mines, and the particular position for which they are applying, and not because they are sons of John Doe, the demon coal loader back in '98.

How many times have we started around our plant to look at it as a visiting operator would, and to make the necessary corrections? We never get to first base. We see a condition that is wrong, and we know it is wrong, but we can find some dandy excuses for it, so we let it go at that. In a little while our good intention has petered out and we are right where we were at the start.

Let's have some action and a little housecleaning in this coal game—and what a game! Let's investigate new devices and ideas and not reject them with that old bunk that, "if they were any good we would have heard of them long ago." DONALD B. LONG.

Woodward, Ala.

[The author of this forthright criticism died as the result of accident on Sept. 25, 1931.—EDITORS]

COAL AGE

SYDNEY A. HALE, *Editor*

NEW YORK, NOVEMBER, 1931

Basing jobs on physique

PHYSICAL examinations of applicants for jobs and of men already employed has too frequently been treated entirely from the viewpoint of the employer, yet, as R. R. Sayers declares in an article reproduced in this issue, it has even greater value to the employee. In an accident, it is his body that is hurt, and as his financial loss is the greater when compared with that of the employer, it is to his interest that he should know, and promptly have corrected, such conditions as militate against his safe employment, and that he should be placed in such occupation as will safeguard him against the accidents likely to occur to him by reason of irremediable personal defects.

Surely it is well that a manila rope should not be required to perform a service for which only a crucible steel rope is fitted. A man with a weak heart, a rupture, or an ulcerated stomach is too frail a creature for heavy work. The man with uncorrected eye defects is the sport of circumstance. Accidents do not happen to him; he happens on accidents.

Men are chosen for engineering and management by their mental qualities. It is not the fault of any man, perhaps, that he has not the mental capacity of an industrial leader. But when a man is engaged for such a position his ability is carefully canvassed, and inexorably are his services declined if he fails to measure up. Is there not reason, therefore, for subjecting employees—even those whose labors are in the main physical—to careful examination? Should not they also receive preferment in the best of jobs only after qualification as to their physical and mental fitness?

Cooled-air conscious

MAN has shown such ingenuity in providing for his own comfort that his backwardness in enlisting engineering science to give his home the same freedom from heat of summer that it has from the cold of winter seems almost a reflection upon his resourcefulness. Thanks in a great measure is due, therefore, to the enterprise of the motion-picture industry in making a large part of the public conscious that the discomforts of excessively high temperatures may be avoided.

The art of keeping cool in summer has had still another boost this year as the result of the vision of the management of the Baltimore & Ohio Railroad in applying conditioned air to one of the crack trains of the line on the New York-Washington run. This initiative brought such spontaneous recognition from the public that it was necessary to equip a second train with air-cooled coaches. Next summer, officials of the railroad say, all the featured trains on the system will be air-cooled. Other railroads will follow the path blazed by this carrier.

The wide publicity that has been given this innovation on the B. & O. has done much to quicken public consciousness that it is just as foolish to swelter in summer as it is to be chilled to the marrow in winter. Adoption of cooling systems by stores and their use in public buildings is the forerunner of lower costs for such installations and of their adaptation to residential service. Keeping cool with coal, long a dream, is seen to be a reality.

Permissive orders and safety

WHEN orders are given, they usually should be mandatory, not permissive. An order which leaves the performance and the sequence in which it should be performed to the judgment of the person ordered can always be evaded on the ground that conditions have not called for its execution. Miners who are told to set the posts that are needed for their safety always can excuse their neglect by saying that in their judgment it was not necessary to stand them. But if the miner is given a plan as definite as an architect's blueprint he has no more pretext for leaving out a post than a carpenter has when he omits a door which his plan prescribes.

Moreover, judgment is of little avail under a treacherous roof that may have an unobservable kettle bottom or a crevice. On few coal-mine roofs can any reliance be placed. Because of their great weight a kettle bottom or a heavy slate may fail to respond to test with a pick handle or a bar, even with the aid of the human touch to sense the vibrations. It is safest, therefore, to prop according to a plan found to afford safety, leaving the miner the sole liberty of placing more timber if the roof seems to require it. Then, when inspection is made, the miner cannot square himself unless he has followed the plan and has set all the required props.

At the recent National Safety Council, A. H. Trestrail testified to the value of this principle in the operation of mines on the Iron Range. The "back" or roof was causing many fatalities and other accidents. So dangerous was it that forepoling was frequently introduced. One company decided that forepoling should be compulsory and not permissive, and gave the necessary orders. The safety record of that company became so good that it was not long before the other companies ordered all their places forepoled in every instance, regardless of the apparent safety of the roof. That rule is now universal on the Range. To those who have not instituted systematic timbering, the experience is respectfully commended.

In the open

WHAT many coal men long have been saying privately was said openly at the recent conference on anti-trust laws sponsored by the New York University when Charles O'Neill declared that too large a part of the delivered price of bituminous coal was absorbed in transportation charges. "Freight rates," he asserted, "are excessive to the extent of 50c. to $1 per ton, and we submit that the coal industry cannot continue to pay such tribute to a sheltered industry." Transportation charges representing 62.5 per cent of the destination price of soft coal, Mr. O'Neill insisted, are out of line when compared with rates absorbing 33.76 per cent of the destination price on common brick, 27.28 per cent on coke, 22.61 per cent on anthracite, 13.85 per cent on building stone, and 7.26 per cent on fabricated iron and steel products.

The issue raised is a vital one which cannot be evaded forever. If the level of coal freight rates is too high, responsibility for that situation rests primarily with the coal industry itself. Past indifference to any change which did not involve interdistrict relationships did not put the carriers on notice that rates were impeding the free flow of coal tonnage. Fortunately, however, the doctrine of laches does not prevail. The partnership between the railroads and the coal industry is not estopped from considering the whole subject anew in the light of changed competitive conditions both in fuel and in transportation which have arisen since the days when the relationship between coal-producing districts fighting for a common consuming market seemed the only thing which really mattered.

Because the partnership between coal and the railroads is frankly recognized by both industries, there should be every reason to expect that a reexamination of the rate structure can be approached in a spirit of friendly cooperation. Certainly the possibilities of changes which would increase volume and revenues for both sorely distressed industries are worthy of careful exploration. The National Coal Association, which clung to the traditional policy of non-participation when the question of formal appearance before the Interstate Commerce Commission in the Recent *Fifteen Per Cent Case* was considered, might well take the lead in promoting such a reexamination.

"Technologic unemployment"

IN TIMES such as the present, when so many willing and competent men are unable to find work, there is a disposition to discuss labor-saving equipment in hushed whispers. The few advocates of the machine age who dare lift their voices in defense of progress not infrequently meet foolish attacks with no less foolish defense. All the fine-spun arguments of the engineering rhetorician that the machine has not contributed to technologic unemployment will not convince a single glass blower or a single coal loader who is out of a job, because some mechanical device has been installed in the factory or the mine. The displaced worker has experienced a personal demonstration of the malevolence of the machine which, in his mind, outweighs all argument.

But, to admit the validity of this fact does not mean, as some contend, that industry should demechanize in order that employment opportunities may be multiplied. Such a retrograde movement is impossible, because the plants which have invested capital in mechanization will not forego the advantages that investment gives them, and it would not be the part of wisdom to do so. Particularly is this true of coal, where the competitive situation demands prices which will support high wages only when production is mechanized or natural conditions are unusually favorable. We need more not less mechanization. To sweep the machine into the discard would compel the surrender of the social advantages, the comforts, the higher standards of living which the machine has created.

William Green, president of the American Federation of Labor, takes the sounder view when, writing in the symposium on engineering progress sponsored by the Engineering Foundation, he says: "We have learned how to make quantities, but we have not learned how to get them to the people who can use them or how to distribute equitably the returns from joint products. We are attempting to turn these currents through the old channels we developed in the days of hand production." The task confronting industry is not the elimination of the machine but the task of making it a still greater instrument of social progress. That this may lead to a shorter working day and a shorter working week should frighten nobody not under the spell of outmoded traditions.

For broader service

A LONG-FAMILIAR feature — the monthly review of spot markets—is missing from the pages of the present issue of *Coal Age*. The disappearance of this section is the result of the conviction that, in large part, these market reviews are a duplication of speedier weekly and daily service in this particular field of coal trade news, and the belief that the energies employed in this duplication can be more profitably devoted to merchandising studies more fundamental and original in character. Week-to-week and month-to-month changes in markets are superficial reflections of movements which call for deeper and more detailed analysis. Many of these changes are paced so slowly that their full significance cannot be mirrored in reviews confined to current fluctuations in prices and demand. *Coal Age,* therefore, plans to increase its service to the executives of the industry by giving more attention and more space to study of these broader movements in fuel marketing.

NOTES

. . . from Across the Sea

SOME few years back the Coal Mining Institute of America discussed the progress in British mines, and speakers questioned whether the British had adopted, as fully as they should, modern standards of size and weight of equipment. One who had just returned from visiting British mines declared that the development of the coal industry in England had been cramped by the small shafts and low and narrow roadways of earlier operations, and that wherever new work was attempted it would be on more generous lines.

Consequently, it is interesting to note just what equipment a new plant such as that operated by the Hauxley colliery in Northumberlandshire has installed. This shaft was sunk in 1926. It has a diameter of 18 ft. and is 480 ft. deep. *Colliery Engineering*, of London, in describing this plant, says, "It has been possible to develop Hauxley colliery on the best modern lines." The main heading is a steel-arched roadway 8 ft. high and 10 ft. wide. Probably it has about 70 sq.ft. of cross-section, which would give a somewhat greater ventilating capacity than would be afforded by an unlined irregular heading 7 ft. high and 10 ft. wide.

Such a main intake airway seems likely to be inadequate as time progresses. In the best American practice, especially where there is much gas, there will be three or four such intake airways and as many returns. But it is only fair to say that in American mines with coal as thin as 1 ft. 9 in. to 3 ft. 3 in., such as is worked at the Hauxley colliery, rather less than more cross-section usually is provided. It must also be admitted that the British cars, being relatively small, as will be seen later, will not block the airway as much as cars do in American roadways. Nor should it be forgotten that with the greater concentration in this mine as compared with American mines and with the thin coal, the quantity of gas to be removed will be less than in many of our operations. Heading falls being eliminated, also, the air will be less obstructed and roof gas will not be tapped in any volume. Nothing is said as to the main return airway, which probably is still less adequate.

At Hauxley colliery the branch headings measure 7x8 ft. and have a cross-section of 50 sq.ft., these roadways also being strengthened by steel arches. American practice in thin seams is to make these 6x10 ft., but as the roof is roughly arched and the sides are rougher, the ventilating resistances probably are no less than that of the Hauxley branch headings.

"Careful attention," says the article, "has also been given to the track, which is laid with British Engineering Standards Association rails weighing 30 lb. to the yard and laid on steel sleepers [ties] of the clip and bolt type." In contrast, 70-lb. rail is becoming the American standard for the main-line track of large mines. Thirty-pound rail is relegated to rooms. But here again it must be remembered that it is the weight of the locomotives and not that of the cars that has made our American standards what they are. The Hauxley mine is relying on rope haulage and ponies, and so can afford to lay its track with lighter rails.

The track gage is 2 ft. In America all gages up to 4 ft. 8½ in. may be found in coal mines. Rarely are gages below 30 in. used, though one can still find little mines, some of those even that are equipped with railroad sidings, working with gages underground as narrow as 19 in.; 42 in. is regarded as standard. It is difficult to explain the use of a 2-ft. gage, especially where the cars do not enter the rooms. Here, indeed, the evil influence of early standards seems to have hampered modern development. Just how this early influence acts is explained in the following paragraph.

Says the article, "Although desirable in itself, the weight of track has been made additionally necessary in view of the large tubs [cars] which have been introduced and are gradually replacing tubs of 10-hundredweight capacity." So this British mine apparently has been trying to operate with two sizes of car, and in order to put the two types on one track has had to concede a rail gage so small as to preclude the use of a large car, even as has been done too often here.

The new car, thus introduced, carries 25 hundredweights, which I take to mean long hundredweights, or 2,800 lb. The car looks big because it is high—3 ft. 7 in. above the rail—but it is so narrow that it has no capacity. Such a narrow car must be difficult to load well without spillage. It has a total width of 2 ft. 9 in., instead of 6 ft. or even the 7 ft. 6⅜ in. which was the width of a car exhibited at the Cincinnati convention. "The introduction of such a large tub," says the article, "marks a novel departure from the usual practice in the Northumberland and Durham coal field, where one frequently comes across tubs—a legacy from bygone generations of engineers—with a capacity as low as 8 hundredweights [896 lb.]."

But more than enough that is critical has been said. One would miss the significance of this Hauxley colliery if one did not mention the points which it furnishes to American engineers for a betterment of their operations. One must admire the long 26-in. trunk belt conveyors fed by 20-in. belts from both right and left, with shakers for face work, and belts also for that purpose where gradients are unfavorable for the movement of coal by shakers. Few mines in America are so well equipped in this regard. Our hesitancy contrasts unfavorably with the ready acceptance of the necessities of conveyor mining found in Great Britain.

The coal is undercut to a depth of only 5 ft., which is perhaps necessary, as the roof loads are heavy, the coal dipping 1 ft. in 4 toward the sea and thus speedily reaching great depth. But power drills are used both in the coal and on the rock, which shows advanced practice. In each case the drive is electric. The lagging behind the steel arches in the roadway is of creosoted timber with brick below the arched portion. The cars have roller bearings and are discharged on revolving dumps, the latter being standard British practice.

At the near-by Broomhill colliery of the same company the rails weigh only 25 lb. per yard. At the latter mine, turnouts, even when constructed for arc-wall work, are of ¾x3-in. bar iron set on edge and laid without ties. This Broomhill mine is laid out like a checkerboard, a 50-per cent recovery being made on first mining and 50 per cent on second mining, one process following close on the heels of the other.

* * *

Europe is beginning to show an interest in the use of duralumin for mine cages. This material has long been used for airship construction. It is finding increased application for railroad equipment, for marine work, and motor trucks. In mining, its application is to cages and miners' helmets, though in the latter case apparently it has merely been subjected to test.

Duralumin possesses the strength of mild steel, although its weight is barely a third as great. Its elastic limit is from 34,000 to 42,500 lb. per sq.in.; its tensile strength, 57,000 to 64,000 lb. per sq.in., and the elongation is from 16 to 24 per cent. A number of duralumin cages, reports Marcel Pubellier, in a meeting of the French Industry Society, from which these facts are taken, have been constructed in Germany. Two companies were using such cages—the Oberbayerische Actien Gesellschaft at Hausham, near Munich, where the cages are double deckers and have been in use fifteen months, and a company at Hamm, Westphalia, where the cages have been used for an equal length of time.

The advantages are economies in the size of the hoisting rope, the power requirements, the costs of installation and maintenance, or in an increased useful load carried or in the depth of mine workings that can be operated. With duralumin cages the depth of the shaft can be increased 825 ft. under conditions ruling at German mines.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Modern Combustion, Coal Economics and Fuel Fallacies, by C. V. Beck. Mid-West Coal Retailer, Chicago. 382 pp., 7x10½ in.; cloth. Price, $3.

All who look to coal as a means of livelihood should be reading and rereading Clarence V. Beck's book. Probably it is not all gospel; much of it seems too good to be true; but all of it is stimulating and all of it is calculated to destroy that spirit of defeatism that the coal man is breathing day by day.

Mr. Beck is president of the St. Louis Coal Co. and marketing executive of the Lumaghi Coal Co. This explains why he has written this book. He is giving the public the benefit of the conclusions which have been back of his executive drive. He describes the coal industry as largely a subsidized activity, meaning that many mines have been opened because of the trade they brought to railroads and merchandising industries, but that is truer of Illinois than of some other parts of the country. In many sections where mines have sprung up in numbers almost overnight, there were not even farms, much less stores, vacant houses and land sites eagerly awaiting customers, renters and purchasers; the mines were opened to produce coal, not to sustain communities or sell real estate.

It is probable that if the coal business were to improve, more allied interests than ever would be willing to assist with capital in the development of the mines, but any such statement is academic, for hardly anyone today is willing to put money in new coal enterprises, even in pursuance of a side interest. Yet, only the other day a company which proposed to reopen some large mines was approached by merchants who offered to buy a block of stock if the company would undertake the operating program proposed, the reason for the offer being that the venture would bring purchasers to stores which needed the business.

One of Mr. Beck's opening theses is that there will soon be no excess production. He tries to prove it by three assumptions: (1) That all mines which continue to work will have to be mechanized; (2) that no mine producing less than 500 tons a day has the funds, or can obtain the funds, for mechanization; and (3) that loading machines cannot operate in coal seams thinner than 5 ft.

One cannot well assent to these assumptions. It is likely that all mines will before long be mechanized, even though many by grievously low wage scales have been able to continue in operation without what is commonly implied by mechanization. Again, a mine is not to be judged by what it is but by what it may be. A mine with small tonnage may have, nevertheless, a wonderful acreage available, if not already purchased. When installment buying invades the coal industry, as it already has other industries, who shall say what may not be done? As for the last assumption, that a coal seam must be 5 ft. thick or thicker for successful mechanization, that has been clearly disproved by the scraper loader and the hand-loaded conveyor.

The author has sharpened his pencil and in a series of able tabulations proves that a large number of mines and a number of mining districts are doomed to extinction. He admits, however, that some will be saved by their local markets.

Mr. Beck in his opening nine chapters discusses coal economics and follows that discussion with six chapters on fuel fallacies. A large section is given to studies on combustion, including the large and small stokers, but many other matters are treated, including the use of cinders and the comparative values of fuels. Mr. Beck's declaration is that, "Efficiency is pulling coal out of the hole everywhere." And he does much to prove that this is true and to indicate how with high endeavor and a knowledge of the facts it can be made to be true.—R. Dawson Hall.

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Reflections of an Anthracite Engineer, by George E. Stevenson. Printed for Private Distribution. 238 pp., 5¼x8 in.; cloth.

At last coal mining has produced an autobiography and has thus come abreast of present times, which have perhaps exceeded all others in their wealth of biographical and autobiographical material, the publication of which has come either during the author's life or thereafter.

Mr. Stevenson's work is posthumous, not indeed, I presume, from any desire to escape criticism, for the author was always willing to sacrifice himself for his convictions. Witness his effort to have someone on the examining board or the state attorney general prosecute him for violating the Miners' Certificate Law of 1889. He ultimately attained the arrest he coveted, and was acquitted. A generous hearted man, he was always seeking a cause to defend or advance, at considerable loss and expense to himself.

The book is not all autobiography, as the title would suggest. All the problems that have assailed the anthracite region since George E. Stevenson was born at Danville, Montour County, Pa., in 1860, have been treated in a determined but kindly way.

One cannot feel that he is right in suggesting that the Pennsylvania legislature or the courts "strained a point to make a separate class for anthracite." True it is that some of the coal from some of the area designated by the law will coke, but none of it is mined now. True also it is that some is relatively soft and has a percentage of volatile matter entitling it to be termed semi-bituminous, but not much of it. But on the whole the designation of the field as a unit is now pretty generally agreed upon and its peculiar differentiations are well known. No engineer would have made any different division than that the legislature recognized.

What made the tax obnoxious to anthracite men was the fact that anthracite competes with bituminous coal as well as oil and gas, which were not taxed. No matter what the nature, however variant from bituminous coal or other fuels, to single out anthracite coal for a tax was a misuse of legislative powers and unconstitutional.

Our bituminous friends will be surprised to read that "Coking is simply the driving off of volatile matter by the application of heat without burning up the fixed carbon." According to that definition nearly all coal will coke—lignite, bituminous, semi-anthracite, and it may be presumed some anthracite—which, of course, is not true.

Eminently readable, almost invariably fair, human in quality, full of interesting and original fact, this book by Mr. Stevenson adds to his reputation and may add many admirers to the already large number of those who, while he lived, were his friends and now unfortunately must perforce be only his admirers. The book will be read with interest by future generations of mining men, as well as by those of this generation. R. Dawson Hall.

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A Syllabus of Pennsylvania Geology and Mineral Resources, by George H. Ashley. Bulletin G1, Pennsylvania Geological Survey, Fourth Series. Harrisburg, Pa. 160 pp., 6x9 in.; paper.

In this little volume Dr. Ashley presents a comparison of Pennsylvania as a source of minerals with the rest of the United States; discusses geology broadly as an introduction to a description of the geology and mineral resources of Pennsylvania which follows. The book is a popular disquisition on the subject and is written in Dr. Ashley's illuminative style. It has been prepared to replace two bulletins now out of print on "The Rocks of Pennsylvania" and on "The Mineral Resources of Pennsylvania." Evidently the book has been some time in the press, for one fails to find any reference to the presence of gas in the Tioga field.

THE BOSSES TALK IT OVER

HOSPITAL CASES—

"Mac, that man is sure in a bad way from that accident this morning. Doc tells me the shock is worse than the injury; that his chance for recovery is not so good. Poor Jim has it on his mind that he is going to die, which makes matters worse."

"No wonder," observed the foreman. "Why shouldn't he be scared, the way he was handled on top? Doc didn't arrive for more than an hour. Meantime, John was held in the first-aid room. Men were allowed to pass through to look him over. They shook their heads. So did the doctor."

"There was little that could be done," protested the super.

"Oh, yes, there was," Mac argued. "As many men are scared to death as die from injuries. If I had been here, I should have seen that he got the right kind of first-aid treatment, and then rushed him to the hospital if the doctor was not here—with your permission of course.

WHAT DO YOU THINK?

1. Should a man seriously injured be held at the plant for a doctor's examination?

2. If the man has been given adequate first aid, can the doctor do any more for him at the plant?

3. How do you keep up his courage?

4. What steps do you take to keep the curious from crowding around him?

[Note: Consult your company doctor before answering these questions.]

All superintendents, foremen, electrical and mechanical men are urged to discuss these questions. Acceptable letters will be paid for

Should yardage be paid on tonnage basis? Jim and Mac considered this problem in October. What the readers think is told in the letters following.

The Ton Rate Has Possibilities

The old man's scheme is workable; certainly it is more efficient than the old system of yardage measurement. A foremen's meeting should be called and the new idea thoroughly discussed. If it appears practicable to the particular conditions at the mine, then it is up to the foreman to sell the idea to the miner, proving to him that the new plan will be fairer to everyone concerned. The bosses should explain that payment for the number of tons or cars loaded, according to the thickness of the slate, will in the long run be more accurate and economical than the old method.

Mac's method—the old scheme—has several weak points: (1) It takes more time to measure yardage than to estimate tonnage of slate on the basis of the quantity of coal loaded; (2) often, during the two weeks between measurements, the station or mark last established will in some way be changed or destroyed, perhaps by a fall of slate or coal, perhaps by the miner himself; (3) measurement of the yardage in pillar sections cannot be maintained uniformly accurate, because of the frequent occurrence of falls.

Under the new method I would suggest that the engineers measure the thickness of the slate in all places except the pillar sections. In the latter places the section foreman should take the measurement daily. Finally, the rate paid the miner per ton or car should vary according to the thickness of the slate. ARTHUR J. PUGH.

McAlpin, W. Va.

Why Blame Tonnage or Yardage?

In my experience I have seen both tonnage and yardage plans give the desired results—and by tonnage I mean an increased rate per ton for coal mined in these entries above the regular room and pillar rates. Both methods have their advantages and disadvantages, and the satisfaction derived from either depends upon the reckoning the mine foreman makes to the company. Under the tonnage plan, if the miner can get away with it, he may drive the entry too wide, knowing that the wider the place the better will be his earnings, while with yardage he will more certainly aim to keep within the designated width limits. He may even get it so narrow as to overlook side clearance in an attempt for extra yards.

The efficient foreman or assistant, however, will check up every day on width, clearance, points, roof, track, etc. Then the desired results usually will be obtained. It is my judgment, backed by experience, that the problem is one of efficient management rather than that of either one of them, tonnage or yardage, being the best plan.

I have seen very little necessity for extras in compensation for mining pillars. I have worked thin seams where the roof, the bottom, or the thick middle slate was shot and removed in rooms to provide head clearance for the mine cars, mules, and haulage equipment, but it was so planned and worked to eliminate pillar yardage and deadwork.

Where pillars abandoned for years

are recovered, there are many caves to clean up, and a great deal of track work and timbering is required. Most of this deadwood is generally assumed by the miner himself, who realizes profit by the ease with which this coal is mined and loaded. The large caves likewise are cleaned up on an equitable contract basis. W. H. NOONE.

Davis, W. Va.

Certain Objections to the Plan

A high yardage cost will always start trouble. Only when this cost is fairly constant can investigations be avoided. The yardage cost is important in production because it represents the work done and paid for which lends nothing to the value of the product. When a uniform thickness of slate prevails over the workings, the cost should be fairly uniform.

Several objections can be raised to the plan. In the first place the Old Man cannot pay for slate by the ton unless the width and depth of the slate, as well as the thickness, are known. Then, too, the specific gravity of the material must be taken into account. If it were possible to load up all the slate and weigh it, the method would be fair and accurate. But where slate is gobbed, the final solution rests with the ability of the one measuring the slate to estimate the tons handled. This means that the cost might again fluctuate. PAUL W. HINCHEE.

Beckley, W. Va.

A Notebook Is Invaluable To the Busy Mine Foreman

I find that a notebook is as necessary a part of my equipment as a tape line, anemometer, or watch. The information usually found in it, of course, would not serve anyone else, but it saves me a good many steps and also saves my employer money through more efficient supervision. It depends, I think, on the size of the operation you happen to be in charge of. The greater the responsibility the more necessary is the notebook.

During examination of various districts in the mine, I make note of material such as rails, ties, timber, and a hundred other items that enter into the maintenance of a section, including notes on conditions in working places and sections. By making a careful examination of a section and taking proper notes I am able to discuss conditions as they are with section foremen and the superintendent intelligently. I am also able to direct my supply men to where they can get materials on one section for delivery to another section or to the outside, as the case may be.

I check over my notebook each day, cross out information that is of no further use, keep each day's work dated, and finally when the book is full I put it away for future reference. Summed up, the notebook is to a busy foreman what the memorandum pad is to the busy executive. LLOYD BUSH.

Indianola, Pa.

The New Plan Is Equitable But Will Labor Accept It?

I take it that in stating his case, by the words "payment for slate by the ton" the Old Man means payment by the coal-ton. As a matter of fact, there could be no other interpretation, inasmuch as no mine, to my knowledge, follows the practice of weighing slate.

That being his proposition, the Old Man suggests a scheme which stands ace-high with me. It is too bad such a scheme was not instituted at the beginning, in place of the one which has been the cause of dissension these many years. It is the only arrangement that will give the miner payment for the slate which he handles, and no more. I hate to say this, but in stating the facts, no other charge can be made than that a portion of the payment for slate on the yardage basis is graft. The Old Man's scheme could be worked out with justice to both the miner and the company, but the question is, will labor accept the plan? J.D.R.

Pittsburgh, Pa.

A Method of Slate Payment Where Thickness Is Uniform

In one mine where a constant parting prevails and in which there is a variable overlying slate which comes down with mining, the following procedure is followed: The parting is removed at a fixed payment rate which is included in the cost of loading, because this parting is always present. The overlying slate is then measured twice a month by the engineers and not by bosses. The engineers become a neutral party and only pay for slate removed. The measurements are not influenced by the bosses' measurements, because this is one of the things they do not meddle with. This is a boon to the foremen in that they are protected from the consequences of favoritism.

The slate is measured in yards and paid in yard-inches—that is, a rate is set per inch for both narrow and wide work. Bottoms are handled the same way. The narrow and the wide work is uniform; therefore, after the rate is fixed per inch, the volumes are proportional. Yardage is measured only in places advancing. Slate falls occurring after yardage is measured is removed by company men. Falls are few, because the slate is taken either to the solid or taken to a joining plane which separates easily and gives a safe top. After each measurement, white lead is used to mark the station where measurements stopped.

Pillar yardage is covered by varying the rate per ton of coal according to the thickness of the slate, which is known. This rate is fixed by the chief engineer. Here again slate falls are removed by company men. It has been found with this method that the yardage cost usually does not take sudden jumps. When it does jump suddenly there is a reason and it can be traced. Opening a large number of new places at one time before old places are completed will cause yardage cost to go up. When the mine is not operating at full time, yardage cost can increase unless it is properly governed.

For example, it may be that yardage cost increases for a half, the reason being that the last three days of the half are idle days. The mine foreman may conceive the idea of preparing for a big run the first day the mine operates. He loads every car during these idle days. He does not make a big run because his car distribution is poor. His slate cost increases because the coal loaded comes only from yardage places, coupled with the fact that the tonnage that half was low and yardage was paid for coal not dumped in that half.

JOHN P. LUKENS.

Dorothy, W. Va.

A Job for Day Labor

It is a little difficult to understand just what the Old Man means by the words "to pay for slate by the ton." Surely it isn't customary to hoist the slate to the surface and weigh it, as in the case of coal. The alternative is to compensate for the removal of the drawslate by allowing an increase in the coal tonnage rate. My experience with both systems urges me to give an unequivocal "No" to the practice of either.

A like problem has been solved in this field by a special rate per ton of coal passing over the scales, with a separate allowance for the removal of drawslate and impurities in the bottom coal—payment being made at the laborer's rate per hour of actual work performed. In some cases a force of day men is maintained for this same purpose. From the standpoint of efficiency, I recommend this latter practice, as loaders performing this type of work at an hourly rate is poor economy.

ALEXANDER BENNETT.

Panama, Ill.

His Company Follows the Plan

The big boss is surely on the right track this time. He will not only be better satisfied with his yardage measurements on pillars but his loaders will soon learn that the tonnage basis is the best way to estimate the yardage in caved areas. We have been using this system for about a year and have had no trouble or dissatisfaction whatever with the loaders.

The system has two big advantages over the old way of measuring: First, the loader will make an effort to get all the pillar out, for he will not be paid for the slate if he leaves the coal in, as he sometimes did under the old arrangement. Second, he will be careful to separate as much of his coal as possible from the refuse, instead of leaving half of it mixed with the refuse, with the thought that he will get yardage for it anyway, so cleaning is not worth the trouble.

We average the tonnage coming from

each place in solid work, and on this determine the exact amount which should be added to each ton of pillar coal for each inch in thickness of slate. The assistant foreman each day measures the thickness of slate in each place and this is closely checked later by the engineer. Final figures are based on the quantity of coal loaded, as taken from the payroll, and to the regular loading payment is added the compensation for slate due the loader for that half. WALTER HORNSBY.

Glo, Ky.

Tonnage Rate Should Apply To Handling of Roof Slate

Slate should be paid for on a tonnage basis. Then, when the machine cuts wide the miner gets full pay for the quantity of slate he handles; by the yardage method he would be paid only for the slate in a narrow cut. In the same way the company's interest is protected.

In establishing the tonnage rate much care is needed to make it fair. The temptation to make a flat rate and thus save measuring may be strong, but the only fair basis is to fix the rate on the thickness of the coal and that of the slate. This method is in operation at some mines where I have worked, and is as near satisfactory as any system I have ever seen.

When a boss says he has measured the pillars to the best of his ability he is right, for the best a man can do in this case is to make a good guess. Incidentally, it pays to watch your day work when this last system is in effect, as some bosses, not understanding, may attempt to slip in some company time for slate that is already paid for.

If a tonnage rate is used, it is best to apply it exclusively. In some cases, however, the system may be applied to pillars only, making this tonnage rate equitable with the room yardage rate. Kicking is inevitable wherever slate is handled, if for no other reason than just to keep in practice, and this applies to the high-ups and low-downs alike. C. E. MONTGOMERY.

Milburn, W. Va.

A Vote for the Old Method

As a boss, I have been in the position of Jim, accused of paying too much to the miner when his wages were above the average. Invariably my answer was that I welcomed the higher officials to check up on my work. I gave what I thought was just and right to the worker. It is a tough problem at times to be governed by justice while others are doing shady work, apparently to save themselves from going to the wall.

If possible, all work ought to be on a piecework basis to save the honest worker and employers from the drones. If slate can be loaded by the ton, that should be done. I assume that the big boss wants to pay for slate on the basis of so much per ton of coal produced. Great care and patience would be necessary to adjust the differences which are bound to arise under this arrangement. Men will say they are being robbed even when they receive payment which is better than usual. The simple fact that labor, in general, does not get justice casts suspicion on all operators, honest and dishonest alike.

I believe the best method is the old one: namely, to pay so much per inch of thickness per linear yard in accordance with the width of the plate. Yardage payment causes the most friction in the mining of thin seams. Frequently in these cases the fault lies more with the method of mining than with the method of payment for the slate handled. Methods should be adopted that call for the least amount of narrow work for yardage payments. W. H. LUXTON.

Linton, Ind.

Recent Patents

Mine Car; 1,815,082. Jacob Steinberg, Brooklyn, N. Y. July 21, 1931.

Method and Apparatus for Mining Coal; 1,815,856. Nils D. Levin, Columbus, Ohio, assignor to Jeffrey Mfg. Co., Columbus, Ohio. July 21, 1931.

Coal Mining Machine; 1,815,981. Nils D. Levin, Columbus, Ohio, assignor to Jeffrey Mfg. Co., Columbus, Ohio. July 28, 1931.

Blasting Cartridge; 1,816,257. Frank H. Kneeland, Chicago, assignor to Safety Mining Co., Chicago. July 28, 1931.

Coal Pulverizer; 1,816,408. W. C. State, Akron, Ohio. July 28, 1931.

Drilling Apparatus; 1,816,481. Charles C. Hansen, Easton, Pa., assignor to Ingersoll-Rand Co., Jersey City, N. J. July 28, 1931.

Process and Mechanism for Separating Intermixed Divided Materials; 1,817,296; 1,817,297; 1,817,298. Kenneth Davis, Ebensburg, Pa., assignor to Peale-Davis Co., Wilmington, Del. Aug. 4, 1931.

Hoist; 1,817,736. O. E. Clark, Denver, Colo., assignor to Gardner-Denver Co., Denver, Colo. Aug. 4, 1931.

Coal Loader; 1,818,168. P. E. Smith, Herrin, Ill., assignor of one-third to Le Roy B. House, Herrin, Ill. Aug. 11, 1931.

Purification of Coal; 1,818,189. Maurice Bertrand, St. Nicolas Lez Liége, Belgium, assignor to Société Anonyme D'Ougrée Marihaye, Ougrée, Belgium. Aug. 11, 1931.

Apparatus for Loading Mine Cars; 1,818,427. James A. Paisley, Cleveland, Ohio, assignor to Valley Camp Coal Co., Cleveland, Ohio. Aug. 11, 1931.

Mine Prop; 1,818,633. Nils D. Levin, Columbus, Ohio, assignor to Jeffrey Mfg. Co., Columbus, Ohio. Aug. 11, 1931.

Coke Oven; 1,818,713. Charles E. Hughes, Hackensack, N. J., assignor to Semet-Solvay Engineering Corporation, New York City. Aug. 11, 1931.

Coal Mining and Loading Machine; 1,818,771. Frank H. Weltz, Duryea, Pa. Aug. 11, 1931.

Blasting Cartridge; 1,818,993. Frank H. Kneeland, Chicago, assignor to Safety Mining Co., Chicago. Aug. 18, 1931.

Blasting Cartridge; 1,818,995. Frank H. Kneeland, Chicago, assignor to Safety Mining Co., Chicago. Aug. 18, 1931.

Froth Flotation of Minerals; 1,819,112. Robert L. Perkins, East Aurora, N. Y., assignor to National Aniline & Chemical Co., Inc., New York City. Aug. 18, 1931.

Loading Machine; 1,819,515. R. E. Jenkins, Farr, Colo. Aug. 18, 1931.

Apparatus for Taking Samples of Coal; 1,820,381. Howard N. Eavenson, Pittsburgh, Pa. Aug. 25, 1931.

Publications Received

Coal Industry and Trade of the Netherlands. U. S. Department of Commerce, Washington, D. C. Trade Information Bulletin No. 768, 23 pp. Price, 10c.

Ninth Annual Report of Safety in Mines Research Board, including a report by the Health Advisory Committee. H. M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, England. Price 2s. Pp. 86, illustrated.

Effect of Certain Operating Variables on the Efficiency of the Coal-Washing Table, by H. F. Yancey and C. G. Black. Bureau of Mines, Washington, D. C. R. I. 3,111; 13 pp., illustrated.

Experiments to Determine the Minimum Amount of Coal Dust Required for Propagation of a Mine Explosion, by G. S. Rice and H. P. Greenwald. Bureau of Mines, Washington, D. C. R. I. 3,132; 3 pp.

Comparison of Storage-Battery and Cable-Reel Gathering Locomotives in a West Virginia Coal Mine, by C. W. Owings. Bureau of Mines, Washington, D. C. R. I. 3,121; 10 pp.

Lost-Time Accidents in Some Alabama Coal and Iron Mines During 1930, by F. E. Cash and H. B. Humphrey. Bureau of Mines, Washington, D. C. I. C. 6,506; 7 pp.

Trade Literature

Wire Rope and Wire. John A. Roebling's Sons Co., Trenton, N. J. Pp. 279, illustrated. Outlines in detail grades, constructions, sizes and applications of various ropes.

Shovel, Convertible. Bucyrus-Erie Co., South Milwaukee, Wis. Bulletin FBE-211; 24 pp., illustrated. Describes its 21-B, ¾-yd. shovel convertible into dragline, clamshell and crane.

Dry Cleaning. The Birtley Co., Ltd., Birtley, Co., Durham, England. Catalog No. 1; 31 pp., illustrated. Contains a general description of the Birtley dry cleaning system and includes views showing its installation.

Cold Finished Steel Bars. Joseph T. Ryerson & Son, Inc., Chicago, Ill. Pp. 8, illustrated. Describes shafting, screw stock and open hearth carburizing steels.

Turbines, Mechanical-Drive. General Electric Co., Schenectady, N. Y. GEA-1450; illustrated folder describing the type D-58 non-condensing mechanical-drive turbines.

Cementation. Dravo Contracting Co., Pittsburgh, Pa. Bulletin No. 301; 19 pp., illustrated. Describes the Cementation system of grouting.

Shoveling Machines. Myers-Whaley Co., Knoxville, Tenn. Pp. 12, illustrated. Covers the use of these machines for loading rock and ores.

Feeder. Deister Concentrator Co., Fort Wayne, Ind. Sheet No. DFW-17, illustrating and describing the Concenco disk feeder.

Drill Sharpener. Sullivan Machinery Co., Chicago, Ill. Bulletin No. 72-P; 4 pp., illustrated, covers portable drill sharpener, Class "E."

Gears, Celoron. Continental Diamond Fibre Co., Newark, Del. Pp. 28, illustrated. Describes the construction of these silent gears and gives other gear information, horsepower rating, etc.

Electrical Equipment. General Electric Co., Schenectady, N. Y., has issued the following illustrated bulletins: Arc Welders, GEA-1440, 8 pp., describes the generator, motor, transformer reacter, control, running gear, etc. Plastic Products, GEA-1429, 22 pp.; illustrations of different applications of plastic molding are presented. Automatic Time Switch, GEA-1427, 9 pp.; describes the operation, installation, adaptability, etc., of this general-purpose time switch.

Pipe. American Rolling Mill Co., Middletown, Ohio has issued a bulletin containing information on coatings of Armco spiral welded pipe, their selection, probable life and other data.

Haulage Equipment. Bottom dump trailer is illustrated and described in Bulletin No. 102 issued by United Iron Works Co., Pittsburg, Kansas.

Drill. Jeffrey Mfg. Co., Columbus, Ohio. Folder No. 532, illustrated, covers the A-6 Post Drill.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Synchronous Motor Excited From Generator End

Referring to the article by E. R. Bigger, Crichton, W. Va., on "Field Current Value Vitally Affects Synchronous Motors" (*Coal Age*, Vol. 36, p. 199), D. C. McKeehan, chief electrician, Union Pacific Coal Co., Rock Springs, Wyo., adds his own experiences and recommendations. These latter, he states, were developed through a number of years and give excellent results, especially with motor-generator sets. The objective is to have the synchronous motor receive its exciting current from the generator end. His method follows:

With the d.c. breaker open and the generator operating at no load, the synchronous motor field current is adjusted to 60 or 70 per cent of the normal full-load current of the motor. This permits the motor to operate with a leading power factor at light and medium loads with presumably 250 volts at the generator. The generator series field is adjusted so that at full load or more it over-compounds to 275 volts; i.e., approximately 10 per cent. This adjustment is simply the equivalent of raising the exciting current on the synchronous motor 25 volts, which usually is sufficient to take care of the full-load condition and makes the operation practically automatic.

Adjustment of the machines for the proper exciting current is governed to a certain extent by the location of the machine in the mine, as to whether it is in a poorly or well ventilated location. And, of course, the excitation should never be carried to a point where undue heating will result.

If the motor happens to be at the end of a line having poor regulation, the adjustments are made so that the motor will carry the maximum amount of leading current without overheating and with due regard to the operating cycle. In this way it is possible to carry leading current when the machines are lightly loaded, and still have approximately 100 per cent power factor at full load and overload.

Motor generator sets having a direct-coupled exciter are adjusted for the maximum amount of exciting current they can safely carry for the working shift. Local conditions will govern each particular case, but the general method should apply in nearly all instances with slight variations.

When operating with a load of 8,000 kw. on the power plant, the power factor varies from 90 to 95 per cent lagging. This is considered quite good, as the synchronous motors must carry leading current to compensate for the wattless current of several thousand horsepower in induction motors, both the squirrel-cage and slip-ring type.

Power interruptions are due mainly to the tripping of the d.c. circuit breakers; tripping of the oil circuit breakers on the synchronous motors seldom occurs.

Truck Elevates Sand, and Gravity Completes the Handling

AT MINE No. 2 of the C. H. Mead Coal Co., Eastgulf, W. Va., a motor truck is used to convey sand from the railroad siding to an elevated point, from which it flows by gravity through a storage bin, dryer, and borehole into the mine. Location of the sand house beside the railroad would not have permitted delivery by borehole to a convenient location in the mine, so instead of hauling the sand into the mine after drying it was arranged to complete the

Sand Is Unloaded From Trucks on a Highway That Overlooks the Plant

Sand Flows Into the House and Out by Gravity

necessary handling at the time of unloading from the car.

From the roof of the sand house a conduit of vitrified tile was installed on an angle of 45 deg. for a distance of 55 ft. up the hillside to the county road. The upper end terminates at a wall which retains a road shoulder of sufficient size to permit parking of the motor truck while unloading sand into the tile.

Referring to the picture of the sand house, the dim outline of the dryer can be seen through the open door. The opening to the borehole is in the floor on which the dryer stands. The top of the concrete portal of the main slope appears in the foreground.

Cracks in Metal Revealed by Kerosene and Whiting

There are times when a drive shaft or some other finished metal part of an important piece of equipment should be inspected carefully for fine cracks which later might develop into breaks. Very fine cracks can be detected by the use of Spanish whiting and kerosene.

First, the part is soaked in kerosene or the surface covered by brushing or wiping with a saturated rag. Next, the surface is carefully wiped with a dry rag, and a coat of whiting applied. Any cracks will soon become evident by reason of the kerosene coming out and affecting the coat of whiting.

The imported Spanish whiting commonly sold in this country is said to come from England. It is made by grinding and purifying a natural stone.

Why Concreted Drillholes Sometimes Fail

Unless the concrete is properly placed in a drillhole intended for pumping acidulous water, there is little use in sealing the hole at all. This obvious conclusion is not always observed by those in charge of the job, states W. H. Luxton, Linton, Ind., who illustrates his point by giving the experience of a superintendent of his acquaintance.

The superintendent had directed the drilling of a hole to take over the function of another hole in which 3-in. pipe lasted but a few days, so acidulous was the water. To avoid a repetition of this trouble, he ordered that the new hole be made of a diameter of 6 in., that a 3-in. pipe be lowered, and that the open space outside the pipe be sealed with a rich cement grouting. His choice of a rich mix was made primarily to hurry the job, for if pumping had been held up for any great period of time, the main body of the mine would have been under water.

A recurrence of trouble was soon manifested, and examination revealed two faults in the work. Several holes were found in the concrete, caused, no doubt, by the intrusion of pieces of coal or rock in the open space outside the pipe. Furthermore, inspection of the cement in place disclosed that it was of too rich a mixture. It was possible to push off corners of a sample of this material with the hands. The water, under heavy pressure, soon wore away much of the lining.

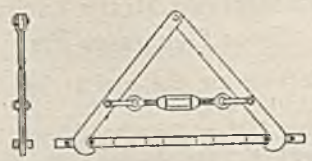
In offering a remedy, Mr. Luxton advances the following method: Put through an 8-in. hole instead of a 6, and use a tube of thin sheeting to hold the space open between the 3-in. pipe and the rock strata. The pipe should be centered with respect to the tube by the use of spacers. Avoid a rich grouting mix and in it use sand which is not sharp. Finally, choose a time for the work when the finished job can be allowed to stand for at least seven days before pumping is resumed.

Big Things in a Little Way

Continuing modernization is the order of the day. But participation in this advance requires patience, alertness, and hard work on the part of management: Patience must be exercised to make the most of the means available; alertness is needed to discriminate in determination of the best order of doing things; hard work is required to push the job through. In the undertaking big things can be accomplished if funds are readily available. Lacking an abundance of money, mental resources must be taxed. That is why, these days, operating ideas which accomplish big things in a little way are in demand. If you have a big little idea, send it in, and you will receive at least $5 for it if published.

Chain Conveyor Repairs Aided By Tension Take-up

When a conveyor chain must be opened for the replacement of broken links or pins the job will be greatly simplified by a tension take-up. Such a



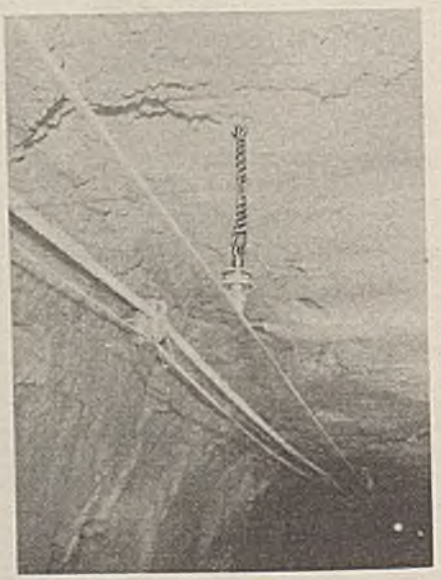
For That Obstinate Repair Job

device is described in the July issue of *Canadian Mining Journal*. It is nothing more than a pair of hooked legs which are hinged and drawn up by a turnbuckle. One leg is forked to receive the other and thus maintain both hooks in line.

Wire Instead of Pipe Used For Hanger Extensions

At Valier mine, in Illinois, most of the trolley-hanger extensions along straight track in high roof consist of stranded messenger wire instead of the usual rigid support made from a pipe

Flexible Trolley-Wire Support



or bracket. One of the hanger supports of this flexible type is shown in the accompanying illustration.

The messenger wire is fastened to the eyes by bending the ends back and binding them with a few turns of single wire. Where the roof height is such that extensions are not needed, the trolley-wire hangers are fastened rigidly to the expansion bolt. There are places where these rigid supports are as much as 200 ft. apart and all supports in between are of the flexible type.

Lower cost is the principal reason for the use of the messenger cable extensions, but the mine officials of the Valier Coal Co. are of the opinion that the flexibility also is an operating advantage.

Pocket Compass Useful in Checking D.C. Feeders

Determination of the direction of flow and observation of reversals of direct current in a trolley wire can be made with an ordinary pocket compass. This applies to the condition where two substations are operating in parallel and it is desired to determine to how much territory or how far either substation is delivering current. To put it another way, the idea is to determine at what location along the tie cable or trolley wire the current is zero.

Fig. 1 illustrates the directions that the compass needle will assume for positions above and below trolley wires with currents of opposite flow. The broken-line circles around the conductors indicate the directions of the magnetic lines of force surrounding the current flow.

An easy way to remember the compass direction with respect to the direction of current is to assume that the conductor is grasped with the right hand so the thumb is pointing in the direction of the current. The fingers will then point in the direction of the lines of magnetic force. Then, of course, it must be remembered that the compass needle always assumes a position so that its north pole points in the direction of the magnetic lines. If held above the current-carrying conductor, the needle points in one direction, and if held below, it points in the opposite direction.

When exploring to find the normal load-dividing line, or "zero," between two parallel substations (see Fig. 2) an approach to the location is indicated by reversals of the compass needle when held in a fixed position above or below the conductor. At the dividing location the compass will show the most frequent reversals and at times will indicate that there is little or no current flowing.

The same determinations can be made by use of an ordinary ammeter, but this method is impracticable because of the cost of having to open the heavy conductor for inserting the meter shunt in series. A better way is to use the instrument without shunt; that is, use the millivoltmeter only and with its leads bridge a few feet of the main conductor. This method takes two men, and care must be exercised or the millivoltmeter may be damaged.

A mine electrician who does much "trouble shooting" on d.c. equipment and who is interested in the problems of power distribution would do well to make a practice of carrying a pocket compass. Experience with it will reveal many other practical uses.

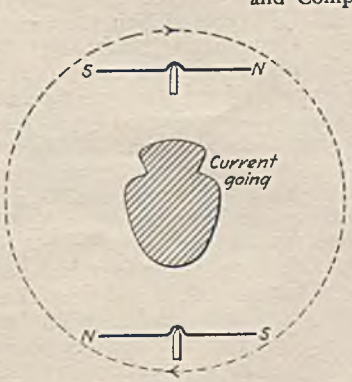


Fig. 1—Relations of Current Direction, Magnetic Field, and Compass Needle Positions

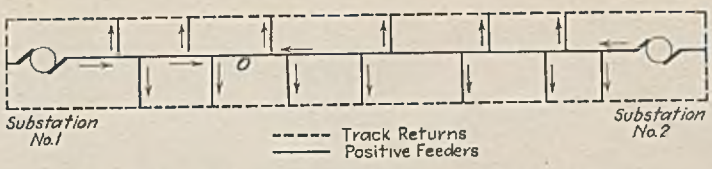
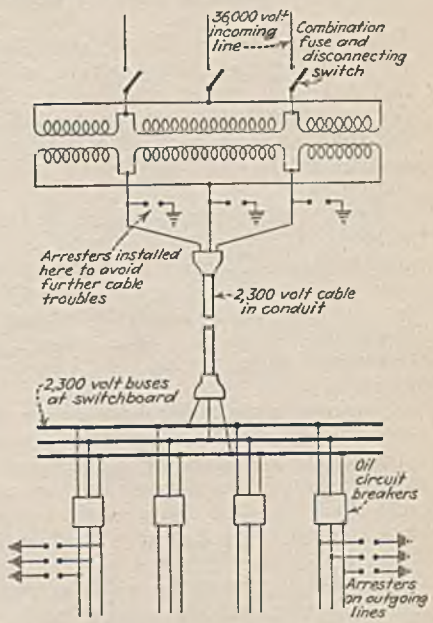


Fig. 2—Location of "O" Depends on Loads, Distances, Circuit Resistance, and Generator Voltages

Static Accumulation on Cable Causes Peculiar Trouble

A succession of cable failures at the Reliance (Wyo.) mines of the Union Pacific Coal Co. brought an unusual condition to the attention of D. C. McKeehan, electrical engineer. The accompanying sketch shows the connections of the cable in question, a 3-conductor, 300,000 circ.mil, varnished cambric insulation, suitable for a working pressure of 5,000 volts, but operated at 2,300 volts.

Failure always occurred near the switchboard end of the conduit, where the cable was attached to the busbars. Short-circuits or overload invariably blew two of the high-tension fuses and left one intact. Before installing new fuses the local electricians would open all oil circuit breakers on the switchboard. This left the 2,300-volt cable from the transformers and the busbars without a discharge path to ground. As a result, static accumulated on the cable and the busbars, a phenomenon always present when there was only one fuse in the primary. After the fuses were renewed, trouble was apparent when the second fuse was connected to the line, as it allowed the energy current to follow a path already established by the static discharge.

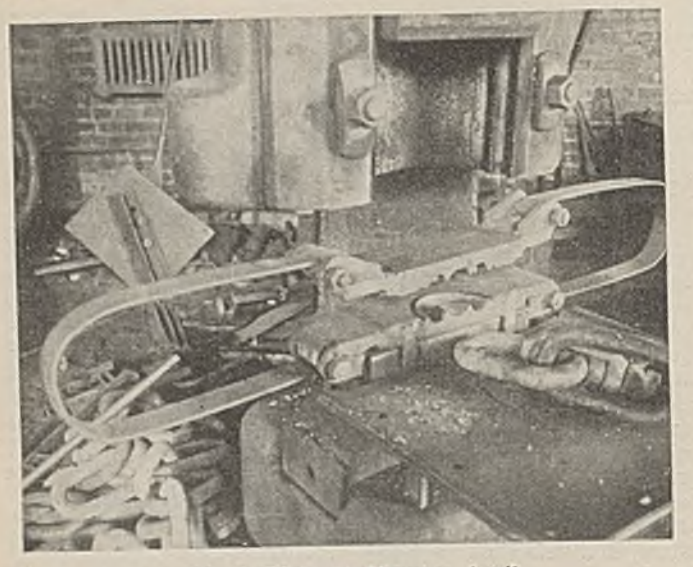


High-Voltage Cable Connections

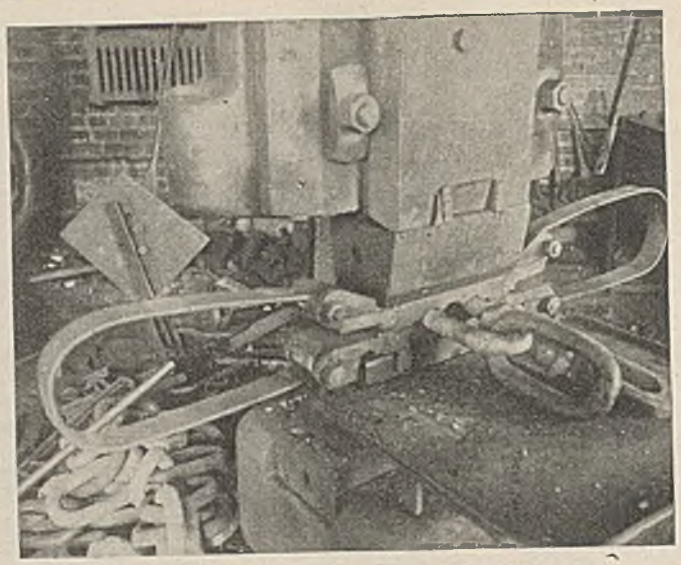
Lightning arresters were installed at the secondary leads of the transformers. Always being in circuit, they prevent the trouble described when fuses are renewed.

Swivel Couplings Made by Special Welding Die

Construction of a special die for using a steam hammer in forge welding mine-car coupling links effected a tremendous labor saving and resulted in more uniform and safer links at



Die in Place on Hammer Anvil



Tremendous Pressure Quickly Applied

Valier mine, Valier, Ill. In connection with an improvement program which included the replacement of a 130-deg. air-operated rotary dump with a full-rotation electric dump, it was necessary to fit all cars with swivel couplings.

Swivels were purchased and the links welded to them at the mine shop. Construction of the die is shown in the two illustrations. The die is fitted to the steam hammer merely by setting it down on the anvil. Lugs projecting downward along the sides hold the tool in place.

The two halves of the die are normally held apart by the long flat springs attached to the ends by shackle bolts. By reason of the tremendous pressure resulting from the blow of the steam hammer, and the fact that the job is done before the link has time to cool below welding heat, the welds are uniformly better than if made by hand.

Hinged Paddle Is Effective As Level Indicator

When a new plant for air cleaning of slack was put into use at Mine No. 4 of the C. H. Mead Coal Co., Mead, W. Va., it soon became evident that the operative should be aided by some sort of device for indicating the approximate level of the raw slack in the feed bin above the table. Without such an indicator much of the operative's time and energy were consumed by traveling a stairway from the top of which he could inspect the level in the bin.

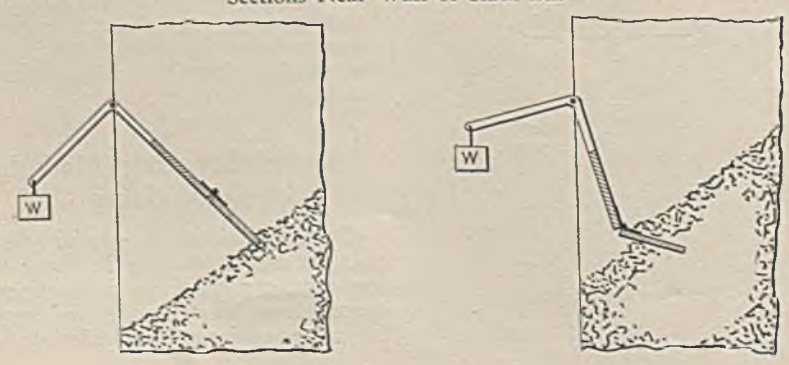
The accompanying sketch illustrates the principle of an indicator which was suggested by an executive of the company. Essentially it consists of a hinged paddle fastened to an arm which sticks out through the side of the bin and is pivoted at the bin wall. A weight swings the paddle away from the wall when the end is free of coal, and the hinged portion naturally straightens in line with the fixed portion of the paddle.

The left-hand sketch shows the normal position of the paddle and indicates how there is a tendency for the fine coal to run around back of it as the coal level rises. On account of this anchoring action, a one-piece paddle would move very little even if covered by coal. The right-hand sketch indicates what happens with the hinged paddle. With this device the hinge operates and the indicating arm outside of the bin moves through a considerable angle.

At Mead two indicators are installed, one a few feet above the other. By glancing at the protruding arm from his usual position near the table, the operative can tell if the coal level is above, below, or between the two indicators.

The device, including the refinements of an open-end vertical conduit or tube along the bin wall to house one or more of the indicators, and electric switches by which the indicators would actuate remote signal devices or motor controls, has been covered by an application for a patent. The indicator is applicable to any fine material.

Sections Near Wall of Slack Bin

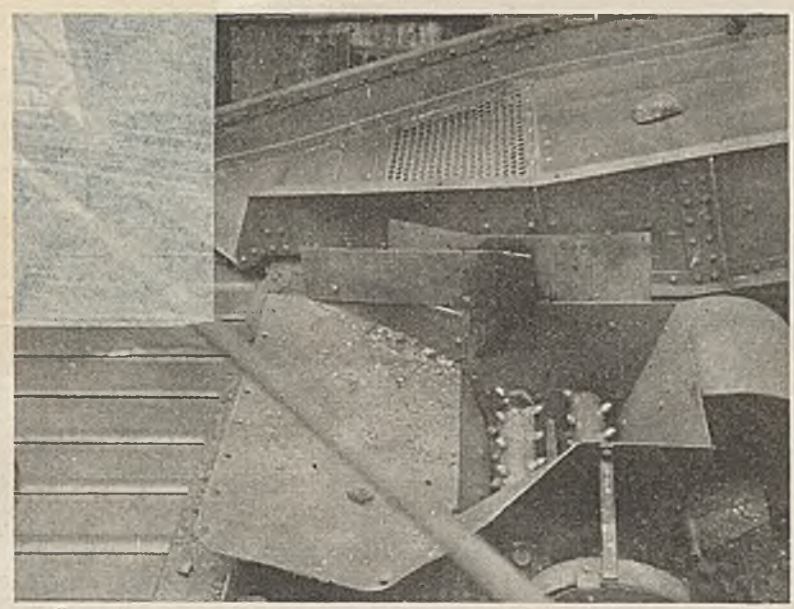


Crusher of Simple Design Handles Special Job

At Mine No. 4 of the C. H. Mead Coal Co., Mead, W. Va., there is in use a shop-made crusher which handles the job so well that it has been copied at another mine in the Winding Gulf district. The use in both cases is to break lumps consisting of coal and the characteristic Pocahontas No. 3 bone, clinging together.

At Mead No. 4 mine the crusher is installed beside the picking table and the bone-and-coal lumps are thrown directly into it. As shown in the illustration, the machine consists of two heavy shafts, or rolls, with pins or teeth projecting from the surface. The shafts are 5 in. in diameter and are set on 12-in. centers. The teeth consist of 1-in. pins driven through holes drilled through the shaft and allowed to project 2 in. at each end.

The ends of the pins are tapered and the dull points protected by a weld application of hard alloy. Welds around the bases hold the pins from loosening in the shaft. The rolls are 30 in. long and there are 22 points on each. There is one row of six pins equally spaced along the 30-in. dimension and another row of five pins displaced from the first by 90 deg. Individual pins of the two rows are staggered along the length of the roll. The angular position of the two rolls is adjusted so that a row of



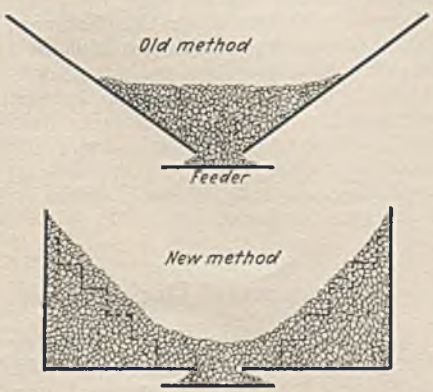
Bone Contaminated Lumps Are Thrown Directly Into the Crusher

six pins of one roll lie in the same plane as a row of five pins in the other roll when the pins are turned to the horizontal position.

The other crusher of the same principle has two pairs of rolls instead of one and the upper pair has a wider center spacing than the lower pair. The shafts are 6 in. in diameter, the pins 1¼ in. in diameter, and the pin projection is 2½ in. These crushers appear to perform efficiently the job of breaking the lumps to the desired extent with a minimum of fines.

"Dead" Corners Added to Bin Reduce Lump Breakage

Slack coal makes a soft bed for absorbing the impact of falling or rolling lumps and in new designs this fact is often capitalized as a means of protecting the wearing surface of equipment, such as a belt, and for decreasing the breakage of lump coal. Not long ago at a mine in the southern field reconstruction of a mine-car dump bin, substituting slack coal at its natural angle of repose for the sloping steel sides, is said to have appreciably reduced the breakage.



Bin Lining Changed From Steel to Coal

In the illustration the upper sketch indicates the original design and the lower (referring to the full lines) indicates the new. The bin is now a plain wooden box of rectangular section. The corners remain full of coal, the surface of which consists principally of fine material. Dotted lines show how the same effect can be obtained by sloping the corners of the bin in a series of steps. This reduces the quantity of inactive coal but unless that bulk of coal is a fire hazard or the greater weight complicates the structural design, the additional cost of the step construction is hardly justified.

It is recognized that, if possible, all dropping and sliding of coal at high speed should be eliminated in designs of plants where there is reason to prevent breakage. That this is very difficult is indicated by the fact that at least one large plant of recent design makes use of slack pockets in chutes into which button conveyors discharge.

Worn Pump Packing Makes Threadless Pipe Joint

Velocity and pressure, as well as acidity, are factors determining the life of metal pipes in mine pumping service. As a matter of fact it is the velocity combining with pressure which causes the threaded couplings to leak and finally give way long before the body of the pipe has been corroded thin.

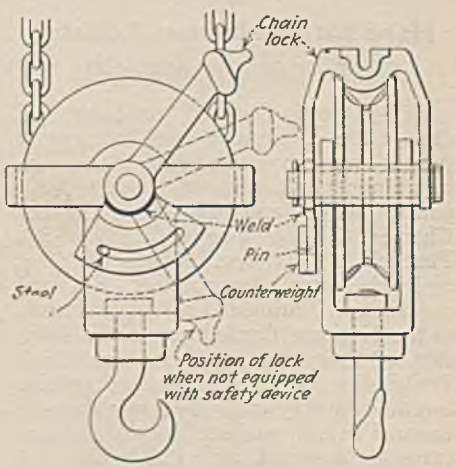
At a group of mines where much 2- and 2½-in. wrought-iron pipe has been used in advancing dip entries, the body of the pipe outlasted several times the threaded joints. This constituted a waste which, for want of facilities to rethread the worn ends on location, suggested the method hereinafter described by W. H. Noone, Davis, W. Va.

For the making of a new coupling, used boiler flues of 3 to 3½-in. diameter were cut into nipples 6 to 8 in. long. These were fitted over the worn joints of the pipe and the space between was stuffed with worn pump packing, either flax or hydraulic. A good job requires three to five rings on each side of the joint, depending on the pressure.

Where there is considerable pumping to the surface, worn packing from the main pump may be saved for yeoman service on gathering pumps, in which case it may be necessary to augment the surplus supply of worn packing for pipe joints by the purchase of new packing. According to Mr. Noone, new packing may be used over and over again for this service and effect such savings over the cost of pipe replacement as to justify its costs.

Lock on Chain Hoist Prevents Injury to Hands

On the pendant sheave carrying the swivel hook of differential chain hoists, unguarded chain locks can be the cause of injury to the hands. If not equipped with a counterweight or some similar safety arrangement, the heavy lock lever will drop suddenly upon release of the chain link and hit against the hook support, thus presenting a hazard to the operative.



The Lock Lever Cannot Fall All the Way

In the October issue of *Engineering and Mining World* is described a device to circumvent this danger, which was developed for use in the machine shop at a metal mine in Mexico. As will be seen in the sketch, the fall of the lock lever is checked by the welded-on balance weight, which is controlled by a steel stop pin attached to the hook support. The semicircular slot restricts the distance to that required to clear the chain.

WORD from the FIELD

Problems Facing Coal Industry Theme of Pittsburgh Meet

Scientists from fifteen nations will present almost 100 papers at the Third International Conference on Bituminous Coal, to be held at the Carnegie Institute of Technology, Pittsburgh, Pa., the week of Nov. 16. Economic phases of the coal problem, including competition with other fuels, will be discussed at the opening sessions. Other topics on the program are: Cleaning and preparation; coal and coke combustion; domestic utilization (with particular reference to small stokers and district heating), gasification, high- and low-temperature carbonization, hydrogenation and liquefaction, new uses, origin and classification; pulverized fuel; smoke abatement and stream purification.

Hope for Bituminous Industry Lies in Market Growth

Self-protection sooner or later will dictate the cooperative establishment of proper wage relationships within the bituminous industry and between competing fields and districts, declared Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., New York City, and chairman, government relations committee, National Coal Association, at the National Conference on the Relation of Law and Business, New York University, Oct. 26. Increased income for the industry can come only with an expansion in market. Lower freight rates, he asserted, are vital to the promotion of such expansion.

Wage rates in the bituminous industry are today 25 to 60 per cent below 1920 levels, according to Mr. O'Neill, while real wages are still lower, because of lack of full-time employment and in spite of a slight reduction in the cost of living. In many cases, he said, earnings are below levels that will provide a proper standard of living or, in a few instances, below the subsistence level even if full working time were available.

Present freight rates on coal are 50c. to $1 higher than necessary to yield the cost of transportation and a fair return. A reduction of 30 per cent in the present tariffs, Mr. O'Neill asserted, would reduce the destination price of coal sufficiently to allow it to compete with substitute fuels and hydro electricity and recover lost business. At the same time, the carriers would benefit by increased business, more employment at the mines, and a greater income for operators and miners.

Central selling agencies as a stabilizing influence met with little favor from Mr. O'Neill, who pointed out that the mortality among sales companies has been relatively greater than for producing companies. If the central sales plan proved unsuccessful, the operator might find his good will wrecked along with the selling company and his business stripped from him.

Black Diamond Purchases Mine

Black Diamond Coal & Mining Co., Birmingham, Ala., has purchased the equipment, structures, and mining town of the Premier Coal Co., Shelby, Ala., which has been idle for some time, and is engaged in building a new washery, overhauling mining equipment, and dewatering the workings preparatory to placing the mine in operation.

Coal Production Rises

Bituminous coal production, in response to a quickened domestic demand, rose to 35,740,000 net tons in October, according to preliminary figures compiled by the U. S. Bureau of Mines. The output in September was 31,919,000 tons, while the total for October, 1930, was 44,150,000 tons. Anthracite production is estimated at 6,520,000 net tons in October, against 4,358,000 tons in September, and 7,443,000 tons in October, 1930. Total production of bituminous coal for the first ten months of 1931 was 317,780,000 tons, a reduction of 17.2 per cent from the output of 383,792,000 tons in the same period in 1930. Anthracite production in the first ten months of 1931 was 50,688,000 net tons, a reduction of 13.4 per cent from the 1930 total of 58,509,000 tons in ten months.

New Plant Construction

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

Clinchmore Coal Co., Clinchmore, Tenn.; contract closed with the Morrow Mfg. Co. for rescreening plant to handle 1¼-in. slack at the rate of 100 tons per hour; two sizes will be produced, and it is expected that the plant will be completed Dec. 1.

Colonial Colliery Co., Natalie, Pa.; one 8-ft. Hydrotator installed by the Hydrotator Co. to clean 50 tons per hour of No. 4 buckwheat.

Elk River Coal & Lumber Co., Widen, W. Va.; installation of a washing plant for preparing nut and egg sizes completed. Three Wilmot Engineering Co. "Simplex" jigs, each with a capacity of 50 tons per hour, were installed.

Glen Alden Coal Co., Wanamie, Pa.; contract closed with the Hydrotator Co. for a 5½-ft. Hydrotator to clean 35 tons per hour of rice coal; to be installed before December.

Lehigh Valley Coal Co., Wilkes-Barre, Pa.; two Hydrotators installed at the Prospect Colliery to clean 35 tons per hour of rice and barley each.

Lehigh Valley Coal Co., Centralia, Pa.; two Hydrotators installed at the Centralia Colliery to clean 25 tons per hour of rice and barley each.

Sonman Shaft Coal Co., Sonman, Pa.; contract closed with the Link-Belt Co. for coal preparation equipment consisting of the following: dump hopper, apron feeder, two gravity screens, two lump picking table-loading booms, slack conveyor, mixing conveyor, and driving machinery; capacity of the installation is 250 tons per hour.

"Pocahontas" Decision

Pocahontas operators won another victory in their fight to restrict the trade name "Pocahontas" to coal produced in the Pocahontas field of West Virginia when the U. S. Supreme Court on Nov. 2 refused to review the ruling of the U. S. Circuit Court of Appeals for the Seventh Circuit that the use of the trade name "Wonder Pocahontas" for coal not produced in the region was unfair competition.

Soft Coal Men Move to Stabilize Industry; States Progress in Plans to Aid Coal

NATIONAL Coal Association representatives and operators from the bituminous coal-producing states east of the Mississippi met at the Biltmore Hotel, New York City, Oct. 21, to consider ways and means for improving conditions within the industry. At the end of three days' discussion and examination of various stabilization plans, the conference recommended the appointment of a special committee of fourteen members to consider the several proposals and report at a future meeting. Members of the committee are:

E. C. Mahan (chairman), Southern Coal & Coke Co., Knoxville, Tenn.; George J. Anderson, Consolidation Coal Co., New York City; W. J. Cunningham, Crummies Creek Coal Co., Crummies, Ky.; C. C. Dickinson, Dickinson Fuel Co., Charleston, W. Va.; J. D. Francis, Island Creek Coal Co., Huntington, W. Va.; Michael Gallagher, Northwestern Mining & Exchange Co., New York City; Geo. B. Harrington, Chicago, Wilmington & Franklin Coal Co., Chicago; R. H. Knode, Stonega Coke & Coal Co., Philadelphia, Pa.; J. D. A. Morrow, Pittsburgh Coal Co., Pittsburgh, Pa.; W. D. Ord, Empire Coal & Coke Co., Alexandria, Va.; C. F. Richardson, West Kentucky Coal Co., Sturgis, Ky.; W. L. Robison, Youghiogheny & Ohio Coal Co., Cleveland, Ohio; J. W. Searles, Pennsylvania Coal & Coke Corporation, New York City; R. H. Sherwood, Central Indiana Coal Co., Indianapolis, Ind.

Allocation of production by states, districts, and mines was the principal feature of the plan approved by Kentucky operators at a meeting in Lexington, Ky., Oct. 9, and later presented at the New York conference by Senator C. W. Watson, Elk Horn Coal Corporation; W. W. Miller, Hatfield-Campbell Creek Coal Co.; and P. H. Burlingham, Hardy-Burlingham Mining Co., the author of the plan. Theoretical capacity would first be determined for each of the units, after which the governors of the coal-producing states would jointly determine the consuming needs of the country and regulate production in accordance, the output of each unit to be a fixed percentage of the theoretical capacity. A free market would be maintained, according to the plan, and the governors would have the power to increase the tonnage mined if desired to prevent excessive prices. With equal running time in all districts, labor would tend to flow to those operations paying the highest scale, thus maintaining wage payments.

Governor White of Ohio, after conferences with United Mine Workers representatives on Oct. 29 and with a group of 25 operators on the following day, advised Governor Sampson of Kentucky that he would send a representative to the proposed governors' conference. Various stabilization plans were considered at the operators' meeting, but none was approved. Early in October, the Governor asserted that he would not participate in any conferences unless labor was represented, and this attitude was reflected in the naming of a committee of United Mine Workers officials to participate in future conferences on the Ohio industry. Members of this committee are: Percy Tetlow, international vice-president; Lee Hall, Ohio president; John Saxon, international organizer; and John R. McCormick, board member from Ohio. The operators' committee is composed of the following: W. L. Robison, Youghiogheny & Ohio Coal Co.; R. L. Ireland, Hanna Coal Co.; William Emery, Jr., Cambridge Collieries Co.; Fred Essex, Essex Coal Co.; and George K. Smith, Sunday Creek Coal Co.

Five Pennsylvania coal men conferred with Governor Pinchot on Oct. 30 on ways of rehabilitating the industry in that state. No definite program was agreed upon, though it was decided to send Walter Glasgow, Secretary, Department of Mines, to the governors' conference as the representative of Governor Pinchot, while the operators picked R. Templeton Smith, Poland Coal Co., to act as observer without authority to speak for the committee. The group of five, consisting of John M. Jamison, Jamison Coal & Coke Co.; J. T. M. Stoneroad, Carnegie Coal Corporation; C. F. Hosford, Jr., Butler Consolidated Coal Co.; W. A. Jones, secretary, Central Pennsylvania Coal Producers' Association; and Messrs. Smith and Glasgow met in Pittsburgh on Oct. 27 and 28 to canvass plans for relieving the industry, when it was decided to send a circular letter to all operators in the state producing over 100,000 tons annually to get their suggestions.

Senator LaFollette, Wisconsin, has proposed the creation of an economic council to advise the country on general economic and business questions and to formulate solutions for such problems as now exist. President Anderson, of the Consolidation Coal Co., was one of the business leaders to testify before a Senate committee conducting hearings on the economic council bill. Mr. Anderson was of the opinion that the coal industry would benefit greatly from any steps taken to bring about production control. He agreed that an economic council would be an important factor in securing industry stabilization, but felt that failure of previous attempts to bring about order in coal was due to the fact that the remedies were not sufficiently comprehensive.

A federal coal commission somewhat similar to the Interstate Commerce Commission is proposed in a bill being drafted by Representative Clyde Kelly, Pennsylvania, for introduction at the next session of Congress. The commission would regulate all mines selling coal in interstate commerce. Representative Kelly felt that the anthracite industry also needs regulation in spite of the fact that it is not in the same situation as bituminous coal. The bill will be discussed with leaders in the coal industry when completed.

Yukon Completes Additions

The Yukon Pocahontas Coal Co. has completed the installation of Menzies hydroseparators, vibrating screens, and other equipment, including two additional loading tracks, at its Yukon (W. Va.) mine for preparing and loading 3x¼-in. coal. The former plant had four loading tracks, and the new equipment brings the capacity up to 300 tons per hour. The washer is a twin four-compartment unit, with a capacity of 180 tons per hour. Six Arms vibrators comprise the new screening equipment. Twelve motors, totaling 140 hp., were added to the connected load.

New Addition to Yukon Pocahontas Plant

C. & O. Backs Stoker Tests

Chesapeake & Ohio Ry. and the College of Engineering, University of Kentucky, have entered into a cooperative agreement to study the adaptability of coals on the carrier's line for domestic purposes, particularly for use in small stokers.

Natural Gas Sales Decline

Natural gas sales declined 9 per cent to 465,000,000,000 cu.ft. in the first eight months of this year, according to the reports to the American Gas Association by utilities controlling 85 per cent of the distribution. Sales for industrial purposes declined 15 per cent, but this was offset by expansion into new territories.

Continental Construction Corporation is acquiring right-of-way and making arrangements for the construction of a 170-mile natural-gas line from the Texas-Chicago line to supply natural gas to northern Illinois cities and Milwaukee, Wis. A permit for the construction of 20-in. pipe line from the Canadian line to Portland was requested of the Oregon State Highway Commission last month. According to the backers of the plan, the line will start in Alberta, traverse Oregon, and end at Vancouver, B. C.

Financial Reports Issued

Island Creek Coal Co., for the quarter ended Sept. 30, reports net earnings of $338,317, after depreciation, federal taxes, and other charges, against $562,428, in the same period in 1930. Earnings for the first nine months of 1931 were $1,141,609, compared with $1,682,230 in 1930.

M. A. Hanna Co. and subsidiaries report net earnings of $442,982 in the quarter ended Sept. 30 after interest, depreciation, depletion, and other charges compared with $701,405 in the same quarter in 1930. Net earnings in the first nine months of 1931 were $1,171,432, against $1,805,097 in 1930.

St. Louis, Rocky Mountain & Pacific Co., for the three months ended Sept. 30, reports a net loss of $11,605 after taxes, depreciation, depletion, and other charges, against net earnings of $2,366 in the preceding quarter. In the nine months ended Sept. 30, the company reports a net income of $1,999, as compared with net earnings of $62,276 in the first nine months of 1930.

United States Distributing Corporation and subsidiaries report a consolidated net profit of $289,314 in the nine months ended Sept. 30, after depreciation, depletion, interest, and federal taxes, compared with $349,827 in the same period in 1930.

Virginia Iron, Coal & Coke Co., for the quarter ended Sept. 30, reports a net loss of $7,763 after depreciation, depletion, interest, and other charges. Net earnings in the first nine months of 1931 totaled $85,317, against a net loss of $110,501 in the same period in 1930.

Kanawha & Hocking Coal & Coke Co. reports a net loss of $142,420 in the year ended June 30, after interest, taxes, depreciation, and depletion.

Colorado Fuel & Iron Co., for the quarter ended Sept. 30, reports a net loss of $949,251 after interest, depreciation, and depletion, but before deduction for equipment retired. Net loss in the first nine months of 1931 was $1,585,527, against net profits of $844,260 in the same period in 1930, before deduction for equipment retired.

Lehigh Valley Coal Corporation reports net profits of $26,625 in the quarter ended Sept. 30 after interest, taxes, depreciation, depletion, and minority interest. Net profits in the first nine months of 1931 totaled $756,860, against a net loss of $105,010 in the same period in 1930.

Pennsylvania Coal & Coke Corporation and subsidiaries, for the three months ended Sept. 30, report a net loss of $96,913, after ordinary taxes, depreciation and depletion, compared with net losses of $110,448 in the preceding quarter and $31,195 in the same quarter in 1930. Net loss in the nine months ended Sept. 30 was $225,328, against $58,718 in the same months in 1930.

Pittsburgh Terminal Coal Corporation reports for the three months ended Sept. 30 a net loss of $223,161, after depreciation, depletion, and other charges, against net losses of $199,610 in the preceding quarter and $116,204 in the same three months in 1930. Net loss for the nine months ended Sept. 30 was $546,099, compared with a net loss of $539,634 in the first nine months of 1930.

Truax-Traer Coal Co., for the three months ended July 31, reports net profits of $51,433 after depreciation, depletion, interest, federal taxes, and a discount of $47,711 realized on debentures retired, equal to 18c. a share on the no-par stock.

Permissible Plates Issued

Three approvals of permissible equipment were issued by the U. S. Bureau of Mines in September, as follows:

(1) Gellatly & Co.; Type A conveyor; 5-hp. motor, 500 volts, a.c.; Approval 205 A; Sept. 28.

(2) Sullivan Machinery Co.; Type CR-3, shortwall mining machine; 50-hp. motor, 220-440 volts, a.c.; Approvals 232 and 232A; Sept. 29.

(3) Sullivan Machinery Co.; Type CR-3, shortwall mining machine; 50-hp. motor, 250-500 volts, d.c.; Approvals 233 and 233A; Sept. 30.

Coal Expenditures and Value Lower in 1929

The average value of bituminous coal in 1929 was $1.80 per ton for the country as a whole, a decline of 25.3 per cent from the 1919 figure of $2.49 per ton, according to a summary of statistics collected by the Census Bureau in the 1929 Census of Mines and Quarries. Average expenditures for wages, supplies, fuel, and purchased power was placed by the bureau at $1.34 in 1929, a decrease of 28.3 per cent from the average in 1919. Wages alone dropped from an average of $1.48 per ton in 1919 to $1.08 in 1929; supplies from 30.9c. to 19.8c.; fuel from 5.6c. to 1.4c.; while the outlay for purchased power rose from 2.4c. per ton in 1919 to 5.7c. in 1929.

Declines were registered in the total rated capacity of prime movers and electric motors driven by energy generated by the coal company, while the capacity of motors driven by purchased electricity more than tripled. Capacity of prime movers was 721,687 hp. in 1929, against 1,383,934 hp. in 1929; electric motors driven by company-generated power dropped from 707,341 hp. in 1919 to 429,970 hp. in 1929. Capacity of motors driven by purchased electricity rose from 771,131 hp. in 1919 to 2,402,500 hp. in 1929.

West Virginia had the lowest labor cost in 1929 (90.8c. per ton) of all the states for which separate returns have so far been published, while Iowa took the highest rank with $1.825 per ton. Tennessee reported the low figure of 14.5c. per ton for supplies in 1929. The high of 36.5c. was turned in by Oklahoma. Alabama and Missouri were the leaders in the use of electric energy, requiring 9.56 kw.-hr. per ton produced. Ohio accounted for the low figure of 2.63 kw.-hr. per ton. West Virginia reported a total expenditure of $1.15 per ton for wages, supplies, fuel, and purchased power in 1929, the low figure for the country, while Oklahoma registered highest with $2.16. Average value of the West Virginia coal was $1.56 in 1929; the Missouri realization reached $2.84.

Explosions Kill Twelve Miners

Three explosions in October and early November resulted in the death of twelve miners in eastern mining states. Three men were killed and one was burned in the explosion of a pocket of gas at the No. 30 mine of the United States Coal & Coke Co., Lynch, Ky. Four men were killed in a disaster at the West End Coal Co. mine at Mocanaqua, Pa., Oct. 22, and two others were rescued alive on Oct. 30 after a week of battling slides of rock. Five miners were killed in an explosion in the No. 20 mine of the Island Creek Coal Co., Whitmans, W. Va., Nov. 3. Two hundred and forty-one other employees escaped after the blast.

B. C. Coal Subsidized

The Canadian government subvention on British Columbia coal was increased last month to 50c. a ton on bunker coal and $1 a ton on export coal to all countries except the United States.

Associations

The Alabama Mining Institute chose three new members of the board of governors at the annual meeting held in Birmingham last month, as follows: Clarence L. Moss, president, Moss & McCormick; Horace Hammond, vice-president, Alabama By-Products Corporation; and G. F. Peter, president, Southern Coal & Coke Co.

Joseph D. Zook, Chicago, was re-elected president and commissioner of the Illinois Coal Operators' Association last month, and the word "Labor" was dropped from the name of the organization.

C. A. Cabell, Charleston, W. Va., president of the Carbon Fuel Co., was elected president of the Kanawha Coal Operators' Association at the annual meeting held in October.

Frank G. Frey, for several years assistant director, has been appointed director of Anthracite Service, with headquarters in New York City.

H. Foster Bain, secretary of the American Institute of Mining and Metallurgical Engineers, New York City, for six years, resigned Nov. 1 to accept a position as managing director of the Copper and Brass Association. A. B. Parsons, assistant secretary and formerly associate editor of *Engineering & Mining Journal*, was named to succeed him.

Glen Alden Miners End Stoppage in October; Sporadic Strikes Occur in Ohio

TWENTY-NINE thousand Glen Alden Coal Co. employees in Lackawanna and Luzerne counties, Pennsylvania, returned to work Oct. 12 following the action of the general grievance committee in rescinding the strike order on Oct. 10. The walkout, which began Sept. 24, was ended by the promise of John L. Lewis, president, United Mine Workers, that he would immediately appoint an international commission to sit with the miners and officials of District 1 in the settlement of grievances and arrange for one of the rank and file to assume the authority and duties of an acting board member.

Four hundred Ohio miners employed at the Millfield operation of the Sunday Creek Coal Co. struck on Oct. 26 as a result of a controversy over the assignment of motormen. On the same day, employees of the L. D. Poston Coal Co. in the same city walked out because of water conditions. Company officials at once notified Governor White and Adjutant General Henderson, who took a prominent part in settling a previous strike in the vicinity. Poston employees returned to work the following day and walked out again Nov. 2, but the Sunday Creek miners refused to return. The latter company declared that no effort would be made to settle the affair until after the coal conference called by the Governor. Three hundred and fifty miners at the Cadiz (Ohio) mine of the Ohio & Pennsylvania Coal Co. struck on Nov. 2 after a 6 per cent reduction in the former scale of $4.25 for day work.

Northern West Virginia miners returned to work quietly after the 25 per cent reduction in wages early in October. A strike was called in the Scotts Run region on Oct. 5 by the National Miners' Union, but the response was negligible. Strike activities in the northern Panhandle were almost submerged in the battle to provide food and clothing for the miners and their families.

Pittsburgh Terminal Coal Corporation miners employed at the Coverdale (Pa.) operation talked of striking against a wage reduction of 15 per cent, while employees at the Avella mine voted to accept the cut without opposition. The company is working under a contract with the United Mine Workers.

The Illinois miners' convention which convened in Springfield, Oct. 6, voted on Oct. 18 to postpone definite decision on the wage demands which will be presented at the next contract conference with the operators until shortly before the negotiations take place. The delegates also voted (Oct. 12) to continue the ban against President John L. Lewis for fear that he would dictate the scale in the coming negotiations if allowed a hand in District 12 affairs.

Wyoming miners last month rejected proposals of the Southern and Northern Wyoming Coal Operators' associations for a voluntary reduction in wages. They also refused to allow a state convention to be called to consider a reduction before the expiration of the present union contract, in June, 1932.

The Estevan (Sask.) strike, which lasted four weeks and resulted in several fatalities in clashes between police officers and the miners, was terminated by a temporary agreement with the operators, under the terms of which the men went back to work on Oct. 8. The end of the stoppage was made subject to the findings of a royal commission and the possible drafting of a permanent working agreement. Mine committees are to be recognized by the operators for the purpose of carrying on negotiations. Contract miners are to work eight hours and company men nine hours per day.

Committee to Aid Maryland Coal

Production, marketing, and utilization problems confronting the coal industry of Maryland will be studied by a commission named by Governor Ritchie last month. The members of the committee are: Dr. E. B. Mathews, Maryland Geological Survey; Thomas Finan, financier, Cumberland; Walter N. Kirkman, State Purchasing Bureau; Tasker G. Lowndes, banker, Cumberland; James Carey Martien, real estate, Baltimore; Wm. R. Offutt, attorney, Oakland; Dr. J. J. Rutledge, Maryland Bureau of Mines; Wm. F. Schluderberg, packing company head, Baltimore; Alexander Sloan, banker, Lonaconing; and Judge Wm. C. Walsh, attorney, Cumberland.

Rate Increase Offered Railroads

Anthracite, bituminous coal, and coke, among other commodities, will be subject to an increase in freight charges of $3 per car if the railroads accept the proposition of the Interstate Commerce Commission in the Oct. 20 decision on the application for a general increase of 15 per cent in rates. The Commission refused to allow the 15 per cent raise, but offered a number of increases on specific commodities, provided the railroads would agree to pool the resulting revenue for the assistance of the weaker roads. A move to absorb the increase was evident among some anthracite producers, who announced that they would carry the extra charge to prevent any increase in retail prices.

Explosive Approved

One addition to the active list of permissible explosives was made by the U. S. Bureau of Mines in October, as follows:

Burton Explosives, Inc., Burton 1, L. F.; volume of poisonous gases, between 53 and 106 liters, inclusive; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1¼x8-in. cartridge, 111 grams; smallest permissible diameter, 1 in.; unit deflective charge, 218 grams; rate of detonation of 1¼-in. diameter cartridge, 10,400 ft. per sec.

Drainage Standards Revised

Revised mine drainage standards, covering equipment and practice, have been issued by the national standardization committee of the American Mining Congress and approved by the American Standards Association. W. E. Housman, Scottdale, Pa., research engineer, H. C. Frick Coke Co., was chairman of the special committee on mine drainage problems.

Pure Air Committee Named

American Society of Mechanical Engineers has appointed a pure air committee to study air contamination and clarification in any way involving engineering responsibility. The work of the committee will be broad in character, and local activities will be avoided. Direction and coordination of present and future problems related to air pollution, development of adequate and proper model smoke laws to meet community requirements, coordination of research projects within and relevant to the field, and the dissemination of information will be the primary activities of the group. Ely C. Hutchinson, editor of *Power*, is chairman.

Soviet Wages Increased

Russian miners working underground will work on the piecework basis in the future as the result of changes in the methods of wage payments in the Soviet Union designed to speed up improvements in the economic position of the workers. Fifty-three per cent of the surface workers at coal mines also will go on the piecework basis, which provides the following incentives: first 10 per cent above the normal, an increase of 25 per cent in the rate; second 10 per cent, 40 per cent increase; any further increase in production, 80 per cent rise.

Bonuses of 10 to 25 per cent will be granted to underground miners in unusually dusty or dirty places or in localities where high temperatures prevail. Under the new scale, skilled underground workers will receive from 4 to 7 rubles per day. In the Donetz basin, the total increase in the payroll has been set at 30 per cent. Workers will be paid at half rates for delays through no fault of their own.

Wages for foremen range from 175 to 250 rubles per month with a bonus of 50 per cent for fulfilling or exceeding the plan. Engineers receive from 300 to 700 rubles per month, with bonuses of 50 to 100 per cent for fulfilling the plan. More than 300,000 workers in the coal industry will benefit.

The Late E. R. Clayton

Obituary

E. R. Clayton, 55, secretary of the Harlan Coal Operators' Association, Harlan, Ky., died Oct. 29 after an illness of several months. Mr. Clayton was born at Grafton, W. Va., and entered the business world as secretary to the division superintendent of the Baltimore & Ohio R.R. Later, he became superintendent of the Wendel (W. Va.) plant of the Maryland Coal Co. of West Virginia. In 1910, he went to Kentucky as sales manager of the Harlan Coal Co. and later took a like position with the Wallins Creek Coal Co. Mr. Clayton was made secretary of the Harlan association upon its formation in 1916.

A. J. ("Emperor") Cook, secretary of the Miners' Federation of Great Britain, died at a hospital in London, Nov. 2, at the age of 46, after a lifetime spent in labor-political activities.

Worth Kilpatrick, Connellsville, Pa., president of the United Pocahontas Coal Co., operating mines at Crumpler, W. Va., died suddenly Oct. 18 at the age of 85. Mr. Kilpatrick was a manufacturer of firebrick in the Connellsville field and became interested in the Pocahontas region after supplying brick for the first coke ovens built in the field. He opened up the operations of the Indian Ridge Coal & Coke Co., at Worth, in 1894, and acquired the Zenith Coal & Coke Co., Crumpler, in 1890. Additional land was leased in 1915, and the operating companies consolidated as the United Pocahontas Coal Co.

Elias McClellan Poston, president of the New York Coal Co., died at his home in Columbus, Ohio, Oct. 9, at the age of 69. Mr. Poston entered the coal business at his native town of Nelsonville, Ohio, and later branched out into West Virginia and Kentucky.

R. A. Walter, president, Conveyor Sales Co., Inc., died Nov. 3 at St. Luke's Hospital, New York City, at the age of 46. Mr. Walter was trained as a mining engineer and supplemented his education by studying in Germany. He organized the Conveyor Sales Co. in 1925, and from 1922 to 1925 was head of the Walter Engineering Co. Prior to that time he held positions with a number of large companies, and also served with the U. S. Coal Commission.

Albert Jefferson Sayers, head of the coal tipple and coal washery department of the Link-Belt Co., died at his home in Chicago, Oct. 11 at the age of 61. Mr. Sayers joined the Link-Belt organization in 1899, and was well known as a designer and builder of coal preparation plants and as an expert on the mechanical handling, screening, and washing of coal.

Industrial Notes

Dardelet Threadlock Corporation, New York City, has granted licenses to manufacture and sell bolts, nuts, and screws threaded with the Dardelet self-locking thread to the Rockford Screw Products Co., Rockford, Ill.; Wm. Gaskell & Son, Brooklyn, N. Y.; Harrison Nut & Bolt Co., Harrison, N. J.; and the Standard Pressed Steel Co., Jenkintown, Pa.

F. J. Griffiths, until lately president of the Republic Research Corporation, has joined the Timken organization as director and president of the Timken Steel & Tube Co. M. T. Lathrop, president, Timken Roller Bearing Co., has been made chairman of the board of the steel and tube organization.

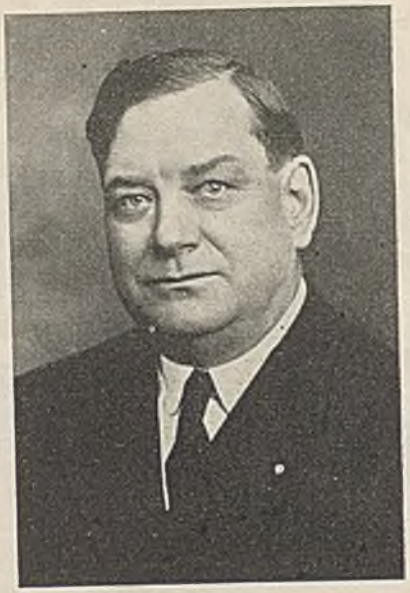
L. U. Murray, district manager of the industrial department, east central district, General Electric Co., has been appointed manager of the Graybar Western Electric department, with headquarters at Schenectady, N. Y. J. P. Jones, manager of the machinery manufacturers' section of the industrial department at Schenectady, succeeds Mr. Murray. J. J. Huether has been appointed to succeed Mr. Jones.

George W. Moore Co., Chicago, and H. W. Caldwell & Son, a subsidiary of the Link-Belt Co., have been merged to form the Caldwell-Moore Division of the Link-Belt Co. Max M. Hurd, president, George W. Moore Co., becomes a vice-president of the Link-Belt Co., in charge of Caldwell-Moore operations.

Lincoln Electric Co., Cleveland, Ohio, has been appointed general industrial distributor for "Blackor."

E. R. Dougherty has joined the sales staff of the American Manganese Steel Co., Chicago Heights, Ill., and will assist in the sales and engineering of "Fahralloy" castings in the Chicago territory.

W. L. Mellon was elected to the board of directors of the Westinghouse Electric & Mfg. Co. in October to succeed the late Harrison Nesbit. Ralph Leavenworth, lately assistant sales manager of the Austin Co., Cleveland, Ohio, has been appointed general advertising manager of the Westinghouse Company, with headquarters at East Pittsburgh, Pa.



The Late A. J. Sayers

Samuel Mather, 80, senior member of Pickands, Mather & Co., died at his home in Cleveland, Ohio, Oct. 18. Mr. Mather entered the employ of the Cleveland Iron Mining Co. in 1873, and in 1882 entered into a partnership to engage in the commission business in iron ore. As time went on, Mr. Mather broadened his holdings in the Lake Superior iron mining district and entered the iron, lake shipping, and coal mining industries.

William H. Williams, president of the Wabash R.R., died at St. Louis, Mo., Oct. 14, at the age of 57. Mr. Williams was vice-president of the Delaware & Hudson Co. and senior vice-president of the Hudson Coal Co. from 1915 to 1928.

Field Scott, president of Field Scott, Inc., operating a mine at Richlands, Va., died at his home in Athens, Ohio, Oct. 8.

Coming Meetings

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

Indiana Coal Operators' Association, annual meeting, Nov. 17, Terre Haute House, Terre Haute, Ind.

Southern Appalachian Coal Operators' Association; annual meeting, Nov. 20, Knoxville, Tenn.

Harlan County Coal Operators' Association; annual meeting, Nov. 18, Harlan, Ky.

Operators' Association of Williamson Field; annual meeting, Nov. 19, Williamson, W. Va.

Canadian Institute of Mining and Metallurgy; western meeting, Nov. 25-27, Vancouver, B. C.

West Virginia Coal Mining Institute; annual meeting, Nov. 27 and 28, at Wheeling, W. Va.

Coal Mining Institute of America; annual meeting, Dec. 16 and 17, in Auditorium of Chamber of Commerce Bldg., Pittsburgh, Pa.

Fatalities and Death Rate Fall in September; Accidents Kill 107 Miners

ACCIDENTS in coal mines in the United States during September, 1931, caused the death of 107 men, according to information furnished by state mine inspectors to the U. S. Bureau of Mines. This was a reduction of seven from the revised figure for August, and a reduction of 33 from the 140 deaths which occurred in September a year ago. While production of coal in September declined 17 per cent as compared with the same month last year (from 43,893,000 tons to 36,277,000 tons), the number of fatalities was reduced 24 per cent (from 140 to 107). A comparison of September with August of the current year shows an increase of 4 per cent in tons produced but a decrease of 6 per cent in fatalities, with the August record covering 34,848,000 tons of coal produced and 114 men killed by accidents. Death rates per million tons were 2.95 for September and 3.27 for August of the present year and 3.19 for September a a year ago. Although the rate of 2.95 for September, 1931, may be increased slightly on account of deaths to be reported later because of injuries that have not as yet proved fatal, it stands at present as the lowest rate on record except on two occasions: namely, December, 1930 (rate 2.75), and December, 1922 (rate 2.92).

Considering bituminous mines alone, a lower death rate was shown in September, 1931, than in either the corresponding month of 1930 or in August of the present year, the rate being 2.32 as compared with 2.67 in September a year ago, and 2.82 in August, 1931. Seventy-four men were killed in bituminous mines in September of this year, 86 in August, and 103 in September, 1930.

In the anthracite mines of Pennsylvania 33 men lost their lives during September, against 28 in the preceding month and 37 in September, 1930. The fatality rates per million tons of coal produced for these three months were 7.57, 6.49, and 7.03, respectively.

During the 9-month period from January to September of the current year, 1,079 lives were lost in the mining of 326,208,000 tons of coal, resulting in a death rate of 3.31. Reports for the same period in 1930 showed 1,462 deaths and a production of 390,270,000 tons of coal, with a resulting rate of 3.75. The death rate for bituminous mines alone, which had a record of 783 deaths, was 2.78 for the period from January to September, as compared with 3.32 for the same period in 1930, when 1,128 deaths occurred. The anthracite record for the 1931 period was 296 deaths and a fatality rate of 6.70, as compared with 334 deaths and a rate of 6.60 for the 9-month period in 1930.

There were no major disasters in September—that is, no disaster in which five or more lives were lost. There have been four such disasters thus far in 1931, causing the death of 46 men. Three of these disasters occurred in January and one in May. Based exclusively on these disasters, the death rates were 0.141 in 1931 and 0.246 in 1930, when there were eight major disasters and 96 deaths. The major disasters thus far in 1931 occurred at the rate of 1.23 separate disasters (as distinguished from the number of deaths resulting from the disaster) for each hundred million tons of coal produced, as compared with 2.050 for the corresponding period in 1930. The bituminous coal mining industry has established what is almost an all-time record for freedom from major disasters, in that it has gone eight months (February to September inclusive) without a major explosion or a major disaster of any kind.

Comparative fatality rates are as follows:

Cause	1930 Fatalities	1930 Rate	Jan.-Sept., 1930 Fatalities	Jan.-Sept., 1930 Rate	Jan.-Sept., 1931 Fatalities	Jan.-Sept., 1931 Rate
All causes	2,014	3.793	1,462	3.746	1,079	3.308
Falls of roof and coal	1,067	2.009	801	2.052	618	1.895
Haulage	303	.571	239	.612	190	.583
Gas or dust explosions:						
Local explosions	61	.115	52	.133	17	.052
Major explosions	214	.403	85	.218	46	.141
Explosives	78	.147	60	.154	28	.085
Electricity	76	.143	64	.164	43	.132
Miscellaneous	215	.405	161	.413	137	.420

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

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

State	Underground												Shaft					Surface							Total by States	
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip, or bucket	Other causes	Total	Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	1931	1930
Alabama	....	....	2	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2	3
Alaska	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Arkansas	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Colorado	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	0
Illinois	6	....	4	....	....	....	....	....	....	....	1	11	....	....	....	....	....	....	....	....	....	....	....	....	11	8
Indiana	1	....	....	....	1	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2	3
Iowa	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	0
Kansas	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Kentucky	5	2	1	....	....	....	....	....	....	....	....	8	....	....	....	....	....	....	....	....	....	....	....	....	8	10
Maryland	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Michigan	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Missouri	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Montana	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....	....	1	0
New Mexico	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	0
North Dakota	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Ohio	2	....	1	....	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	3	6
Oklahoma	....	....	1	....	....	....	1	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2	0
Pennsylvania (bituminous)	8	3	4	....	....	2	....	....	....	....	....	17	....	....	....	....	....	....	....	....	....	....	....	1	1	18	31
South Dakota	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Tennessee	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Texas	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Utah	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	3
Virginia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	2
Washington	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
West Virginia	8	5	3	....	....	....	3	....	....	....	....	19	....	....	....	....	....	2	....	....	....	1	1	4	23	30
Wyoming	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	1	2
Total (bituminous)	31	12	16	....	1	2	4	....	....	....	2	68	1	....	....	....	1	2	....	....	....	1	2	5	74	103
Pennsylvania (anthracite)	12	4	5	5	1	1	....	....	....	....	3	31	....	....	....	....	....	1	....	....	....	....	1	2	33	37
Total, September, 1931	43	16	21	5	2	3	4	....	....	....	5	99	1	....	....	....	1	3	....	....	....	1	3	7	107	....
Total, September, 1930	65	17	18	8	4	....	10	1	3	....	6	132	....	....	2	....	2	1	1	1	....	1	2	6	....	140

WHAT'S NEW

IN COAL-MINING EQUIPMENT

Explosion-Proof Starters

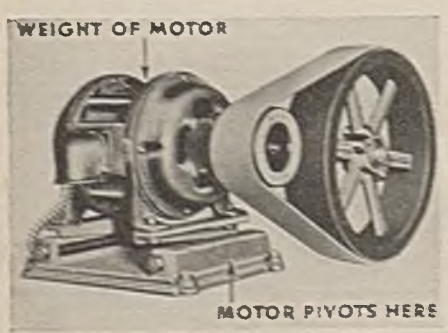
A new line of explosion-proof starters for use in hazardous locations has been developed by the Electric Controller & Mfg. Co., Cleveland, Ohio. The design of the starters, it is stated, is such that they meet the underwriters' specifications, operate in an oil bath, and are protected against moisture and corrosion. The overload relay panel is inclosed in an explosion-proof case, which also serves as a conduit connection box. All types of starters, including across-the-line and reduced voltage compensator types, can be supplied with this construction, the company says.

The Electric Controller company offers the "No. 2, Type ZO, across-the-line motor starter," which is inclosed in a heavy, pressed steel case with oil-immersed circuit contacts and vapor-proof overload relays, thus making it safe in adverse atmospheric conditions. Quietness, compactness, ease of setting overload relays, and quick inspection and repair facilities are points stressed by the company. The starter can be used for low-voltage release or low-voltage protection applications, and special housings are not necessary, the company says. Standard, vapor-proof, or explosion-proof pushbuttons may be installed with the starter.

Drive Utilizes Leather Belt

Rockwood Mfg. Co., Indianapolis, Ind., offers the Rockwood drive for short-center service with flat leather belts. In this drive, the motor is mounted on a pivoted base, and its weight is used to maintain a prescribed tension in the belt at all speeds. Changes in belt length for any reason do not require any adjustment, the company declares, as the drive automatically compensates for the variations. Belt slippage is less than 1 per cent at the rated capacity, it is asserted. Six sizes of bases are carried in stock to fit any motor from 1 to 50 hp., and larger sizes can be made to order. The belt and two pulleys ordinarily are included with the drive. The drives can be mounted on the floor, wall, or ceiling, but cannot operate where the driven shaft is lower than the driver.

Rockwood Short-Center Drive



Shovel-Crane-Dragline

Link-Belt Co., Chicago, has added the K-48 crawler shovel-crane-dragline to its line of earth-moving equipment. Gasoline, diesel, or electric drive is available. Equipment and capacities for the different duties are: shovel, 25-ft. shovel boom, 17½-ft. dipper stick, 1¼-yd. dipper; crane, rated capacity of 32 tons at a radius of 12 ft. and of 10,400 lb. at 45-ft. radius, with a 45-ft. boom; dragline, 1½-yd. heavy or 2-yd. light-medium bucket on a 45-ft. boom, and a 1¼-yd. heavy or 1½-yd. light-medium bucket on a 50-ft. boom at any convenient angle; trench hoe, 2-yd. solid-bottom bucket in average soils at normal digging depth.

Link-Belt K-48 Independent Chain Crowd Shovel

Welding Electrodes; Motor Base

An improved, heavily coated electrode for welding within the shielded arc on mild steel has been brought out by the Lincoln Electric Co., Cleveland, Ohio. The new electrode, designated "Fleetweld," is said to give 20 to 30 per cent greater ductility and to increase the tensile strength 10 per cent. Resistance to corrosion and lessened "spattering" also are noted. "Fleetweld," the manufacturer states, requires a high welding current, but gives two to four times the welding speed. It is available in diameters of from $\frac{1}{8}$ to $\frac{3}{8}$ in., and in 14- or 18-in. lengths.

The Lincoln Electric Co. also offers "Manganweld," a welding electrode for shielded arc welding containing 11 to 15 per cent manganese steel. This rod is said to produce a weld with the structure and qualities of wear-resisting cast manganese steel. In lengths of 14 in. diameters are: $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$, and $\frac{1}{4}$ in.

"Hardweld," a coated welding electrode that is said to avoid the difficulties usually met with in using high-carbon electrodes, has been developed by the Lincoln Electric Co. for use in building up worn steel wearing surfaces. The weld, it is asserted, has a tough, dense surface that is moderately hard and will resist wear and abrasion. Length is 14 in., and available diameters are: $\frac{5}{32}$, $\frac{3}{16}$, and $\frac{1}{4}$ in.

One-piece, welded steel base plates for electric motors are now being manufactured by the Lincoln Electric Co. The bases are fabricated of rolled steel angles and flat bar stock. Slotted flanges and a screw adjustment are provided for installing the motor. The company declares that the new bases are stronger and lighter than the cast variety.

Manganese Steel Feeder

American Manganese Steel Co., Chicago Heights, has developed a manganese steel apron feeder with the following features of design: smooth apron surface with overlapping floor and side flanges to prevent fouling, leakage, and spillage; one-piece link chains, with liberal pin surface and knee-type joints to prevent sag; no chain wear except when rounding sprockets; and no rollers in chain, no lubrication of chain parts, no operating attention except for lubrication of shaft bearings, and no labor in cleaning up spillage. The feeders are made in sizes of from 2 to 8½ ft. in width to fit all conditions, the company asserts.

The American Manganese Steel Co. has added the new, Type "C," manganese steel centrifugal pump to its line of equipment for handling abrasive liquids. Among the features mentioned by the company are: sleeve or anti-friction bearings, which are interchangeable in the field; convenient adjustment of im-

peller clearances and main bearing fits; and absorption of thrust and radial shocks by a new bearing arrangement.

AMSCO, nickel-manganese, steel welding rod has been developed by the company to leave deposits equivalent in analysis and physical properties to heat-treated manganese steel without special heat-treating or quenching. A second feature emphasized by the company is the ease with which the rod can be handled by any fairly competent welder.

Dump Trailers for Hauling

"United" automatic dump trailers have been developed by the United Iron Works Co., Kansas City, Mo., for use in hauling bulky materials. This equipment finds its greatest use in the coal industry in hauling coal from strip pits to the tipple, though it is equally

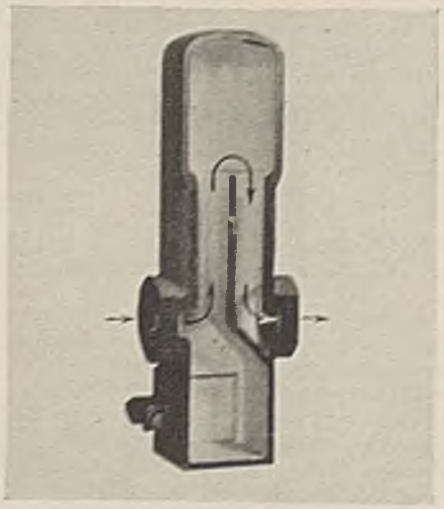
Six-ton "United" Trailer With 2-Ton Truck

well adapted to transporting bulky material for any other purpose, the United company declares. In stripping, it is said, the use of these trailers does away with cars, locomotives, and tracks.

Construction of the trailer is such that two-thirds of the weight is carried on the trailer wheels and one-third on the rear wheels of the truck. The usual size of trailer has a capacity of 6 tons, and is used in conjunction with a light, 2-ton motor truck. A drop-bottom door in the bottom of the trailer can be arranged to open and close automatically as the equipment passes over the dump, or side-discharge doors can be provided.

Vacuum Trap Developed

Deming Co., Salem, Ohio, has developed the "Vac-trap" for use in the suction lines of mine gathering pumps. The equipment acts as a combination vacuum chamber, automatic primer, and dirt trap. It is a single casting weighing 65 lb. and is installed as close to the pump as possible. The water enters one side of the casting, as shown, and flows up the side of the partition and down to the opposite opening. The velocity of the water is reduced when it enters the "Vac-trap," and dirt and



Deming "Vac-trap"

coal therefore drop into the dirt trap, which is provided with a clean-out cover. As the partition is higher than the pump valves, the equipment acts as an automatic primer. A new supply of water can be added through the opening in the top. The area above the partition is sufficiently large to act as a vacuum chamber, thus insuring a steady flow of water to the pump.

Stabilizer for Vibrators

A new mounting for vibrating screens, consisting of a single mechanical unit called a "stabilizer," has been perfected by the Stephens-Adamson Mfg. Co., Aurora, Ill. This equipment eliminates the springs ordinarily used to hold the screen body at the proper angle, and prevents, according to the company, rocking or bouncing caused by sudden surges of material on the screen. The stabilizer, it is asserted, holds the screen at a definite angle, and yet offers no resistance to the vibrating motion. The screening angle can be quickly varied by loosening two bolts on the side of the screen.

Load Center Obviates Fuses

Trumbull Electric Mfg. Co., Plainville, Conn., offers the "Bobust" load center for the protection of lighting and similar circuits. The equipment can be supplied to handle from two to eight circuits, and is designed for flush or surface mounting, with either 15-, 20-, 25-, 35-, or 50-amp. circuit breakers mounted inside. Box, circuit breakers, and trims ordinarily are furnished separately, but the equipment can be fitted with boxes, assembled, and packed in one unit.

Roller Keeps Belts Straight

The "Belt-Trainer," for keeping the return strands of belt conveyors straight and thus avoiding damage to the edges, is offered by the Robins Conveying Belt Co., New York City. The equipment consists of a tubular steel roller so mounted that it tends to become skewed with relation to the direction of travel when a belt runs to one side, thus returning the belt to its proper channel of travel. One "Belt-Trainer" to every eighth idler under normal conditions or to every fifth idler under adverse conditions is recommended by the company. Belt widths from 12 to 48 in. can be accommodated.

Small Direct-Current Motors

Reliance Electric & Engineering Co., Cleveland, Ohio, has introduced a new line of small d.c. motors in sizes from ½ to 3 hp. at 1,750 r.p.m. Ball or sleeve bearings are provided, and open, semi-inclosed, or fully inclosed construction is obtainable. Windings are finished in orange-colored enamel to facilitate inspection and repair. Other features stressed by the company are the refillable-type commutator and the installation of two brushes per stud.

The Reliance company also offers Type T d.c. motors in sizes up to 50 hp. at 1,150 r.p.m. for vertical operation. Large bearings, two heavy eyebolts, a ring base, and a drip cover are provided to insure economical operation and easy mounting, the company declares.

Starters Are Explosion-Proof

A new, explosion-proof, across-the-line automatic starter for squirrel-cage motors has been announced by Cutler-Hammer, Inc., Milwaukee, Wis. The chief feature of the starter, the company says, is the fact that the thermal overload mechanism is immersed in oil. Also, the thermal overload equipment is a new design, and is used in connection with the contactor. All incoming wires are joined to terminals below the oil level, and the starter is completely corrosion-resisting. The operating mechanism, it is asserted, is easily arranged for wall mounting, and the oil tank can conveniently be removed.

A second item in the explosion-proof line of Cutler-Hammer is the oil-immersed, non-breakaway type of automatic starter for squirrel cage motors in hazardous locations. All contacts operate below the oil level and new oil can be added without removing the cover. Terminals are located above the liquid level to avoid deterioration of the wire insulation.

A new, across-the-line reversing starter for d.c. and a.c. polyphase motors is offered by Cutler-Hammer for use on machines up to 3 hp. in intermittent-duty reversing service. Reversing is accomplished by means of two mechanically interlocked, separately controlled magnetic contactors. Small size is emphasized by the company. The

Type SRA starter is arranged for two-wire control, while the Type SRB starter is adapted to either two- or three-wire control.

For small a.c. or d.c. motors on sump pumps and similar equipment, Cutler-Hammer offers a new, float-operated, motor-starting switch, providing across-the-line starting, thermal overload protection, and smallness of size. For larger motors, the starter can be installed without overload protection as a master switch in the circuit of a separate automatic starter. It also can be furnished without the float switch for use as a lever-operated master switch. Maximum ratings are: a.c., ½ hp.; d.c. 1/6 hp.

Fiber Conduits

"Bermico" super-conduit and "Bermico" signal conduit are new products of the Brown Co., Portland, Me. Super-conduit, according to the company, is a strong, water-resisting, impregnated fiber product with unusually high mechanical and dielectric strength. It is said to be particularly adapted to installations where the possibility of mechanical injury exists. In addition, it is asserted that the conduit is corrosion-resisting, and will not injure lead-sheathed or rubber-covered cables. Single super-conduit may be obtained with sleeve or screw joints, the latter assuring a tight coupling. Super-conduit is supplied also in multiple units with the sleeve joint. Conduit and fittings are available in eight diameters, ranging from 2 to 6 in.

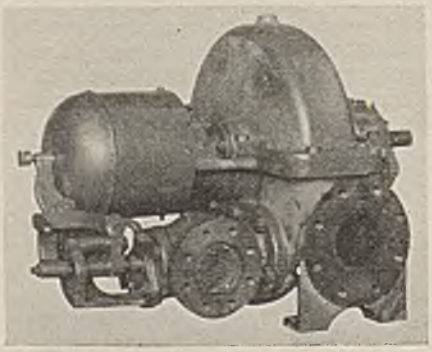
"Bermico" signal conduit, the company says, is especially adapted to installation in the earth without concrete incasement. Extra strength and inbuilt rigidity assure satisfactory service under this condition, it is asserted. High resistance to water and corrosion, and great mechanical and dielectric strength also are stressed by the manufacturer. The company further asserts that the conduit will not injure lead-sheathed cables either mechanically or electrically. Single lengths are available with either sleeve or screw joints. Multiple units can be secured with sleeve joints. The conduit and fittings are made in nine sizes ranging from 1½ to 6 in. in diameter.

New Valve Principle Offered

Ludlow Valve Mfg. Co., Troy, N. Y., is now marketing the Ludlow "Multi-Valve," in which the usual disk is replaced by a stainless-steel truncated cone with five or more annular seating lands. Between each pair of lands is an expansion chamber in which the pressure is partially released, the density is lowered, and the velocity of the liquid or gas is reduced. By reducing pressure, density, and velocity in steps, the material of which the valve is constructed is not subjected to the destructive action of high-pressure, high-velocity material. For this reason, the company declares, the valves are less subject to wear and will function efficiently in throttling service.

Mechanical Drive Turbine

A new, small, mechanical drive, non-condensing steam turbine for driving centrifugal pumps, fans, and similar equipment operating at speeds between 1,750 and 3,600 r.p.m. is offered by the General Electric Co., Schenectady, N. Y. The new turbine is built only as a single-stage machine, and has two rows of revolving buckets. According to the company, its design follows that of the standard General Electric, mechanical-drive turbines and, although simple in construction, is dependable. The wheel

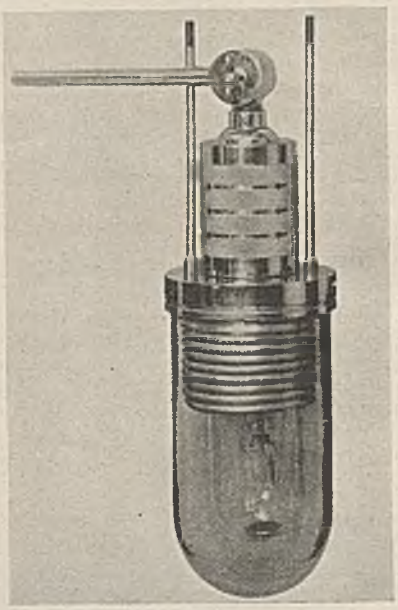


Mechanical-Drive Turbine, D-57

casing is split horizontally for easy access to the parts, and steam and exhaust pipes are connected to the lower half of the machine. A new centrifugal governor, with weights pivoting on knife edges, operates, according to the company, with little friction, and provides proper speed regulation. An independent energy governor is included. The turbine is designated as D-57.

Intermittent line- and spot-welding with interruptions up to 1,000 per minute are possible with a new type of the control equipment, the General Electric Co. says. "Thyraton" tubes are used instead of contactors for interrupting the current. The control consists of two essential parts, which are the series transformer and the control panel. The control panel carries two hot-cathode "thyratons," filament transformers, grid transformers, a time delay relay, and the necessary resistors, capacitators, etc. In starting the equipment the time delay allows the tubes to heat up before power is applied. Advantages cited by the company are: speeds can be obtained which formerly were impossible with mechanical interruptors or magnetic contactors; and contactor wear is eliminated, with resultant savings in replacement time.

Elimination of three-fourths of the heat with a negligible loss of light has been accomplished in a new type of high-intensity incandescent lamp equipment, the General Electric Co. says.

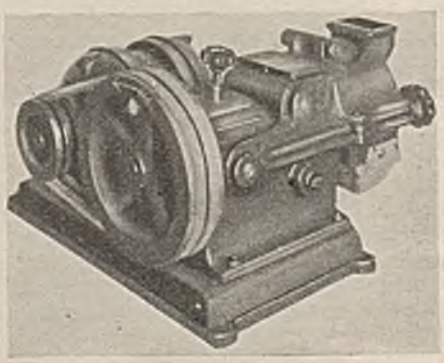


General Electric, Water-Cooled Lamp Equipment

The new unit consists of a lamp directly immersed in the heat-absorbing liquid, which is confined by an outer glass jacket. Also immersed in the liquid is a cooling coil for carrying tap water. Lamp, cooling coil, and outer jacket are all supported from a base plate on which the lamp socket is mounted. Construction of the new unit, it is asserted, permits the use of a bulb of smaller size, as the bulb temperature is not a limiting factor with artificial cooling.

Coal Pulverizer

Iler Co., Cleveland, Ohio, offers the Iler improved disk pulverizer for reducing the size of materials prior to chemical analysis. Both the pulverizer



Iler Disk Pulverizer

and motor are mounted on a single base. Models for operation from line shafts also are available. Main bearings and guides are lubricated by a pump. Two sizes are available.