COAL AGE

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

SYDNEY A. HALE, *Editor*

New York, December, 1932

Leadership

FEW ENTERPRISES, other than the flourishing monopolies the law is presumed to cut down, have escaped the destructive prohibitions of the Sherman act. The unorganized natural-resource industries have been among the outstanding victims. It seems particularly fitting, therefore, that bituminous coal, which is waging such a gallant fight in the Appalachian Coals case to make the interpretation of this archaic statute consonant with present-day economic realities, should lead in an organized effort for reasonable modification of the law.

Such leadership was taken a few days ago when the National Coal Association committee on government relations invited representatives of other natural-resource industries to join with it in considering a program upon which a united front might be presented. As a basis for such a program, the coal men suggested that the natural-resource industries be given the same consideration in cooperative effort as was granted agriculture ten years ago in the Capper-Volstead act. Other proposals also are being studied by this group.

While there has been some talk that agreement on a program should be reached in time for an appeal for relief to the session of Congress which opened December 5, nobody should be disappointed if the joint committee is unable to perfect its plans with such expedition. So many proposals for modification, each dictated by the character of the particular restraint the law has imposed upon cooperative effort in a specific industry, have been put forward in recent years that reconciliation of conflicting views on the details of a program for relief might easily prevent presentation of a unified plan until the next session of Congress. Such a postponement, while regrettable, would be relatively unimportant. The important thing is that the natural-resource industries are at last considering united action; the hope inherent in this transcends any question of immediacy.

Does Modernization Pay?

UNLESS MODERNIZATION reduces costs and improves net profits, capital expenditures for industrial rehabilitation have no place in executive thinking. Conversely, if modernization will produce these results, management which withholds the necessary authorization for such capital investment puts the properties it controls under a heavy handicap which must inevitably weaken their capacity to earn dividends for the stockholders and pay fair wages to the workers. The problem resolves itself into a simple question: Does modernization pay?

If the adoption of such a program would increase tipple capacity and lower preparation costs, do the same in refuse disposal, step up tonnage per locomotive 68 and 78 per cent, increase connected load and reduce kilowatt-hour consumption of energy per ton, and sharply reduce accidents, there would be no denial of the profit possibilities of such a program. There is nothing hypothetical about such results; they have actually been obtained at the Wheelwright operation of the Inland Steel Co.

The story, told in detail elsewhere in this issue, adds another to the long list of case histories of the achievements of progressive management which have been published by *Coal Age*. Their implications should need no underscoring for executives and bankers concerned with improving the physical and financial condition of the properties committed to their stewardship. Modernization properly applied is a paying investment.

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Practical Research

A LONG STEP toward putting research to work for the bituminous industry was taken last month when the research section of the National Coal Association authorized a subcommittee to study the possibilities of the establishment of an independent laboratory and develop detailed plans of organization for submission to the directors of the association. Taking a leaf out of the experience of the anthracite operators, promotion of improved equipment for domestic and industrial consumption of soft coal was set up as the primary purpose of the proposed laboratory.

Consideration of such a plan marks a distinct and desirable departure in the research activities of the association. In the past, the research division has been content to act as a clearing house for information on research activities without officially participating in such work beyond the support of certain research fellowships. While this work had undoubted value in quickening industry interest by making common knowledge the multiplication of research activities by government agencies, universities, private laboratories and industrial groups, it contributed little to coordination of effort or to the elimination of needless duplication in specific projects. The new approach, therefore, holds out glorious promise that this situation will be changed.

Direct Returns

COMPARISON of individual mine accident records before and after the introduction of protective clothing, such as goggles, safety hats and safety shoes, reveals a heartening decrease in the number of eye, head and foot injuries following the introduction of these safeguards. What that means in terms of compensation is evident when it is recalled that the average compensation for a lost-eye accident in the anthracite mines in 1930 was $2,160 and the average in the bituminous mines in Pennsylvania was $1,902. Compensation for accidents resulting in the loss of a foot averaged $2,115 and $2,140. These figures surely are large enough to stir both fields to remedial action.

These costs, of course, as well as payments for other compensable disabilities, are taken into account in figuring base insurance rates. But penalties for a poor safety record and rewards for a good one also are being assessed. The Ohio Supreme Court, for example, has upheld the action of the Industrial Commission of that state in imposing premiums higher than the base rate fixed for the industry on a company with a record below the average.

In Pennsylvania, where last year compensation awarded in coal mining was $6,105,397, or 43.1 per cent of the total awards, although only 8 per cent of the total working population of the state was employed in the coal mines, a still more immediate and direct recognition of adequate safety measures has been given in the setting of a credit item of 18 cents per $100 of payroll to mines using protective clothing; a credit of 8 cents is given on hats or caps, 5 cents on goggles and 5 cents on safety shoes or boots.

Radiance and Coal

MORE AND MORE emphasis is being placed on heat radiance in the promotion of health, though the violet rays and the vitamins those rays create still hold the bigger place in the public mind—perhaps with reason. Breeders have found that chickens that grew sickly under the heat emitted by flames and electrical radiators improved their condition greatly when heated by the radiance of anthracite. Possibly newly hatched chickens have such a thin skin that their bodies demand only a moderately penetrative heat ray near the red of the spectrum rather than somewhat longer rays such as human beings, with a greater depth of capillaries, can utilize to advantage, for apparently the shortest infra-red rays, those nearest the red-light rays, are not as helpful to man as rays a trifle longer.

But, whatever the animal—man, quadruped or bird—it has been shown that the radiance of coal is helpful. Some day the advertising slogan for sunless winter days may be "an open fire in every room." "Radiance" will be the watchword of the anthracite industry just as "vitamins" is that of the fruit and the milk industry, and "iron" of the raisin industry. Radiance has an indicated place in thermotherapy, and no method of obtaining the right kind of radiance is superior to the burning of coal of low-volatile content.

WHEELWRIGHT PROGRAM

+ Brings Increased Safety and Efficiency

With Lower Operating Costs

By E. R. PRICE

Superintendent, Inland Steel Co.
Wheelwright, Ky.

MINING OPERATIONS of the Inland Steel Co. at Wheelwright, Ky., are in the No. 3 Elkhorn seam, the most important bed of the series. The greater part of the holdings of the company in that section, which include approximately 10,000 acres of mineral and 1,550 acres of fee lands, is located on Beaver Creek, a tributary of the Levisa Fork of the Big Sandy River. These mines are served by the Long Fork branch of the Chesapeake & Ohio Ry. The coal, which is particularly well adapted for byproduct gas and coking, averages 38.65 per cent volatile matter, 59.65 per cent fixed carbon, 1.70 per cent ash and approximately 0.53 per cent sulphur.

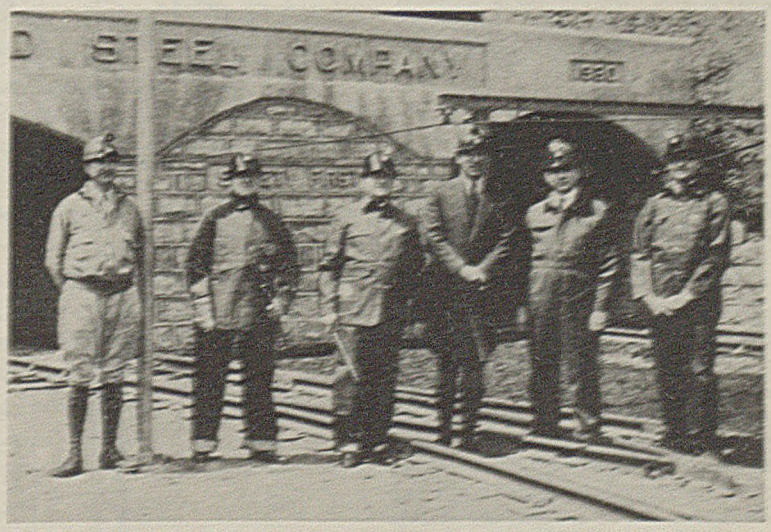
Opened in 1916, the Wheelwright mines had exhausted about 1,000 acres when the Inland Steel Co. took over the property, April 1, 1930. At that time the tipple was a double-frame, pole-type plant with two 36-in. belt conveyors leading from two headframes located on each side of the valley. The arrangement and capacity of the refuse-disposal system was such that it was necessary to double-shift to handle waste material. Mine cars, wood and combination equipment, were small and, because of their condition, had high maintenance and repair costs. Two 8-ft. Stine fans and an auxiliary unit inside the mine comprised the ventilation equipment. Power lines to several sections were over 5,000 ft. long and voltage everywhere was low. Except for about 5 per cent of the dwellings supplied with unfiltered and untreated deep-well water, tenants in company houses depended upon hand pumps for water. The supply was not only insufficient for domestic purposes but inadequate for proper fire protection.

Immediately upon taking over the property, the company decided to modernize the plant to provide increased production at decreased costs and to improve working and living conditions. Major developments in this program include:

1. A new all-steel tipple with increased capacity and lower cost.
2. Installation of an aerial-tram refuse-disposal system with like results.
3. Modernization of transportation equipment and methods which stepped up tonnage for main-haulage locomotives 77.9 per cent and increased tonnage per gathering locomotive 68.0 per cent.
4. An increase in connected load of 475 hp. with a substantial decrease in kilowatt-hour consumption of energy per ton.
5. A safety campaign which has sharply reduced accident rates.
6. Installation of additional fan capacity to improve ventilation.
7. Welfare developments such as a modern bath house, construction of community centers and installation of a modern water-supply system for the town of Wheelwright and its inhabitants.

This program as it affects preparation, refuse disposal, transportation, electrification and safety is covered in detail in separate articles in this issue. Mining methods and other phases of the modernization program mentioned are described in the paragraphs which follow.

Ranging in thickness from approximately 39 to 52 in., the coal seam, over most of the area mined to date, is overlaid with a soft slate of varying thickness, and in this stratum many "horsebacks" and "kettle bottoms" occur. Top of this nature requires close attention and careful, systematic timbering. Fortunately, the advance development in some sections of the mines has reached areas with sandstone top. Except in certain sections where a thin streak of slate, varying from paper thickness to about one inch, is found about 2 in. from the bottom, the coal is clean and free of partings. Because of this streak



Principal Executives of Inland Steel Co. and Wheelwright Mines

From Left to Right: W. G. Fletcher, general superintendent; E. J. Block, vice-president; J. D. Block, president; E. R. Price, superintendent; C. B. Randall, vice-president; and P. D. Block, Jr., assistant to vice-president

Wheelwright's Office Staff

Front Row, Left to Right: G. C. Billups, mine foreman; E. R. Price, superintendent; W. G. Fletcher, general superintendent; F. B. Blackburn, night foreman. Back Row, Left to Right: Blaine Smith, chief clerk; J. C. Osborne, chief electrician and maintenance foreman; H. M. Wilkinson, store manager; G. C. Sutherland, safety inspector; J. W. Bailey, resident physician; J. T. Parker, assistant superintendent and H. O. Zimmerman, chief engineer.

and the rather soft bottom, practically all machine cuttings made in rooms are gobbed; when made in headings and airways, they are loaded out as refuse.

Before shooting, miners are required to remove all machine cuttings from the cut and to load them in cars as refuse or shovel them into the gob. Occasionally, where the bottom is hard, the miner is permitted to place a check on a car of clean machine cuttings, but such cars are thoroughly examined by an outside inspector before being dumped as clean coal. Where the cut is made in the bottom of the seam or the underclay is unusually soft, the miner is furnished with a sheet-iron plate measuring 4x4 ft. so that he can shoot his coal down on it. By this careful method of inside preparation, minus 2-in. coal, or what is termed "2-in. modified," contains an average of about 3 per cent ash as determined from railroad-car samples, which are regularly analyzed at the Indiana Harbor plant of the company.

In rooms and pillars, all places are timbered by the miner, except such as require special timbering. He also lays all straight track. Only under unusual conditions is any timber used in haulways or headings. The top in such places is frequently examined and scaled, any dangerous top being taken down immediately.

Many experiments have been made to determine the most efficient method of mining for concentration of work and the highest possible recovery. Thus far, it appears that the most satisfactory system is a double-entry, full-retreat room-and-pillar system, with rooms and butt rooms on 100 ft. centers, the double entries being driven 600 ft. apart and 12 ft. wide (see sketch). The mines work on a clean-up system, the places being cut on the shift following loading. Room widths vary from 18 to 24 ft., depending upon the tonnage which the miner can load from his place in 8 hours.

Pillars are extracted by longwalling or open-end mining with cars placed along the face whenever top conditions permit such methods. In other instances, butt-offs 16 to 20 ft. wide are driven through the pillar to the gob of the adjacent room. Depending upon conditions, either one or two butt-offs are driven, and the blocks are shortwalled. Occasionally, in order that the work shall not be delayed and the pillar line get out of step, butt-offs are double-shifted. Main entries have seven headings, one accommodating a loaded track, one an empty track and one a sidetrack with four airways, two of which are located on each side of the aforesaid haulage headings which lie side by side. Face entries have only five headings, one containing a loaded track, one an empty track and one a sidetrack. The other two headings are airways, which are located on either side of the aforementioned haulage headings. All headings are driven 12 ft. wide.

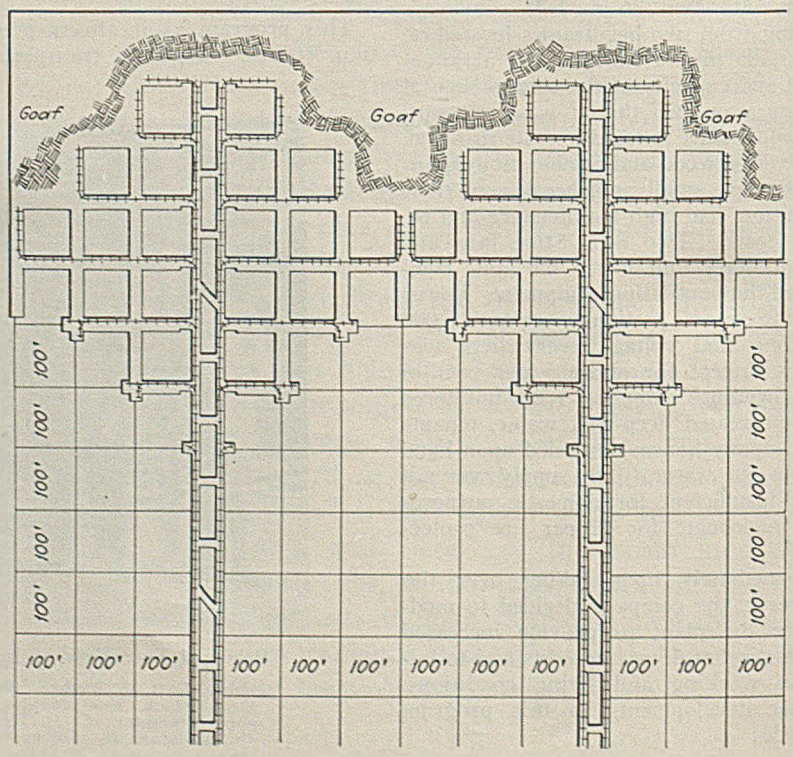
No coal has been loaded mechanically. A Myers-Whaley shovel is being used to load rock when any heavy grading is done or when a heading which has been idle for some time and contains much fallen slate needs to be cleaned of the débris. The possibilities of conveyor loading have been studied, but, thus far, conditions do not appear to warrant the use of such methods. At present, the loaders are averaging 11 tons per day and in addition handle from one to two cars of machine cuttings and slate.

In all main and face headings from 2 to 3 ft. of slate is shot down by the loader, but in room headings, wherever the top rock can be held in place, no slate is taken. However, in some room headings it is necessary to take from 24 to 42 in. of slate with the coal.

A Jeffrey 4 ft. 6 in. x 9-ft. double-inlet reversible fan was installed on Frozen Creek near the far end of the present development. It has a capacity of 150,000 cu.ft. of air against a 2-in. water gage, but at the present time is delivering only 100,000 cu.ft. of air against a mine resistance of only 1 in.

(*Turn to page 436*)

Method of Driving Rooms and Room Entries and of Removing Pillars



CONNECTED LOAD INCREASED

+ Power and Maintenance Costs Cut

At Wheelwright Mines

IN MODERNIZING its Wheelwright properties to increase production and reduce operating cost, the Inland Steel Co. found it necessary to install a new surface plant and increase substation capacity, thus adding materially to the connected motor horsepower. Despite these additions, power consumption per ton of coal mined was sharply reduced through the modernization of transmission systems, electrical equipment and controls, and the cost of maintaining electrical equipment was pared down to the minimum.

Wheelwright operates exclusively on purchased power. The power company's lines deliver current at 40,000 volts to three 60-cycle, single-phase, 333-kva. transformers, tapped for primary voltages of 44,000, 42,900, 41,800, 40,700, and 39,600. These transformers deliver power at either 2,300 or 4,000 volts. Three substations, one with full-automatic control, supply direct current for the mines. These substations have a total capacity of 11,000 kw. One of the stations was built after Inland Steel took over the mines, and is located at almost the extreme point of the present mine development. All substations operate in parallel and are connected inside the mines with 1,000,000-, 800,000- and 500,000-circ.mil cables. Direct current is supplied at 275 volts, and since the installation of the new station and additional feeder lines, the voltage drop is at a minimum in both mines.

Power for the new tipple, headhouse and aerial tramway is supplied by an outdoor transformer bank consisting of three 200-kva., 2,300/230-volt transformers. Total connected motor load installed at the tipple, headhouse and tramway terminal is 475 hp. A list of the motors making up this load is given in Table I. All motors are of the open type and are equipped with ball bearings. Thrustor-operated brakes are used wherever braking is necessary.

Controls for the electrical equipment in the new tipple (capacity, 750 tons per hour) and headhouse are arranged to permit rapid and efficient handling of the coal from the time it comes out of the drift mouth until it is loaded into the railroad cars. One operative in the headhouse, who also dumps the coal and rock, has charge of a pushbutton station which controls all operations from the time the coal leaves the mine until it is dumped into the hoppers at the head of the main mine-run conveyor leading to the tipple. This man also controls the handling of the mine rock until it reaches the aerial tramway loading terminal (see pp. 430-431).

By means of a second pushbutton panel in the tipple, the foreman controls the movement of the coal from the hoppers under the dump until it is loaded into the railroad cars. Signal bells and a telephone enable these two men to work in cooperation, while lights on the control panels show just what units are in operation. Magnetic starting switches also have been centralized at two stations, one in the headhouse and one in the tipple.

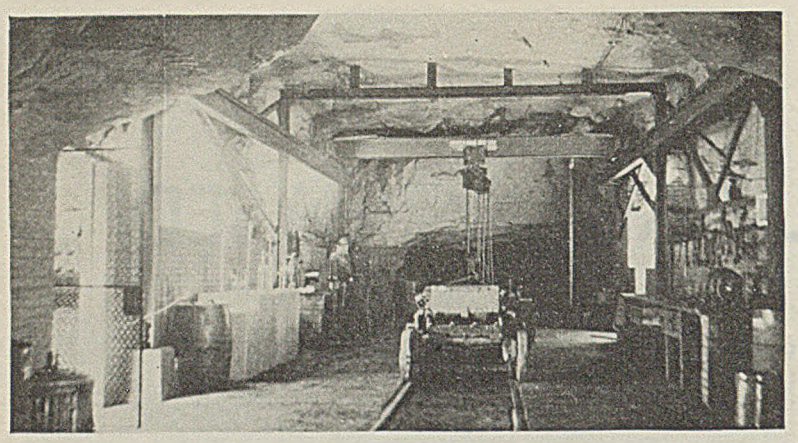
Controls have been designed for maximum reliability, flexibility and safety. Each motor starter is equipped with an individual fused disconnect switch which, when possible, is made an integral part of the motor switch. Thermal overload protection is provided for each motor, and the controls are interlocked so that if any conveyor stops for any reason, all equipment feeding that conveyor will stop automatically. This precludes any possibility of coal or slate overrunning a conveyor. At times, however, it is necessary that the tipple operative be able to "jog" any desired piece of equipment, so provision is made for operation of the equipment out of

Table I—Motor Equipment at Wheelwright Surface Plant

Application	Motor Type*	Motor Rating	Drive	Control
Hiker feeder	KTE	17 hp., 1,200 r.p.m.	Speed reducer and chain	Reversing; full voltage starting
Hiker depressor	KTR	4 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Trip feeder	MTC	50 hp., 900 r.p.m.	Speed reducer and chain	Reversing; speed regulating
Rotary dump	KE	25/7 hp., 1,200/450 r.p.m.	Speed reducer	Non-reversing; full voltage starting
Rock gates (2)	KTR	1½ hp., 1,200 r.p.m.	Speed reducer	Non-reversing; full voltage starting
Mine-run feeder	KG	15 hp., 1,200 r.p.m.	Speed reducer and eccentric	Non-reversing; full voltage starting
Rock feeders	K	5 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Refuse conveyor	K	5 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Clean-up conveyor	K	5 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Domestic coal conveyor	K	5 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Rock conveyor	KG	30 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Main mine-run conveyor	MT	75 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; definite time starting
Shaker screens	MT	50 hp., 720 r.p.m.	Chain	Non-reversing; definite time starting
Loading booms (2)	KG	10 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Boom hoists (2)	KTR	6½ hp., 1,200 r.p.m.	Speed reducer and chain	Reversing; full voltage starting
Degradation conveyor	K	3 hp., 1,200 r.p.m.	Speed reducer and chain	Non-reversing; full voltage starting
Aerial tramway	A Ry	75 hp., 580 r.p.m.	Speed reducer	Non-reversing; definite time starting
Coal crusher	A Ry	75 hp., 580 r.p.m.	Multi-V belt	Non-reversing; definite time starting

*Motor types listed in the table are as follows: KTE, KTR and KE, high-starting-torque, low-starting-current, squirrel-cage induction motors; KG, high-starting torque, low-starting-current induction motors with double squirrel-cage rotor bars; K, normal-torque, normal-starting current, squirrel-cage induction motors; MT, MTC and A Ry, wound-rotor induction motors.

All motors furnished by the General Electric Co., except those driving the aerial tramway and coal crusher, which were supplied by the Allis-Chalmers Mfg. Co.



Inside Repair Shop for Locomotives and Machines

sequence as long as the "start" button is held down.

As purchased power is one of the major items of expense, it was obvious that an increase in connected load of 475 hp. would result in greater power consumption per ton unless compensating economies could be made elsewhere. Consequently, the new substation was built at the limit of present development, additional feeder lines were installed and bonding practice was overhauled, with corresponding improvement in voltage conditions. Heavier steel was laid on some of the haulageways, and considerable grading was done to eliminate hills on the haulage roads.

Nineteen of the twenty 6-ton gathering locomotives were completely overhauled and equipped with roller-bearing instead of sleeve-bearing journal boxes. Contactor control was provided for several of the gathering locomotives, and also for two of the 15-ton and one 10-ton haulage locomotives. All mine cars were equipped with anti-friction bearings, and the size of trips pulled by main haulage locomotives was limited to a definite number of cars to maintain a more even power demand. As a result of this program, the power consumption per ton dropped to 3.10 kw.-hr. in October, 1932. During 1931, before installation of the new surface plant and other improvements, the consumption per ton of coal was 4.565 kw.-hr.

Supplementing the other underground improvements, ten automatic reclosing circuit breakers were installed to sectionalize completely the d.c. distribution system in the mines. These not only reduce the fire hazard but localize power interruptions.

Because, due to the hilly nature of the country, sufficient space was not available on the surface, an inside locomotive and machine barn and repair shop was built just inside the mine portal, with connections to the empty track. The installation comprises a repair shop with a concrete pit about 35 ft. long, a supply room, a room for the trip-lamp charging panel, and sixteen stalls capable of housing 32 locomotives and mining machines. The stalls are driven on a slant from both sides of the service track. Bethlehem No. 9 three-way turnouts on steel ties were installed at the stall entrances, and Carnegie steel ties were used on the straight track between turnouts and in the stalls.

Inspection of locomotives and mining machines is covered by printed instructions, which must be followed closely. In addition to the regular inspection routine, which covers daily inspections of the locomotives and weekly and monthly inspections of the mining machines, all armatures on both locomotives and machines are removed once a year for detailed examination and repairs, including replacement of insulation, commutator repairs, checking of bearings, etc. At the end of seven months of operation under this system, there had been no locomotive armature failure which required rewinding, and but one machine armature failure. The latter was caused by low voltage, due to a substation being idle while the machine was cutting.

Printed instructions also have been issued to cover inspection of pumps, substations and all stationary motors, and these inspections are made regularly. Two Sullivan portable air compressors were overhauled recently and equipped with Texrope drives and automatic starters controlled by pressure regulating switches.

The compressed-air line used for lifting sand from the drying house to a storage tank on the empty track just inside the mine portal has been extended to the tipple, headhouse, aerial tramway loading station, blacksmith shop, and the inside locomotive barn and repair shop. Connections can be made to this line at any of these points for blowing out stationary motors, mining machines and locomotives; also for riveting or other desired purposes.

Daily records on repairs to locomotives and mining machines are kept, and at the end of the month reports are prepared showing separately the cost of repairs and maintenance for each locomotive and machine. Thus, the management is able to determine the major items of expense and place the responsibility for unusual costs.

Locomotives have been equipped with

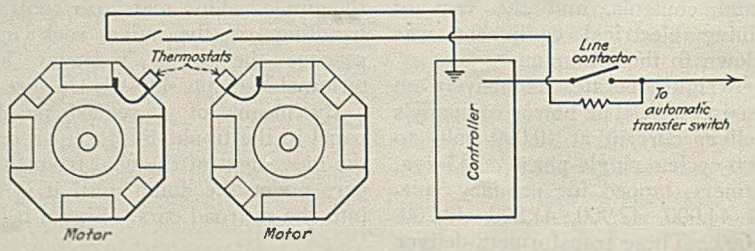


Fig. 2—Wiring Diagram for Thermal Relay Protection for Locomotive Armatures and Coils, and for Contactor Control for First and Fifth Points in Series and First Point in Parallel

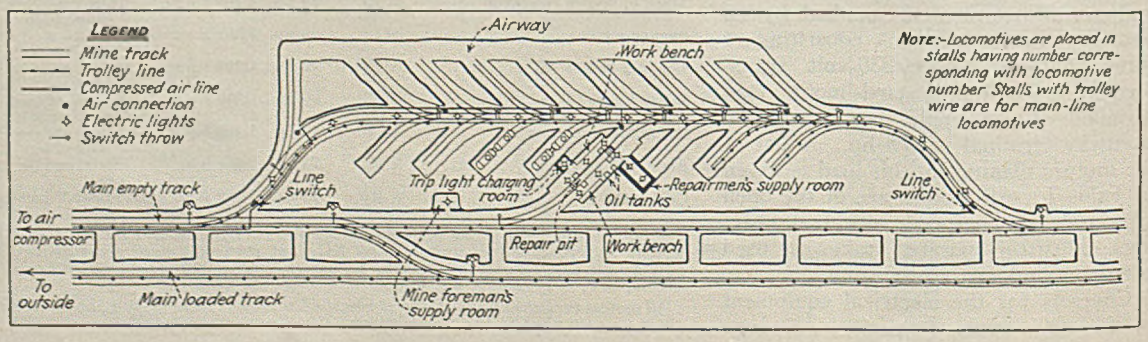
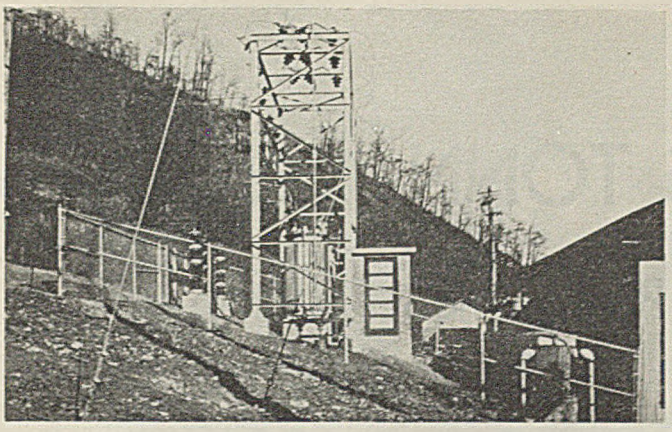


Fig. 1—Plan of Inside Locomotive Barn and Repair Shop



Main Bank of Three 333-Kva. Transformers; Primary Voltage, 40,000; Secondary Voltage, 2,300

Portable Air Compressors After Overhauling and Installation of Automatic Starters and Drill Racks

an unusual type of thermal overload protection lately developed to guard against armature and field-coil troubles. Each motor box is drilled, as shown in Fig. 2, and the bulbs and capillary tubes of General Electric 4387133G8CR2992D2 thermostats are inserted in the holes. The bulbs, shielded to prevent mechanical injury, are placed next to the field coils. The two thermostats are wired in series to a G.E. 930A2 independent line contactor, and are set to open at 175 deg. F. As the mercury in the bulb

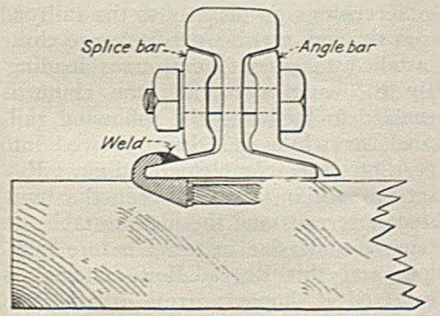


Fig. 3—Application of Bonds to Rail Joint Made Up of One Splice Bar and One Angle Bar

expands from the heat, the contacts of the control are opened, which, in turn, opens the main-line contactor automatically, and the locomotive is idle until the motors cool sufficiently for further operation.

The first thermostat installation was made on a gathering locomotive operating on heavy grades, with the result that it came to the motor barn at the end of the shift with excessively hot motors. Consequently, armature and field coil renewals were frequent. Since installation of the thermostats, however, the locomotive ends the shift at no more than normal operating temperature. For the first few shifts after installation of the thermostats, the locomotive runner complained about delays, and the tonnage from his section dropped off. But by studying conditions in his section, the runner was soon able to adjust operating schedule so that heating and delays were eliminated, with the result that this locomotive is hauling more coal than formerly.

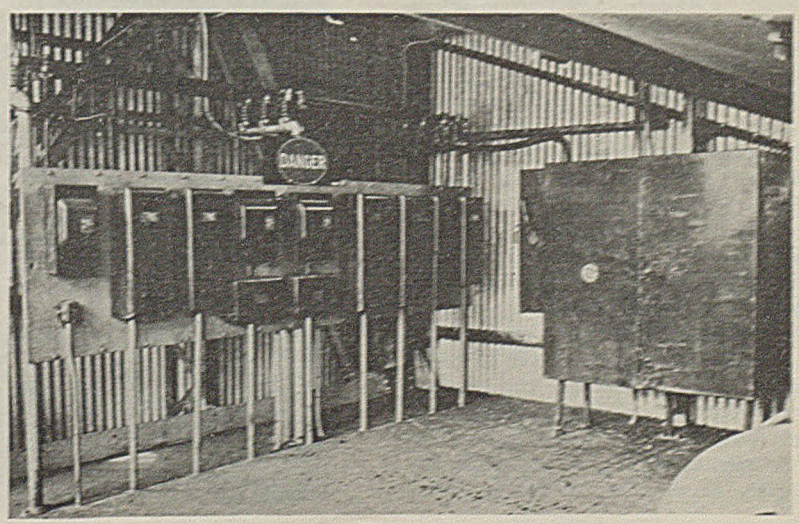
Only two of the 6-ton gathering locomotives are equipped with full contactor control, and in order to reduce the cost of repairs and maintenance, two segments have been added to the top of the controller drum of the G.E. B62A controller, and one A finger has been added to the top of the finger board. These are wired in series to the operating coil of the G.E. DB930A2 line contactor. As most of the controller replacements are made on the first and fifth points in series and the first point in parallel, the installation of the segments and finger affords the same protection to these points as full contactor control.

All locomotives are being equipped with the thermal overload and controller protection described above, except, of course, the two already equipped with full contactor control. Wiring for both types of protection is shown in Fig. 2.

Type AW-18 copper-weld bonds supplied by the Ohio Brass Co. are used exclusively. This bond requires one angle bar and one splice bar at each joint (Fig. 3). Adoption of this system of connecting rails and bonding the joints was based on tests on the comparative strengths of 60-lb. rail joints made with two angle bars and one splice and one angle bar, which were made by the West Virginia Rail Co. Both workway and sidewise tests were made. In the sidewise tests, the bolts sheared at 45,030 lb. for the combination splice and angle-bar joint, and at 69,340 lb. for the angle-bar joint. Deflection in each case was about the same. In the workway test, the combination splice and angle-bar joint broke at 101,920 lb., and the two angle bars were badly bent at 128,960 lb.

These tests showed that the two angle bars made the stronger joint, as was expected, but at the same time they indicated that the combination of splice and angle bars would make a joint of ample strength for ordinary service. In making these tests, the load was applied at the joint with a span allowance of 24 in. As ties ordinarily are spaced less than 24 in. in the mines, the strength of the combination splice and angle-bar joint is, of course, higher than that indicated above. Through the use of this type of connection and the AW-18 bonds, the Inland Steel Co. has reduced the cost of bonds 50 per cent, and at the same time the resistance of the joint has been reduced through the use of the shorter bond.

Switch Panel in Tipple



EQUIPPED FOR BIG TONNAGE

+ Wheelwright Surface Plant Prepares Coal With Smaller Force

SOON AFTER the Inland Steel Co. acquired the Wheelwright mines, it decided to modernize the entire surface plant to ship a better-prepared coal and reduce operating cost. In carrying out this plan, the existing preparation plant was replaced by a three-track steel tipple designed to handle 6,000 tons of mine-run in eight hours; other surface activities were revised to take care of this increased production; and an aerial tramway was installed to handle the added refuse output.

As surface activities at present are arranged, trips of 40 cars each are brought out of the mine to a point about 200 ft. from the rotary dump in the headhouse. Here the haulage motor passes over a trip hiker, cuts loose from the loads, travels on a run-around track past the rotary dump to pick up the empty trip on the other side of the headhouse, and then returns directly to the mines.

The loaded trip is then moved forward by the trip hiker until it reaches the feeder at the dump and is coupled to the loaded cars from the previous trip in readiness for dumping. Operation of the trip hiker is controlled by the dump operative. The hiker is fitted with motor-operated equipment which lowers it to allow the locomotive to pass and then raises it to engage lugs on the cars preparatory to moving the trip forward to the dump feeder.

The dump feeder moves the cars over a railroad-type platform scale, in charge of the weighmaster, where the weight is recorded by a Streeter-Amet recorder, after which two cars are spotted in the dump and the dumping cycle begins. The dump and the dump shield underneath it are arranged so that two cars of coal, two cars of rock, or one car of coal and one car of rock can be dumped at the same time. Motor-controlled rock gates bypass the rock to bins under the dump, while the coal goes to separate feeder hoppers. This arrangement was necessitated by the large quantity of mine rock to be handled each day and the importance of quickly disposing of refuse in cars included in loaded coal trips.

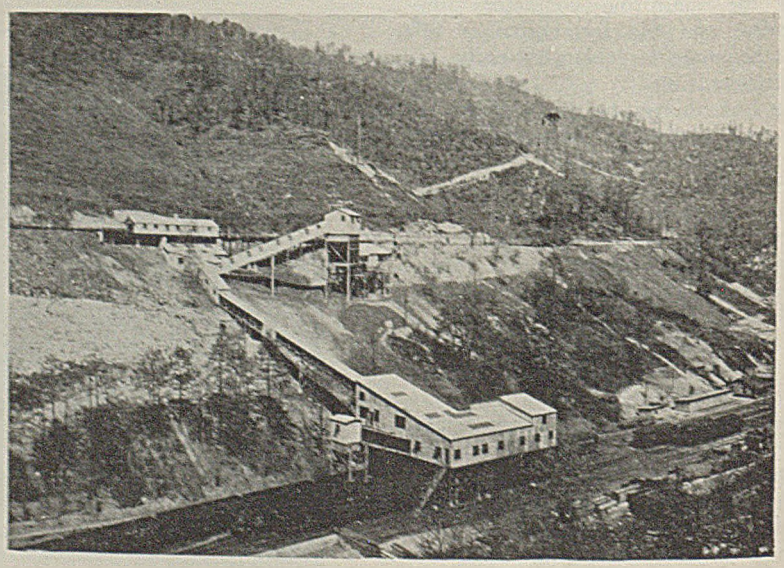
Rock from the two bins is discharged onto a 42-in. apron conveyor by two 42-in. apron-type feeders. The conveyor takes the rock to a 200-ton bin at the aerial tramway loading station, about 75 ft. away. Two men at the loading terminal operate the aerial tramway (described on pp. 432-433) and attend to the loading and dispatching of the buckets.

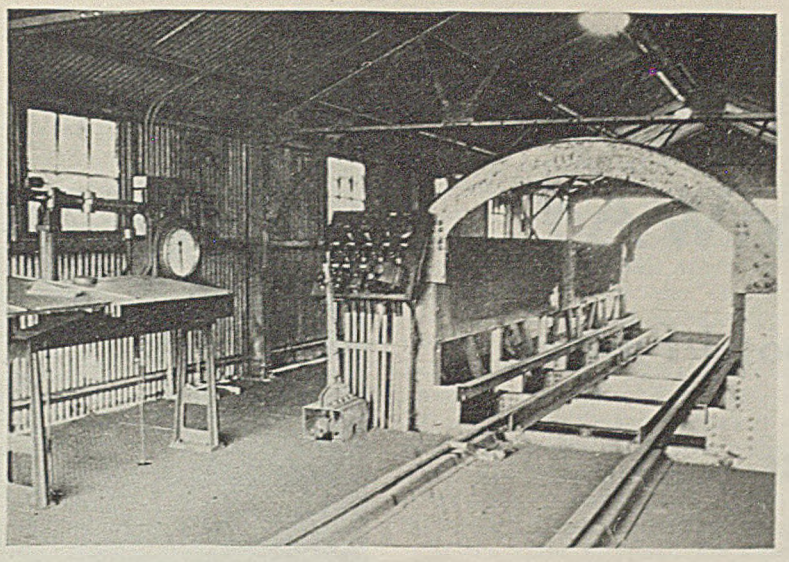
In designing the dumping shield, provision was made for the future installation of equipment for bypassing machine cuttings and bottom "scrappings" to a mechanical preparation plant in case additional cleaning before loading should become necessary or desirable. In this event, the cleaning plant and the required conveying equipment would be located so that the cleaned cuttings and scrappings would discharge onto the main mine-run conveyor connecting the dump and the main shakers.

From the bins underneath the dump the coal is discharged onto a 48x18-in. chain-and-flight mine-run conveyor by a 36x60-in. double reciprocating feeder with a capacity of 750 tons per hour. This conveyor carries the coal on its lower run down a 15-deg. pitch to a pair of hanger-type shaker screens, 10 ft. wide. These screens are fitted with 2-, 4- and 6-in. perforated plates to make 6-in. lump, 6x4- or 6x2-in. egg, and the resultant screenings, which are loaded on three tracks.

Screenings go directly to the railroad cars through a two-way discharge chute installed to permit continuous loading. By throwing a flygate, the chute is enabled to feed into the following railroad car while it is being moved into position for complete loading. Rescreens are installed between the main shaker screens and the picking tables to remove undersize material before picking, and this degradation material is collected in hoppers from which it is discharged onto a 20-in. steel apron conveyor beneath the shakers. This conveyor takes the degradation back to the screenings loading chute.

Surface Plant at Wheelwright. The Aerial Tramway Appears in the Background





Automatic Recording Scale, Rotary Dump and Headhouse Control Panel

Lump and egg are cleaned and loaded on two combination picking table-loading booms, each 5 ft. wide. A 48x48-in. two-roll segmental crusher is installed in the structure at the end of the lump loading boom for reducing this size to 2 in. or smaller when desirable. Provision also has been made for the addition of a second crusher at the end of the egg boom for the purpose of making minus 2-in. coal, if desired. Thus, if necessary, the entire output can be shipped as 2-in. screenings in the future. Provisions for house-coal supply include a 10-ton bin on the uptrack side of the tipple and a 24-in. belt conveyor for filling it with egg.

To facilitate cleaning up spilled coal along the tracks, a 16x18-in. chain-and-flight conveyor is installed under the boom structure. This conveyor parallels the highway. Spilled coal loaded onto the conveyor is delivered to the main shaker screens. This coveyor also handles slate and refuse removed from the railroad tracks, discharging such material through a gate to the refuse conveyor.

To handle refuse from the picking tables, a 24-in. steel apron conveyor is installed in the middle of the picking space. Pickings from both the lump and egg tables are carried up the inclined section of this conveyor, and are discharged onto the upper run of the main mine-run retarding conveyor, which carries the accumulated refuse from the picking operations and also from clean-up activities back to the rock conveyor. Thus, refuse from the tipple and rock from the mine are finally accumulated at one point in the 200-ton bin at the aerial tramway loading terminal.

With the creek on one side of the site and the only highway into the town on the other, space for installation of the preparation plant was limited, and only three loading tracks and a run-around track could be built. As a result, it was decided to build the plant so that there would be a clear span over the three loading tracks to insure maximum clearance. This decision made it necessary to provide a structure of unusual design for supporting the heavy reciprocating machinery, which of necessity had to be suspended over the tracks.

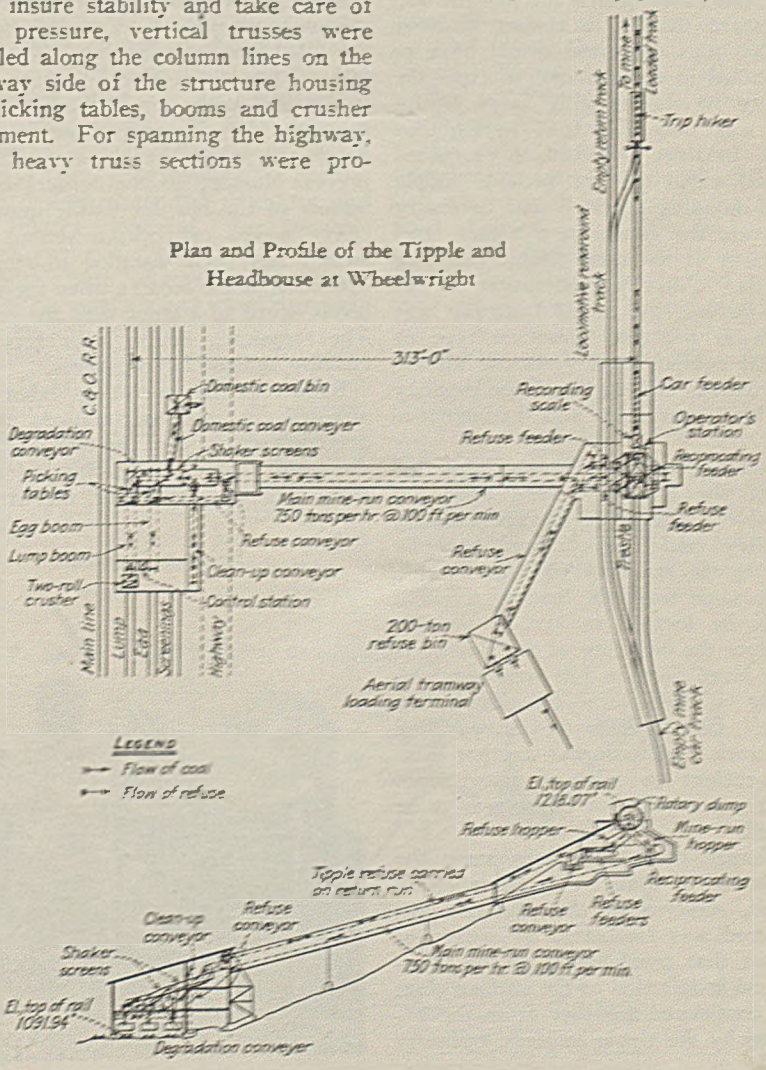
To insure stability and take care of wind pressure, vertical trusses were installed along the column lines on the highway side of the structure housing the picking tables, booms and crusher equipment. For spanning the highway, deep, heavy truss sections were provided. These were anchored into a concrete footing and, in conjunction with heavy steel back braces, form a back tower that takes all of the reciprocating load from the heavy shakers down to the foundation alongside the highway. Few changes were made in the original location of the railroad tracks, and the new plant was built without interfering with loading at the old plant, though only 4 ft. separated the two structures.

The main shaker screens are driven by a heavy, nickel-steel, forged crankshaft supported in four heavy split bearings. The crankshaft is supplied with power from a 50-hp. slip-ring motor through a silent-chain drive running in a dust- and oil-tight casing. All conveying units are driven by individual motors connected by flexible couplings to fully inclosed speed reducers with spiral herringbone gears running in oil. Finished steel roller chains connect the slow speed shafts of the reducers with the driving shafts of the conveying units, also inclosed. These transmissions insure maximum safety and high operating efficiency.

Electrical control of the entire surface plant is centered in two push-button stations, one in the headhouse

(Turn to page 439)

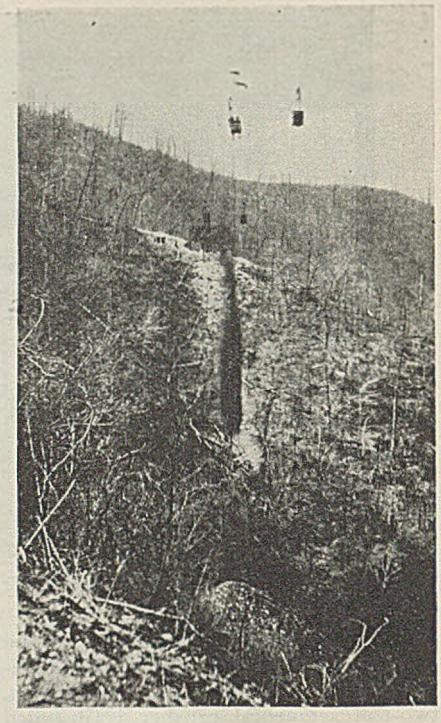
Plan and Profile of the Tipple and Headhouse at Wheelwright



AERIAL TRAMWAY

+ Solves Refuse-Disposal Problem

At Wheelwright Mines



Dumping Between Last Tower and Outer Terminal

WHEN the Inland Steel Co. decided to modernize its Wheelwright plant, it was immediately apparent that the existing system of refuse disposal by larries would have to be replaced. Operating and maintenance costs were very high, and the larries had already filled nearly all the available dumping space within economical traveling distance. Furthermore, the contemplated increase in output meant that a maximum quantity of 1,200 tons of refuse would have to be handled in eight hours, whereas the capacity of the existing larry equipment was only 775 tons in eighteen hours. In order to furnish this required disposal capacity and provide ample future dumping space, it was necessary to elevate the refuse to a higher level and carry it to more distant dumping grounds. After consideration of all these factors, the aerial tramway was chosen as the most practical type of disposal equipment for meeting all the requirements of long life, large capacity and low operating and maintenance costs.

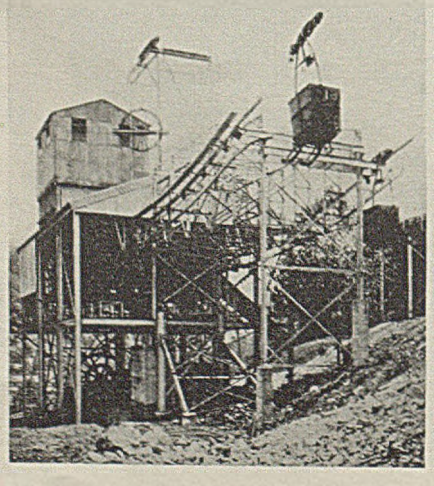
Natural conditions at the proposed site of the tramway were none too favorable. The large storage capacity necessary could be obtained only by carrying the tramway on high towers. At the same time, the loading terminal had to be located as low as possible to reduce the handling of the waste. A fairly large storage bin was required, making it necessary to elevate the refuse. Coordination of tramway and mine-track locations was another difficult problem to solve if interference with the operation of either was to be avoided.

Although these conditions made the installation of even an aerial tramway difficult, solution of the problems encountered was facilitated by reason of the fact that construction of the tramway and installation of the surface plant were considered together from the beginning by the tipple builders, tramway builders and the coal company. Consequently, it was possible to provide sufficient space to insure smooth operation of the tramway and at the same time eliminate any possibility of interference with other surface activities.

The present disposal system is designed to handle 150 tons of refuse per hour. As the production of refuse is more or less intermittent, a 200-ton storage bin was provided at the loading station as a reservoir. Tramway buckets are filled from this bin by either one of two feeders. An electric limit switch is installed at the top of the bin to stop the conveyor carrying refuse from the headhouse when the bin is filled. To prevent damage to the feeders or the bottom of the bin due to the impact of heavy pieces of rock, a second limit switch has been installed to stop the operation of the feeders when the refuse levels drops to a point near the bottom. The remaining refuse layer acts as a cushion against falling pieces.

Reduction in operating labor was stressed in the negotiations which preceded purchase of the tramway, with the result that many automatic features were included. However, the handling of pieces varying greatly in size and weight made full automatic loading of buckets inadvisable, and the feeders, therefore, are arranged so that they may be started and stopped by push-buttons worked by the operative, even though they are equipped with interlocking switches, as pointed out above.

Loading Terminal



Rails in the loading terminal have sufficient fall to allow the buckets to drift from station to station by gravity. Mechanical stops on the rails catch the carriers at the chutes and hold the buckets in place during loading. One release is automatic and the other is hand-operated. After leaving the loading chutes, the carriers strike another stop at the dispatcher, where they are held until the proper instant for attaching them to the tramway cable arrives. At the suggestion of the company, the operation of the automatic stop and the dispatcher were synchronized, and a signal light was installed at the operative's station to inform him when the bucket leaves the dispatcher. Consequently, the operative need not take his attention away from the feeders to watch the other operations in the loading terminal.

Driving machinery for the tramway is mounted on concrete foundations underneath the loading terminal floor. Six-foot idler sheaves in the upper structure deflect the traction rope downward and under the 10-ft. grip wheel, which is fitted with a large spur gear driven by a pinion on a Falk double-reduction herringbone speed reducer. The reducer is direct-connected to a 75-hp. Allis-Chalmers motor and a General Electric "Thrustor" brake. A safety device to prevent the tramway

from running backward is a part of this unit. The traction rope tension equipment also is placed at the loading terminal.

Empty carriers arriving at the loading terminal are detached automatically from the traction rope and coast around to the first feeder on the carrying rail, where they can be stopped or allowed to pass on to the second feeder. Either feeder can load the bucket, two being provided, so that a breakdown of one will not interrupt the operation of the tramway. If loaded at the first feeder, the bucket is released by hand and caught at the second, but if loaded at the second feeder, no further operation is necessary. The buckets are released automatically from the stop at the

View Showing Future Dumping Space. Second 100-Ft. Tower Appears in Background

second feeder, and are allowed to drift to the dispatcher at the same instant the dispatcher opens to send a bucket out onto the line. Operation of the dispatcher is controlled automatically by the travel of the traction rope to give a spacing of 168 ft. between carriers. Between the dispatcher and the attacher, the carriers gain speed, so that the automatic attaching is accomplished smoothly at the speed of the traction rope, a $\frac{7}{8}$-in. wire line operating at 320 ft. per minute. Loaded buckets travel outward and upward on a $1\frac{3}{4}$-in. locked-coil track cable and return after dumping on a $1\frac{1}{4}$-in. locked-coil cable.

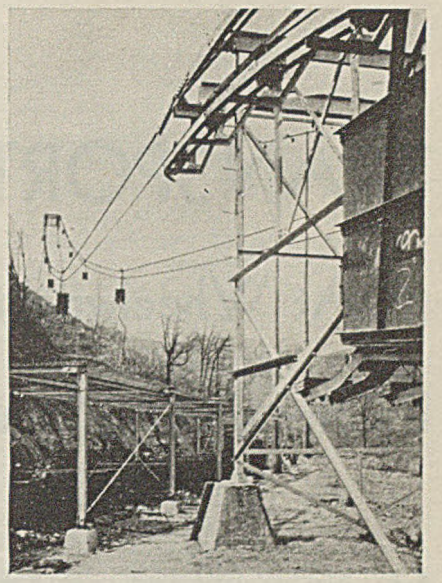
The tramway structures consist of a loading terminal, one small break-over tower just beyond the loading terminal, two additional break-over towers approximately 100 ft. high and 40 ft. across the top, and an outer, or return, terminal. The first 100-ft. tower is 900 ft. from the loading terminal, and its top is about 215 ft. above the loading terminal. Between this tower and the next there is a clear span of 1,285 ft. The top of the second tower is approximately 98 ft. higher than the first. Between these two is the main dumping ground of the future. From the second 100-ft. tower to the outer terminal there is a span of 570 ft. without additional rise. The outer terminal, a comparatively low structure, is 2,755 ft., horizontally, from the loading terminal.

At the outer terminal, the carriers, still attached to the traction rope, travel around a $17\frac{1}{2}$-ft. structural steel sheave. By careful adjustment of the guides, this turn of 180 deg. is made without shock. Track cables are anchored by an 85-ton concrete block at the outer terminal. Tension weights, 41 tons for the loaded-track cable and 21 tons for the empty-track cable, are suspended at the loading terminal. These are made of concrete.

Dumping now takes place at a point about 2,400 ft. from the loading terminal, and is accomplished by a movable tripping frame suspended from the loaded-track cable. As the buckets pass through this frame, the latch holding the hinged and counterweighted bucket bottom is tripped, permitting the bottom to swing downward and discharge the load. After dumping, the counterweights swing the bottom back up to engage the latch, whereupon the bucket is ready for another load when it arrives at the loading terminal.

Capacity of the buckets is 30 cu.ft., and each is equipped with a Leschen heavy-duty friction grip. At present, 37 buckets are in use and a thirty-eighth is held in reserve to replace any that may have to be taken out of service for repairs. Carrier wheels, traction rope guide rollers, and similar parts are fitted with Timken tapered roller bearings.

All the wire rope and tramway

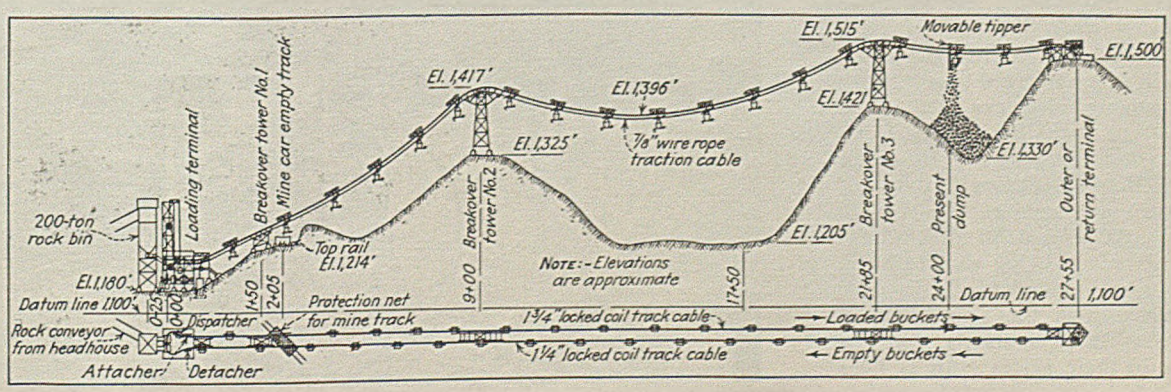


Looking Along Tramway From Loading Terminal; Protective Net in Place Over Mine Tracks

machinery was supplied by the A. Leschen & Sons Rope Co., which prepared the general plans. Steel structures, designed, fabricated and erected by the St. Louis Structural Steel Co., are used throughout. The latter company also supplied the protection net installed over the mine car tracks. Concrete foundations and all motors, wiring and controls were installed by the Inland Steel Co.

The entire disposal system can be operated by one man and, although two are on duty at present, the Inland Steel Co. was nevertheless able to reduce the disposal crew by ten men. The entire refuse production of the mine can be handled in less than a full shift, which is concrete evidence of the superiority of the tramway over the larry system. It would have been physically impossible to handle this quantity of refuse and at the same time dump as far away as is possible with the aerial tramway. Use of the tramway also permits disposal of the refuse far enough away from the townsite to minimize the disagreeable features of a fire in the pile.

Plan and Profile of Aerial Tramway Installation



TRANSPORTATION COSTS

+ At Wheelwright Reduced

By Remodeling Haulage

BY REPLACING small cars with larger and more modern equipment and of larger capacity, by improving the track, relocating sidetracks, decreasing excessively heavy gradients, overhauling locomotives, using roller bearings, improving power distribution and introducing a dispatching system, the Inland Steel Co. has increased its tonnage per main-haulage locomotive at Wheelwright 78.0 per cent and has augmented its production per gathering locomotive 68.0 per cent.

Transportation problems at Wheelwright are similar to those ordinarily found in bituminous mines where the coal is of the same thickness. Trackage has been divided into three classes: Class A (main haulage roads) is new 60-lb. rail laid on 5x7-in. untreated white-oak ties; Class B (all tracks on face entries and secondary haulage roads), 60-lb. relaying rail on similar ties; Class C (all heading and room track), 30-lb. rail laid either on 4x5-in. hardwood or on steel ties.

Although all the track has not yet been brought up to these standards, 12,800 ft. of Class A and B track has been laid since the Inland Steel Co. took over the property and, wherever room entries had 20-lb. rail, that track has been replaced with 30-lb. rail and the 20-lb. material transferred to rooms. No more 20-lb. rail will be purchased, but it will be some time before all such rails will be replaced by 30-lb. stock. Much 56-lb. rail was in use on main haulage roads when the property was purchased, and as conditions permit, this rail will be transferred to secondary haulage roads or sidetracks.

No one type of ballast has been accepted as standard for use in either Class A or B track, although "red dog" (burnt slate) and sand rock have both been tried. At present, in all headings where sand rock is being shot to bring their height up to standard, miners load out all rock which they can place in cars by hand and temporarily store the remainder in their places: this is later loaded by company men for ballast on Class A and B tracks.

On all such trackage, No. 4 standard turnouts are used, installed according to a standard plan. Both No. 2 and No. 3 turnouts are being used on Class C track, but the No. 2 turnouts formerly installed are gradually being replaced by No. 3 switches. All switch throws are of parallel type, except a few old ones, now installed at room mouths.

A track foreman under the supervision of the mine foreman is responsible for all Class A and B track. Not only does he look after the condition of the track in general but he heads one working crew and directs the work of another on the same class of track.

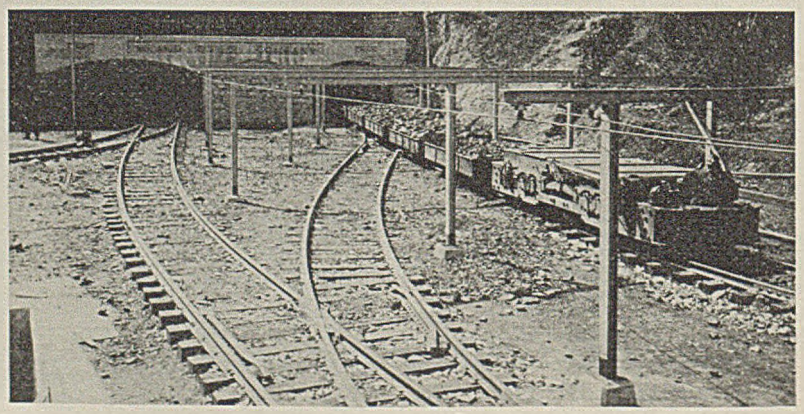
When the haulage system was revised, four new partings with empty and loaded tracks, each capable of accommodating 50 cars, and one loaded track for 50 cars were provided. Much of the increased gathering-locomotive efficiency is due to the proximity of the sidetracks to the working places.

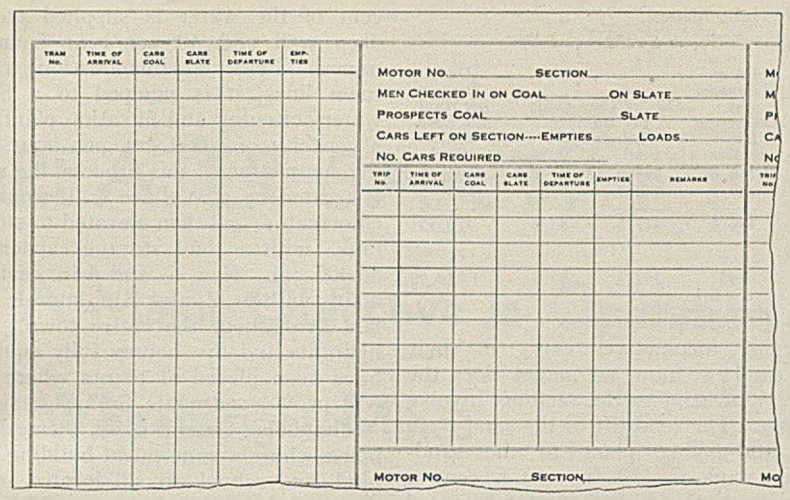
All excessive gradients on Class A and B track were leveled by brushing top and lifting bottom. Where overhead clearance was not sufficient to permit trips to travel with safety at high speed, top rock was shot down to provide standard clearance over the rail. Approximately 5,000 ft. of the old haulage roads received this increase in clearance.

At all switches, refuge holes were cut in the strata, and lights were installed. Where necessary, traffic lights control trip movements, and a signal system of red and green lights controls the movement of the haulage locomotives from a section just inby the mine portal. With these exceptions, a dispatcher at a central point in the mine directs all haulage by telephones located at each section and sidetrack. All motormen are responsible to the dispatcher (motorboss) for the safe and efficient performance of their work, even though the gathering crews, when in the sections, are subject also to the direction of the section foremen.

Each morning, every section foreman reports to the dispatcher the number of men working in his section, detailing the number on coal and on slate; he also reports the number of cars of coal and slate he expects to get from his section that day. Thus the dispatcher has a record of what each gathering motor in the mine is expected to do on that day. The dispatcher also records, by trips, the time of arrival of each motor at the sidetrack with the number of cars of coal and slate per trip, the time of departure and the number of empties which he instructs the motorman to take. This same haulage report shows the movement of each haulage locomotive to the outside, recording, for each trip, the time it leaves the sidetracks and the number of cars of coal and slate, and the time of return with the empties.

Outside Mine Tracks at Wheelwright.





TRAM No.	TIME OF ARRIVAL	CARS COAL	CARS SLATE	TIME OF DEPARTURE	EMP. TIES

MOTOR NO. _____ SECTION _____

MEN CHECKED IN ON COAL _____ ON SLATE _____

PROSPECTS COAL _____ SLATE _____

CARS LEFT ON SECTION---EMPTIES _____ LOADS _____

NO. CARS REQUIRED _____

TRIP No.	TIME OF ARRIVAL	CARS COAL	CARS SLATE	TIME OF DEPARTURE	EMPTIES	REMARKS

MOTOR NO. _____ SECTION _____

Dispatcher's Daily Sheet. Form on Right Is Repeated Four Times Across Sheet and Three Times Below; That Is, Twenty Copies of Form Appear in Full Sheet, Which Measures 31x32 In.

At all times, one empty trip is kept on the outside, at the headhouse.

As the dispatcher is held responsible for the safe and efficient performance of all locomotive crews, he goes to the inside locomotive barn each morning, and as the crews leave he notes whether each locomotive is equipped with rerailers and a trip lamp, and whether the brakeman has a car-coupling hook and also a whistle for signaling.

A man-station is provided off the empty track just inby the mine portal, and from this point all man-trips are dispatched, each trip being in charge of a mine official. In each section, stations are provided, at which in the evening the men wait for the man-trip.

Each locomotive is numbered and assigned to a specific similarly numbered stall in the inside locomotive barn. Each motorman is required to keep his locomotive clean, but the mine electricians attend to all its lubrication needs. At the end of each shift, the motorman, on a form provided, reports to the electrician the number of cars of slate and coal hauled, the number of wrecks to cars and locomotive and such repairs as he desires made. The electrician, on this same report, records the temperature of the motor and lists the repairs made on each locomotive.

Two 15-ton, type LME-A 13, and one 10-ton, type LME-A 13, locomotives haul the coal to the outside and thirteen 6-ton locomotives gather the coal. All the locomotives are of General Electric Co. manufacture. The 15-ton locomotives are equipped with centrally hung motors which afford maximum traction and, through semi-elliptic springs, make provision for an equal distribution of weight. Armatures are mounted on roller bearings; the trucks are similarly equipped. These locomotives have an over-all height of 37 in. and, by the use of blowers, a continuous capacity equal to that which motors of one-hour rating without blowers afford.

Twenty General Electric 6-ton gathering locomotives are provided, thirteen of which are in gathering service. Of these twenty gathering locomotives, nineteen have been completely overhauled. All wire- and ribbon-type cable resistors have been replaced by sheath-wire indestructible units. Steel and cast-iron grid resistors have been replaced by edgewise-wound indestructible units. Sleeve-type journal bearings have been replaced throughout with roller-bearing journal boxes capable of taking care of all end as well as radial thrust. When rebuilding these locomotives, the position of the cable reel was changed, more space was provided for the operative, and the method of guiding the cable was improved.

To obtain favorable haulage conditions, a nearly uniform distribution of direct-current power is required. This has been assured by the installation of a new substation, additional feeder lines and improved bonding practice. Continuity of service is essential, and power interruptions must be reduced to the minimum; such conditions have been obtained through the installation of ten automatic direct-current reclosing circuit breakers so placed that the mine is properly sectionalized.

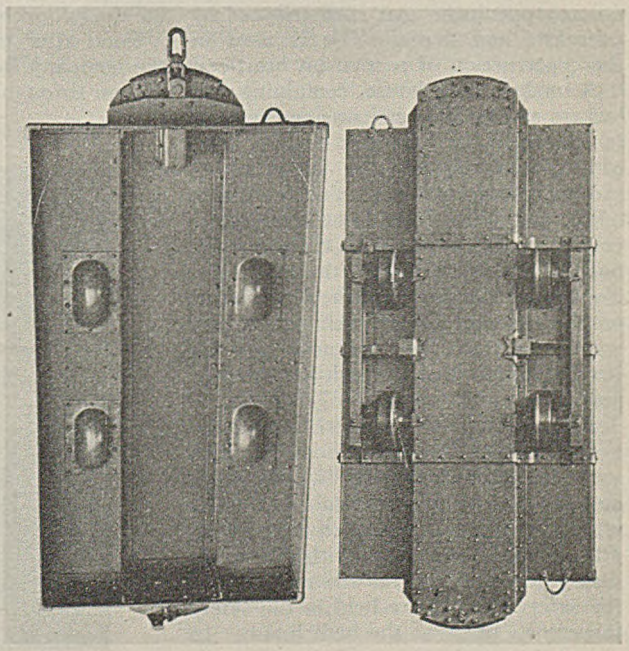
Concurrently with the building of the new surface plant, new mine cars of all-steel construction with stub axles and 14-in. wheels replaced the old. Their over-all length is 13 ft. 3 in.; their width, 6 ft. 3 in.; and the height above rail, 24 in. Inside length is 11 ft. and width 6 ft. Clearance above rail is 3¾ in.; wheelbase, 42 in.; and track gage, 42 in. Capacity of the car is 88 cu.ft. level full. To replace 650 wooden cars and 260 steel and wood cars, 525 cars were purchased from the Pressed Steel Car Co. Of these cars, 500 are equipped with Timken and 25 with Tyson roller bearings.

The results obtained after the mines were consolidated, the haulage conditions were improved and the new equipment was installed are shown in the accompanying tabulation.

As against a capacity of 1.25 tons for the old cars in Mine No. 1 and 1.50 tons for those in No. 2 mine, the new cars haul an average of 3.00 tons; they make 2.28 complete trips for coal and slate in a day's run. At both the mines, under the old haulage arrangement, some of the gathering locomotives delivered coal and slate outside.

Unusual care is taken in the selection of men for transportation service. Age is no barrier to selection, but physical or mental slowness, indifference to instructions, or recklessness are never tolerated. By using men who measure up to set standards, who display a proper interest in doing their work safely and efficiently, a good morale has been created which is reflected in freedom from haulage accidents.

A new sanding equipment was recently installed, the wet and dry sand bins and the sand-drying plant all being located in a building at a railroad siding near the tipple. During their idle time the men composing the tipple crew unload the sand from railroad cars, after which it is dried and shoveled into a



Mine Car Which Has Lowered Haulage Costs

Haulage Records at Wheelwright Mines

Old Haulage Record

Mine No	Number of Haulage Locomotives	Number of Gathering Locomotives	No. of Cars Daily per Gathering Locomotive Coal	Slate	Men per Gathering Locomotive	Daily Tonnage per Gathering Locomotive	No. of Cars Daily per Haulage Locomotive Coal	Slate	Daily Tonnage per Haulage Locomotive Coal
1	2	8	112.4	11.3	14.7	140.6	395.0	72.1	493.75
2	2	12	87.9	10.3	15.2	149.6	440.1	95.2	660.15
1 and 2	4	20	97.7	10.7	15.0	146.0	417.5	83.6	576.95
				Present Haulage					
1 and 2	3	13	79	13	24.5	245	342.3	65.5	1,026.90

tank holding approximately 18 cu.ft., which when filled is plugged, permitting compressed air to be introduced at 130-lb. per square inch pressure. This forces the sand through a pipe which leads to a large storage tank of 275-cu.ft. capacity located over the empty track just inby the mine portal.

This tank is equipped with hose connections and valves and all locomotives receive their sand at this point. The gathering locomotives carry in their own sand; so now no longer does the delivery of sand to the sections involve expense. The total lift of the sand from the sand-drying plant to the sand-storage tank is 170 ft. At a central point inside the mine, a motor-operated bending and straightening machine has been installed which will handle rail of all sizes from 20 to 60 lb. per yard inclusive.

▼

Increased Safety and Efficiency With Lower Operating Costs

(*Concluded from page 426*)

The fan is connected to an Allis-Chalmers 2,200-volt a.c. motor with Texrope drive. The capacity of the fan can be increased by merely changing the motor sheave to one of a larger diameter. Full automatic control of this unit is accomplished by a General Electric automatic starter. Two outlying sections which cannot be served by the new fan are ventilated by the Stine fans previously mentioned. Air from the Jeffrey fan is forced down a 95-ft. shaft; the Stine fans deliver their air through outcrop openings. Air is distributed by overcasts and doors. Tile is used in the construction of permanent brattices.

A modern bath house, containing 746 lockers and 66 showers, was constructed in 1931. In the basement or first floor of this building are the boiler room, safety inspector's office, mine foreman's office, and check-in-and-out room. All employees are required to check in and out at the bath house through time clocks and also are required to record on the reverse side of their time cards whether or not they sustained any injury. This is done through the accident recording clock (see pp. 437-439).

Every day, the chief clerk checks the time reported by the various foremen with the time-card records, and notes on each man's card the number of hours with which he is credited on the payroll. All the weekly meetings with the supervisory force as well as the meetings of the safety council are held in the safety inspector's office at the bath house. In the basement or first floor are showers and lockers for all the supervisory men. On the second floor are lockers, showers, toilets, wash basins, etc., for the separate needs of colored and white employees and on the third floor are lockers only.

A gas well on the property, which was cleaned out and shot by the company, provides gas for the gas-steam radiators and for the hot-water boiler in the bath house. It supplies also a number of houses and all the main buildings for heating and cooking.

Soon after taking over the property, the company installed a complete water system throughout the town. Sixty per cent of the water is supplied from a deep well and 40 per cent from the mines. Prior to introduction in the town lines, it is pumped to a Scaife water-softening and filtration plant with a capacity of 6,000 gal. per hour. On the completion of this process, the water is treated by a Wallace & Tiernan gas chlorinator, and then elevated to storage tanks with a total storage capacity of 85,000 gal. New 6- and 4-in. cast-iron mains with 3-, 2- and 1-in. laterals were laid throughout the entire town. Fire hydrants and fire houses fully equipped have been placed at points where they will provide adequate fire protection.

The office, general store, theater, club house, church, amusement building, hospital, and school are all located within the central part of the town. The company manufactures its own ice and, early in 1930, installed, in the theater, modern sound equipment and a ventilating system. The amusement building houses post office, poolroom, restaurant, soda fountain, and lodge room.

All mine labor and mine supplies are budgeted and expenditures carefully checked. The daily cost sheet of the company carries all items chargeable to the cost of coal. All general-office and fixed charges are furnished by the Chicago office and prorated over the number of days in the month exclusive of Sundays. This enables the local office to prepare daily a cost statement that covers every item entering into cost and permits the local management to know the daily and cumulative cost, which varies only a fractional part of a cent from that of actual operation. This same cost sheet also carries daily, and cumulatively for the preceding days of the month, percentages of the various sizes of coal, tons per loader, per day-man, quantity of rock dumped, and other necessary operating information.

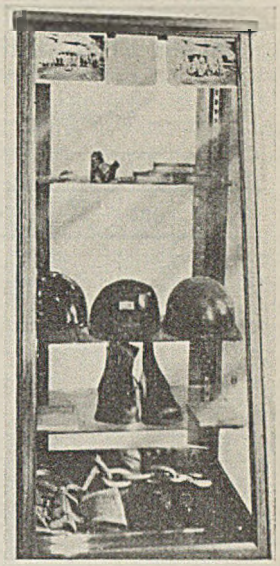
The author wishes to acknowledge the cooperation of J. T. Parker, assistant superintendent; H. O. Zimmerman, chief engineer; G. C. Sutherland, safety inspector; and J. C. Osborne, who assisted in preparing this series of articles.

Wheelwright Set in Its Wooded Hills

GREATER SAFETY

+ A Major Objective in Operation

At Wheelwright Mines



Exhibition of Protective Devices That Have Saved Lives

GREATER SAFETY was and is one of the major objectives at Wheelwright. When the present management took over the properties, a definite program was outlined and since has been carefully followed. As a result, the accident-frequency rate has dropped from 0.725 in 1930 to 0.20 during the first half of 1932 and the severity rate has been cut from 157.20 to 7.72.

While fully recognizing the importance of discipline and supervision, it was felt that much, perhaps even more, could be accomplished by building up a genuine interest in safety among the men and a spirit of cooperation between the supervisory force and the rank-and-file. The company desired the men to realize that it was sincerely interested in their safety and welfare and ready, by improving living and working conditions, to contribute its share toward that end. To this approach the men responded splendidly.

A set of safety rules and operating standards was printed and adopted. All assistant foremen and foremen were advised that the company expected them to press continuously high standards of workmanship and to aid the men in reaching these standards. After the safety rules were compiled, standard timbering plans were prepared, printed and distributed. Wherever the top was of slate, miners were required to set 3x8x30-in. blocks over all safety posts. Particular attention has been paid to the setting of safety posts and other timbers, and this undoubtedly has done its part in accident reduction.

Safety education has been stressed. Once each month, general safety meetings, which practically all the men attend, are held in the theater. At first, the men were reluctant to participate, but now few indeed fail to be present. At these meetings, the accidents of the previous month are analyzed and discussed. Accidents occurring at other places also are described. Safety talks are made by local supervisory men, and meetings are occasionally addressed by men from the State Department of Mines, the U. S. Bureau of Mines, and from other coal companies.

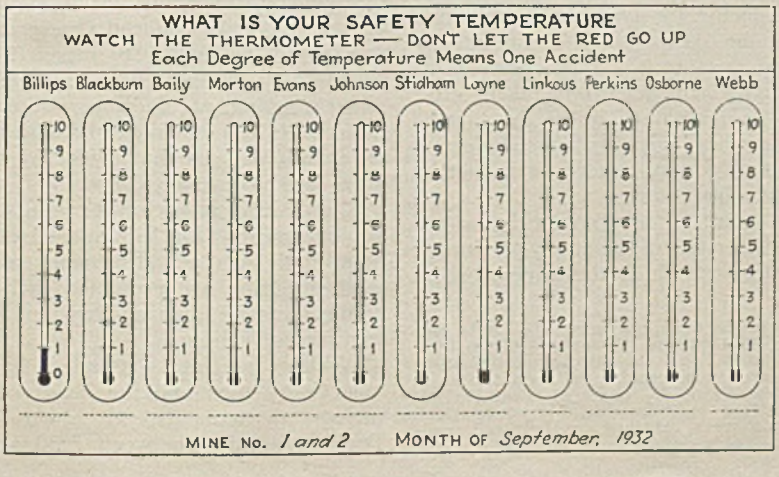
At every meeting, miners and daymen are given an opportunity to talk, and they frequently respond. Local musicians furnish the music and a comedy "talkie" is exhibited. On these occasions, cigars are given to all the men of any section that had a clear accident record during the preceding month. From 600 to 700 men attend and, because of the large number, they are divided into four groups. Four meetings are held on the one day, the program for all groups being practically identical.

Local men under the supervision of the safety inspector give first-aid training to all the men. This year the company received a U. S. Bureau of Mines certificate of 100-per cent first-aid training. In 1930, the local first-aid team took second place in the International First-Aid Meet at Louisville, Ky. At all district and state-wide first-aid meets, at least two teams are entered.

Each month, the safety inspector appoints a safety council consisting of sixteen men to collaborate with him in his work. At its weekly meetings, the council lists all violations of the rules observed and makes such recommendations for safety as it feels pertinent to the occasion. All accidents are investigated by certain members of the council. Through the council, valuable safety suggestions are received which might not otherwise be presented. Meetings of the safety council with the safety inspector are not attended by any operating official unless his presence is requested. When any recommendation of the council cannot be accepted, a full explanation is made, so that the council will realize its suggestions have received careful consideration.

First-aid pocket packets are carried by all officials and motormen, also by a large number of other men. In all sections, first-aid stations and telephones are maintained; the equipment consists of a canister with a stretcher, a woolen

At Wheelwright, Thermometer Chart Compares Month's Accidents by Mine Sections and by Their Assistant Foreman



SAFETY THE FIRST CONSIDERATION

INLAND STEEL COMPANY INC.

WHEELWRIGHT MINES

No._____ PAY ENDING_____ 19__

NAME_____

OCCUPATION_____

DATE	IN	OUT	OVERTIME IN	OVERTIME OUT	HOURS	RATE
16						
1 17						
2 18						
3 19						
4 20						
5 21						
6 22						
7 23						
8 24						
9 25						
10 26						
11 27						
12 28						
13 29						
14 30						
15 31						
TOTAL						

YOU ARE REQUIRED TO REGISTER ON OTHER SIDE. ANSWER YES OR NO AS TO ANY INJURY RECEIVED TODAY.

"BE CAREFUL"

Face of Time Card Showing Hours Worked

SAFETY THE FIRST CONSIDERATION

No._____

NAME_____

DID YOU RECEIVE AN INJURY TODAY? PUNCH YES OR NO

TO PUNCH YES TURN HANDLE TO LEFT AS SHOWN — THEN PRESS LEVER.

DATE	YES	NO	OVERTIME YES	OVERTIME NO	
16					
1 17					
2 18					
3 19					
4 20					
5 21					
6 22					
7 23					
8 24					
9 25					
10 26					
11 27					
12 28					
13 29					
14 30					
15 31					

HAVE ALL WOUNDS TREATED AT ONCE. NO MATTER HOW TRIVIAL THEY MAY BE.

"BE CAREFUL"

Reverse of Time Card Showing Injury or No Injury

and a waterproof blanket, and a first-aid cabinet with adequate supplies.

Discipline is an important part of the program, and no one is immune. Men are warned when found working under certain substandard conditions. For working under other hazardous conditions, they are laid off for the unworked portion of the day and the discipline card is punched. When any man has three punches on his card in any half-month period, he is sent to the mine foreman, who, after consulting with the assistant, decides whether the man is to receive a three-day lay-off or discharge. However, nothing contained in any rule prevents an assistant foreman from exercising his right to discharge any man for refusal to do his work as instructed or for any other type of insubordination. At the same time, great care is exercised to see that the discipline maintained is uniform and fair.

Discipline cards are kept in each working place. These are brought outside at the end of each half month and posted as a permanent record. The discipline cards are punched as the violations are observed, so that, after being posted on the permanent record in the office, the accumulative safety record of each man can be reviewed.

Careful investigation and a detailed report are made of every accident, even though it may have occasioned no loss of time. Accident reports are prepared by the assistant foreman in whose section the accident occurs and signed, after investigation, by the mine foreman. Before anyone is disciplined for an accident, the details of the casualty are carefully studied. Discipline in accidents has been applied indiscriminately to both assistant foremen and mine workers. Thus far, it has not been found necessary to discipline any of the other officials.

No injured man can return to work until the doctor has certified that he has recovered sufficiently to resume his labors with safety. His "return-to-work slip" must first be presented to, and signed by, either the assistant superintendent or the superintendent before the foreman may accept it. This routine affords the official thus acting an opportunity to discuss the accident with the injured man before he goes back to work.

Reports of personal injuries have to be made and sent to the superintendent within 24 hours after an accident occurs. The accompanying listing shows the details set forth in such reports.

DETAILS REQUIRED IN ACCIDENT REPORTS

1. Name; check number; address.
2. Age; color; nationality; ability to speak English.
3. Married or single; widow; number of children under 16.
4. Date and time of accident.
5. Date disability began.
6. Occupation; what was injured doing at time of accident?
7. Was this part of his duty?
8. Exact location of accident.
9. Did injury occur in solid, pillar or longwall work?
10. Length of service at this mine; total length of experience in or about mines.
11. Cause of accident (full details).
12. Was accident due to violation of state mining law? Company rules?
13. Nature and extent of injury.
14. Was safety post set?
15. Was accident due to fault of injured? If so, how?
16. Was first-aid rendered? By whom?
17. Did injured man report to doctor?
18. Date and hour reported.
19. Reason for delayed report.
20. Date returned to work or pronounced by doctor as able to return to work.
21. What was done to prevent other accidents of this kind occurring?
22. Date of report; name of foreman making investigation.

All men seeking employment are referred to the mine foreman. If a man is needed, the foreman gives him an employment slip which he presents to the assistant superintendent or superintendent for approval. If the slip is approved, the man then presents himself to the doctor for physical examination and, if he passes such examination,* he then goes to the office, where his full employment record is taken, after which he is told to be at the "model working place" with his full complement of tools at 3 p.m., where he is met by the safety inspector.

This point of assignment is located on the inner end of the empty track near the station at which the mine workers are accustomed to meet and entrain for the work of their shifts. All new men are instructed by the safety inspector before being permitted to work. A man employed in the morning is ready for work that evening or the following morning. The instructions of the safety inspector are supplemented by those of the foreman and assistant foreman as the men are assigned to their work.

Men both inside and outside the mines are required to wear hard-toed shoes and all inside men must wear protective hats. Cases are on record where accidents have been avoided through use of these safety devices; in two instances, protective hats have prevented skull fractures and possibly fatal accidents. At first, the men were rather skeptical about the value of safety hats, but, with proper encouragement and insistence by the officials, the objections soon disappeared, and it is doubtful if any of the men would be willing to return to the old cloth hat. Goggles are part of the miner's equipment; under certain conditions, their use is obligatory, and since the men have been thus protected, there have been no eye accidents.

The safety inspector examines the mines each day for substandard conditions, and such maladjustments as require attention are presented each day to the mine foreman or assistant foreman for correction.

Weekly meetings, attended by all supervisory men and the heads of the various departments, are held each Tuesday evening between 7:30 and 9

*Substandard applicants are not employed. In the case of workers taken over when Inland Steel Co. purchased the property, however, a number of men found to be substandard on physical examination were shifted to more suitable occupations and some were retained in their old positions.

o'clock. At these meetings, each assistant reports for his section and each department head for his department. Safety and operating problems are discussed and the safety inspector reports any substandard condition observed during the preceding week, and, where no such conditions are found on any section, favorable comment is made.

In the program of safety education, it is the policy to do everything possible to keep the men thinking constantly about their safety and the safety of others while at work. This is stressed particularly by all officials visiting the working places and at all meetings. As anyone enters a miner's working place or as he approaches any group of men, he is greeted with the salutation "Be careful." At the miners' bath house where the men check in and out, three clocks are installed, one of which is an accident-recording clock, and all men must record on the reverse side of their time cards whether or not they were injured during that day. The company has insured all its employees under a group insurance policy, a small part of the premium being paid by the men. Safety meetings are posted both inside and outside the mines.

At both mines, the slate top is dangerous and uncertain. Even in solid work, drawslate from 3 to 48 in. thick is found, and frequently "kettle bottoms" and "horsebacks," which are not always apparent even on close examination, fall from the roof. These conditions have been responsible for all of the fatal accidents since the company took over the property in April, 1930.

MY SAFETY MY FIRST CONSIDERATION

PERIOD ENDING ..... 19.....

NAME ..... CHECK NO. .....

No Safety Post Set	Not Using Safety Block	Powder and Caps Not Properly Stored	DATE	Loading Dirty Coal	Permanent Timbers Not Set to Standard	Bad Slate Not Taken Down	Miscellaneous Violations
			16				
			17				
			18				
			19				
			20				
			21				
			22				
			23				
			24				
			25				
			26				
			27				
			28				
			29				
			30				
			31				

This is a Protection to myself and family. Do not deface or destroy this card.

Card for Recording Violations of Rules

Accident Record at Wheelwright Mines

Year	Non-Fatal Accidents	Fatal Accidents	Frequency Rate*	Severity Rate*	Total Man Days Lost	Total Man Days Worked
1930	115	3	0.725	157.20	24,551	156,089
1931	53	1	0.280	52.09	10,000	191,750
1932 (6 mo.)	13	0	0.200	7.72	494	64,056

* Per 1,000 man days.

Wheelwright Plant Prepares Coal With Smaller Force

(Concluded from page 431)

and one in the tipple. Motor starting switches also are concentrated at two points in the headhouse and tipple. The dumper is in complete control of the control panel at the headhouse, and the tipple foreman is in charge of the tipple panel.

All controls are interlocked to permit reliable, flexible and safe operation. Illustrating this system are the activities at the headhouse. As the locomotive comes from the mine, it stops the trip over the hiker feeder. The depressing device with which the feeder is equipped is at that time in the down position to enable the locomotive to pass. When the locomotive is stopped, the runner presses a limit switch to operate an electric switch thrower, which in turn throws the switch to the crossover track, enabling the locomotive to proceed to the empty track. As the track switch moves, it trips another switch which causes the hiker feeder to rise and engage the cars. The controls are so interlocked, however, that the dumper at the headhouse cannot move the trip to the main car feeder until the motor runner presses another limit switch at the empty track, which causes the electric switch thrower to align the track for the dump. Rotary dump and main feeder controls are so interlocked that the dumper cannot operate the main car feeder, either forward or backward, until such time as the dump is on center and ready to receive the cars.

Through the pushbutton control, the dumper, or operative, in the headhouse operates the hiker feeder, main car feeder, rotary dump, the two motor-operated rock gates below the dump, the two rock feeders, and the main rock conveyor leading to the aerial tramway loading station. On his panel are indicating lights to show when each unit is operating. There also is a stop switch to enable the dumper to stop the tipple when all the coal is dumped. A telephone and signal bell maintain contact between the tipple operative and the dumper. A limit switch in the main rock-conveyor circuit prevents the dumper from overfilling the rock bin.

The tipple foreman, from his push-button panel, controls the operation of the crusher, lump loading boom, egg loading boom, degradation conveyor, shaker screens, main raw-coal conveyor, the double reciprocating feeder under the dump, and the refuse conveyor. These units are interlocked and the sequence of operation is in the order named. While it is impossible to operate any of these units when the one ahead is stationary, provision is made so that the operative, when necessary, can "jog" any unit.

Controls for the domestic coal conveyor and the clean-up conveyor, neither of which is included in the operating sequence outlined above, are mounted on the same panel, which also includes a transfer switch for removing the crusher from the sequence when it is not in use. Neon lamps on the panel indicate when the units are operating. Stop switches are installed at each motor so that they can be shut down in emergency without signaling the control room.

As mentioned earlier, the upper run of the main raw-coal conveyor carries the refuse from the tipple to the main rock conveyor. In order to avoid running the rock conveyor during the entire time the tipple is in operation, a limit switch is installed under a hinged plate in the conveyor. As the refuse from the tipple builds up, this switch starts the rock conveyor, and also stops it as soon as the refuse is carried beyond the switch.

All lighting wires are carried in conduit from a main panel to distributing panels in the headhouse and tipple, and from there, also in conduit, to the various points of use. Compressed-air lines are installed at the tipple, headhouse and aerial tramway loading terminal for blowing out motors, cleaning machinery and similar applications.

Completion of the new tipple and headhouse, and the concentration of the dumping of coal and slate on one side of the valley enabled the company to reduce the surface force 22 men.

The coal mining division of the Link-Belt Co. was responsible for the design, fabrication, and erection and installation of all the structures and mechanical equipment comprising the preparation plant. Concrete foundations and electric wiring and controls were installed by the Inland Steel Co.

ILLINOIS INSTITUTE

+ Discusses Transportation and Cleaning

At Danville Meeting

GOOD TRACK, as a key to safe operation, large output and lowered maintenance costs; the advisability and technique of removing dust from coal, and the problem of coal cleaning as it related to the Illinois fields and other features of mine operation brought about 250 persons to the fortieth annual meeting of the Illinois Mining Institute, which was held at Danville, Ill., Nov. 4.

Underground transportation, said J. B. Haskell, chief engineer, West Virginia Rail Co., Huntington, W. Va., is in reality an industry within an industry. Coal mines transport more coal than the railroads of the country, and that transportation must be economically and efficiently performed or it will be a handicap to the industry which it serves. Usually, it is transportation that is the "bottle neck" which restricts production at mines.

Bad track is expensive, wasting power and causing wheel slippage. Track should be so built and laid that trips can be moved at full speed between terminals without the necessity of slowing down or coming to complete stops. Starting a trip and accelerating to full speeds develop peak loads which not only consume power but also increase demand charges and strain equipment. Bad track greatly increases maintenance costs of all equipment passing over it. It is also wasteful of man power, lowering trip speeds, causing derailment, augmenting spillage and resulting in other related evils that necessitate more hours of work per unit of production.

Accidents to life and limb from bad track must not be overlooked, continued Mr. Haskell. Tabulated reports of mine accidents show that those pertaining to transportation have the questionable honor of being second in the list. Poorly fitted switches, derailments, displacement of roof supports by motors or cars swell accident records. A superintendent at a West Virginia operation recently said: "We must get the depression out of our rail joints." Just what can be saved by replacing bad track by good, though the saving is great, cannot be shown in tabulated form.

Poorly maintained track, he pointed out, made it impossible for a well-known central Pennsylvania mine to maintain its production. With its 40-lb. track replaced by heavier rail laid on good, well-ballasted ties, with alignment improved and proper joints, locomotive derailments were reduced to three for 2,400,000 cars of coal, and none of these was due to the track. Trip running time decreased 28 per cent, life of locomotive wheels increased 40 per cent, and labor cost was reduced 40 per cent.

Several rules have been made for calculating the correct size of rail, remarked Mr. Haskell. One requires 10 lb. of rail per gross-ton load on each wheel. This requires that a 30-lb. rail be provided for a 12-ton locomotive, which is sufficient for room work but too light for other purposes. For heavy cutting and loading equipment, 20-lb. rail has been found too light for room track. Questionnaires sent out by the American Mining Congress revealed that 30-lb. was the most generally used room rail, with 20-lb. second and 25-lb. third. For butt headings, 40-lb. rail gives good service, but 60-lb. rail, which gives 78 per cent greater stiffness for only 33⅓ per cent more weight, is much used for main-line service and greatly improves mine conditions.

Rails of less than 80-lb. weight usually are rolled to A.S.C.E. standards, A.R.A. standards being favored for heavy rail, because it is difficult to roll a heavy rail with wide flanges. A.S.C.E. standards give the rail lateral stiffness and less tendency to cut into the wood tie. With that rail, frogs and switches are readily obtained from manufacturers, whereas A.R.A. sections are not.

Splice bars should be used with the lighter rail and angle bars with 40-lb. or heavier rail. As the angle-bar joint, when properly bolted, is as stiff as the rails it joins, such joints should be located between ties, but the splice-bar joint, because of its weakness, should be located over the tie. A combination splice-angle bar is coming into use which is so designed that, without materially lowering the efficiency of the joint, it greatly increases the electrical efficiency. A standard angle bar is used on one side of the rail and a specially designed splice bar on the other, which, while of sufficient stiffness, leaves the top of the rail flange free of obstruction. On this flange, and within 2 or 3 in. of the end of the rail, is welded a short bond having a total length of 5 or 6 in., giving a bond of high electric conductivity.

Rail joints should be staggered, declared Mr. Haskell, though much track with opposing joints is giving good service. Gage on straight track should be of the specified width, for car manufacturers provide the necessary clearance, but on easy curves the gage should be increased ¼ in., and heavy curves should never have more than ⅝ in. of play. Where guard rails are used, the flangeway should be widened as much as the track gage.

Steel room ties have been installed by the millions and are giving entire satisfaction. They should be selected in relation to the size of rail they are to carry. Room ties should not be more than 4 ft. apart. The ultimate cost, in view of their longer life, is less than that of wood ties; they save 2 to 4 in. of headroom; and they are easier to transport and install. Steel ties are used in great numbers on turnouts either with a set of standard through ties or with special ties only at the switch and with converging tracks set on standard ties which interlace. When every fourth or fifth tie on main roads is of steel, they act like gage rods and hold the track to gage and prevent overturning.

Outer rails of curves should be elevated for the full length of the curve and the elevation run off on the tangent at a rate of 1 in. every 30 ft. Elevations on the same radius of curve should be proportioned to the track gage.

At room necks, No. 2 switches pre-

Elevations of Curved Rail, 30-In. Gage

Radius of Curve, Ft.	Elevation, Outer Rail, In.	Radius of Curve, Ft.	Elevation, Outer Rail, In.
40	1¾	100	¾
50	1½	150	½
60	1¼	200	¼
80	1		

dominate, said Mr. Haskell, but with a 42-in. or wider wheelbase a No. 2½ switch is necessary. However, with bad roof, short switches may have to be used.

Coal cleaning, stated Henry F. Hebley, mining engineer, Allen & Garcia Co., Chicago, Ill., becomes less and less efficient as the size of the coal to be cleaned decreases, and this has been one of the reasons for installing dedusting equipment. Moreover, the integral ash and sulphur in the coal often increase as coal size decreases. If bituminous coal containing soft, powdery fusain is washed by a wet process, the porous fines will remain in the small coal, delay the dewatering of the washed coal and make it more difficult to clarify the water in settling tanks or thickeners.

Sludge recovered from the settling tank in a wet process is often so high in ash that it could be discarded without further treatment with only a small loss, though froth flotation could be used with advantage when the size of the feed is less than 0.1 in. Dust from the deduster can be treated in a similar manner, but if it is fusain it is likely to contain more irremovable ash than coal from other parts of the seam.

Reciting thirteen different kinds of cleaning systems, Mr. Hebley declared that only two, both dry-cleaning systems, the Peale-Davis and the Raw Static systems, are invariably operated without dedusting. The fines derived from the dedusting process could be used for pulverized fuel, colloidal fuel or briquets.

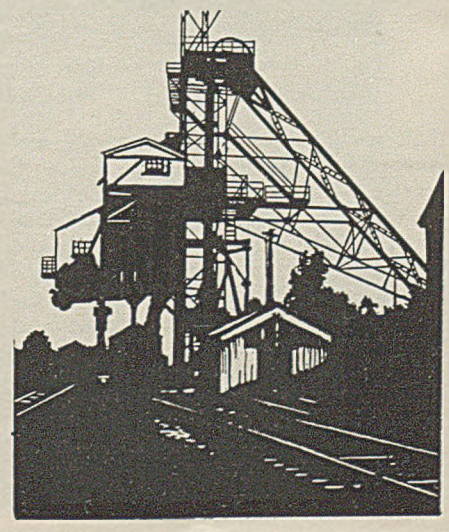
Two major problems face the designer of dedusting equipment. The first is to remove a predetermined size of dust without including any more of the larger material than is absolutely necessary, and to remove all the dust possible from the oversize. In other words, the "cut" should be as sharp as can be arranged; but, unfortunately, there may be a high percentage of free moisture which may cause the dust to stick to the larger coal, a soft sticky clay that may act in the same manner and hold particles together as a ball, and laminated shale particles which, having a large surface area and light weight, may readily be lifted by a stream of air that would be unable to disturb it if less laminated. Three methods of dedusting are in general use: screening, aspiration, and a combination of both methods.

The second problem is the collection of the dust, for which settling chambers —with or without sprays of steam or water—cyclone dust collectors, bag-houses and cloth filters—either of the frame or tube type—are provided. Mr. Hebley described and illustrated the Blaw-Knox, Hunter, Lessing, Birtley, Birtley & Frankfort and A. & G. dedusters, and referred also to the Daqua, Rema, Babcock, Raymond, Hildebrandt and Humboldt equipments.

Minnikin, stated Mr. Hebley, declares that when the moisture in the coal exceeds 4 per cent, screening efficiency becomes prohibitively low. Humboldt screens are said to be able to screen out minus ³⁄₃₂-in. coal where the moisture is less than 3 per cent, but the 16-sq.ft. screen on which this is effected is fed with only 4 tons per hour. As, even under the most favorable conditions of feed, moisture and material, the efficiency of screening is low, dust is aspirated whenever a sharp separation is desired.

Dedusted products may be divided into three classes: dust particles, cloud particles and smoke particles, the last of which are in active Brownian movement. If the density of the dust in grams per cubic centimeter is D and the radius of the particle in centimeters is R, and the terminal velocity expressed in centimeters per second is V, then $V = 12\,DR^2 \times 10^5$. Thus, other things being equal, velocity is proportional to the square of the diameter of the dust particle. But the ability to carry away material depends not only on velocity but on the characteristics of the dust and the humidity of the air at the several temperatures to which it falls during its passage. The quantity of dust carried per unit of volume of air, which is known as "grain loading," also is of importance. This usually is stated in avoirdupois grains per cubic foot at a given temperature and pressure.

Grain loading depends largely on conditions. Where coal is carried by air from mills grinding pulverized fuel or from dry coal-cleaning tables and dedusting units, grain loadings of 50 to 146 grains per cubic foot can be obtained. An installation should, therefore, be based on the quantity of dust to be removed, as revealed by the screen analysis, and on the smallest grain to be left in the oversize. This determines the velocity needed for dust removal.



Dust when carried in horizontal pipes tends to settle more readily than in vertical pipes, for, in the latter, if the dust is to settle, it must fall against the current instead of across it. Feed to aspirators is in general minus ¼-in. or minus ⅛-in. material. Five or six per cent of free moisture does not cause any undue trouble, and coals with even higher moisture content have been handled, though throughput and efficiency have been lowered thereby.

Particles can be settled (1) by radial acceleration, as in a dust cyclone collector; (2) by sudden changes in direction of the dust-laden air, which causes dust particles to be trapped in baffles or pockets; (3) by passing the stream of air through cotton or woolen fabrics; (4) by spraying the air with finely atomized water. Electrical precipitation, such as the Cottrell system, and oiled or sticky filters and scrubbers using wet coke or water sprays are not suited to the dedusting of coal. Dependence on a decrease in velocity to precipitate particles of dust is in vain, for the speed of the air would have to be well below 2 ft. per second for even fair efficiency. The volume of the settling chamber needed for servicing a pneumatic cleaning or dedusting plant would be gigantic, especially if the air in the chamber were to suffer from eddies, turbulence or convection currents.

In the cyclone or centrifugal collector with involute or tangential inlet, the dust-laden air at high velocity spirals down, forming a vortex. On reaching the bottom of the collector the air turns and spirals upward to the outlet. The ratio of the outer vortex to the inner is 2 to 1. This type of collector should be used only for small volumes of air carrying dust particles of large size.

With bag filters, resistance increases as dust is deposited on the surface of the fabric. If the dust contains clay and the air is cooled below the dew point, the filter cloth will become saturated with water and an impervious layer will be deposited on it, destroying the filtering effect. If the dust is both hot and humid, hot air must be added from some outside source to keep the air to be cleaned at a temperature above the dew point.

Heat insulation of the filter casing also aids in preventing the deposition of moisture. Hot dust is likely to explode if a spark is caused by induction. Sectionalizing of filter areas, therefore, is desirable. With air suction instead of air pressure, escape of dust from the filter is prevented. Waring filters have both a cyclone and filtering bags, and the equipment is under suction. When a valve is opened in the suction outlet an inrush of air collapses the bags, thus freeing them of accumulated dust.

The cost of removing dust per ton,

(*Turn to page 443*)

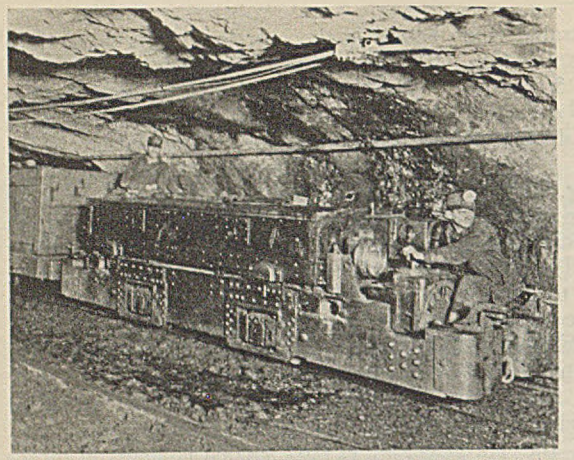


Fig. 1—Lengthened Wheelbase and Shortened Wheel Gage Enable This Locomotive to Steer Cars Round Curves of 15-Ft. Radius Safely.

OAK HILL COLLIERY

+ Completes Program

Of Electrification

By W. A. THOMAS
Consulting Engineer
Scranton, Pa.

BY COMPLETING the electrification of its operations the Pine Hill Coal Co., Minersville, Pa., effected a saving of 30c. in its cost of operation. Included among these changes were the electrification of the hoist and main fan and the haulage on two of the levels at the Oak Hill shaft. Some of the unusual features in this plant of the Pine Hill Coal Co. are here described.

At present the Oak Hill shaft is 906 ft. deep, but eventually it will be extended to a depth of 1,200 ft. As steel cars weighing 4,800 lb. and loaded with 10,000 lb. had to be hoisted in this shaft, the original operating cycle called for a 1,200-hp. motor, on which construction was commenced.

After the motor castings had been made, a change in the cycle was deemed advisable, necessitating a greater motor capacity. Fortunately, the drums of the cylindro-conical-cylindrical hoist had not then been cast, and the design of the latter could still be revised, which change, with the cooperation of the Vulcan Iron Works, was satisfactorily effected.

Fortunately, also, the General Electric Co. was able, by closing the end bells of the 1,200-hp. motor and making other slight changes, to raise the continuous rating of the motor to 1,600 hp., at the same time providing sufficient torque for its operation, if forced ventilation of the motor was provided. After the mechanical changes were made and a small motor-driven Jeffrey 5-hp. fan had been installed to provide this ventilation, the combination (see Fig. 2) gave excellent results.

Another feature of interest in the hoist is the resistance wiring for the control of the 1,600-hp. motor. The rotor leads from each ring consist of two 1,000-circ.mil cables, and in order to avoid the usual mass of cables which ordinarily would lead from the secondary contactors, 3x¼-in. copper busbars have been neatly substituted for these connections. These lateral bar connections will be noted in Fig. 3 above the long row of resistance frames. They are supported in shallow grooves cut in the asbestos-lumber supports, which in turn are mounted on the framework back of the panels.

The brakes and clutches are operated by the mine compressed-air system, because it is more efficient in its operation than would be any small separate air-compressing system provided for such service. Unfortunately, the mine drain on this source of power might be so large that the pressure of the air would fall below normal and would then be insufficient for the operation of the brakes and clutches. To meet this most unfortunate condition, should it arise, a compressor is provided specially for this vital purpose. This will start automatically when the pressure falls, a check valve being provided to prevent the air from flowing into the mine system. As soon as the mine compressed-air system is restored to normal pressure, the small compressor stops automatically.

To replace mule haulage on the Third Level of the Oak Hill mine, a permissible battery locomotive had to be provided; a Jeffrey locomotive with a battery consisting of 48 Exide MV 33 cells being installed for that purpose. This made a unit weighing over 20,000 lb., and, because of the limited side and overhead clearance, the locomotive was of somewhat abnormal length. It should be stated that the tracks were of the character often encountered where tunnels cut into pitching beds. The track has curves as sharp as 15-ft. radius.

Standard locomotives have a wheelbase 40 and 42 in. long, that being considered standard practice where the tracks have a gage of 36 in. Even with locomotives of the usual length, such wheelbases cause, on sharp curves, an excessive side swing, and with a long

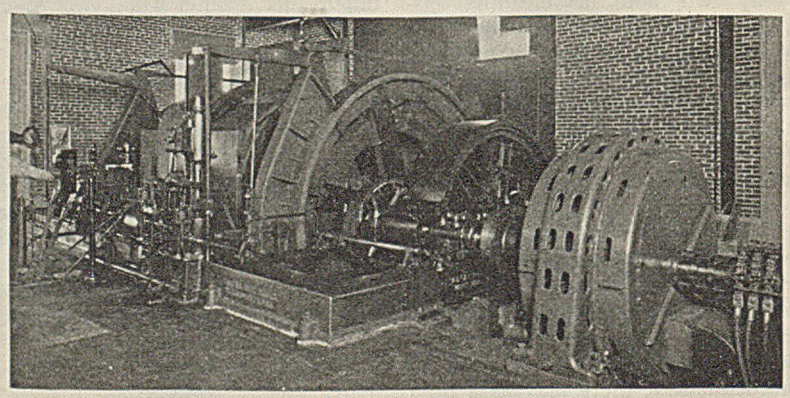


Fig. 2—Forced Ventilation Raises Capacity of 1,200-Hp. Hoist to 1,600 Hp. at Oak Hill Shaft.

locomotive this swing is increased, tending to pull or push cars off the tracks.

To remedy this condition it was concluded, in conference with F. C. Hohn, the transportation engineer, to increase the wheelbase to 56 in. and, in order that the wheels of the locomotive should not bind on the curves, their gage was decreased from 36 in. to 35½ in. The operation of this locomotive has been highly satisfactory; so much so that a second unit was ordered later for the Sixth Level development.

Another somewhat unusual installation at the Oak Hill mine is the automatic-starting synchronous-motor-driven mine ventilating fan, shown in Fig. 4. This is a Jeffrey unit with a wheel of 10-ft. diamater and capacity of 224,000 cu.ft. against a 3-in. water gage. Only in recent years has it been thought practicable to apply synchronous motors to this type of service, because the load builds up with the speed, making the motor pull into synchronism against the full-load torque. In this instance, a 150-hp. motor was required, and to safeguard automatic operation and obtain power-factor correction a 200-hp. 80-per cent power-factor motor was applied. Motor speed is 720 r.p.m., and this is reduced to 166 r.p.m. through a Link-Belt herringbone speed reducer, which eliminates the uncertainty which must always be faced when a belted unit is started in the absence of an attendant.

On the completion of the electrification the normal power factor was found to vary from 82 to 84 per cent, and it was decided to install a 420-kva. Capacitor, or static condenser, which has increased the power factor to 91 per cent, and thus made a large saving in the cost of purchased power.

It should be stated that the 30c. saving covers only the completion of the electrification; a large saving had been made earlier by the electrification of the breaker, most of the underground haulage, the air compressor and several of the ventilating fans. Power is received at Oak Hill Colliery at 66,000 volts and is stepped down to 2,300 volts at both Oak Hill and Pine Hill, which are some 8,000 ft. apart.

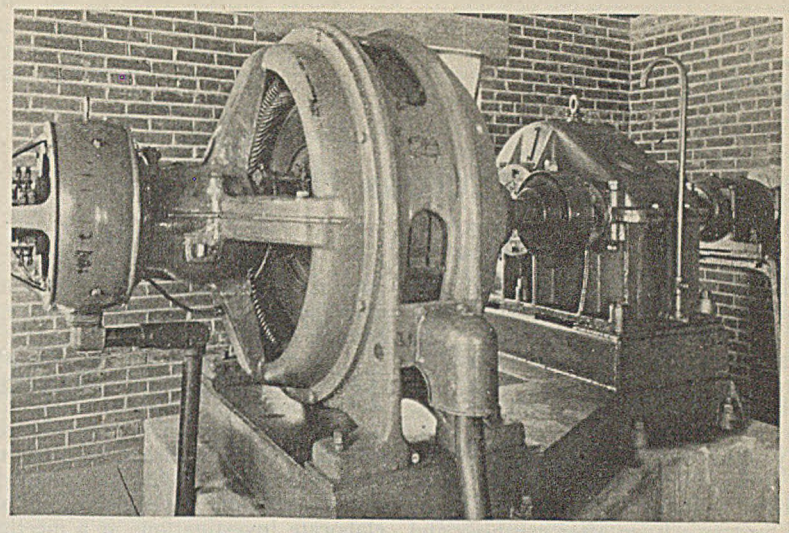


Fig. 4—Automatic Starting Synchronous Motor Which Drives Fan at Oak Hill Colliery.

Illinois Institute Discusses Transportation and Cleaning

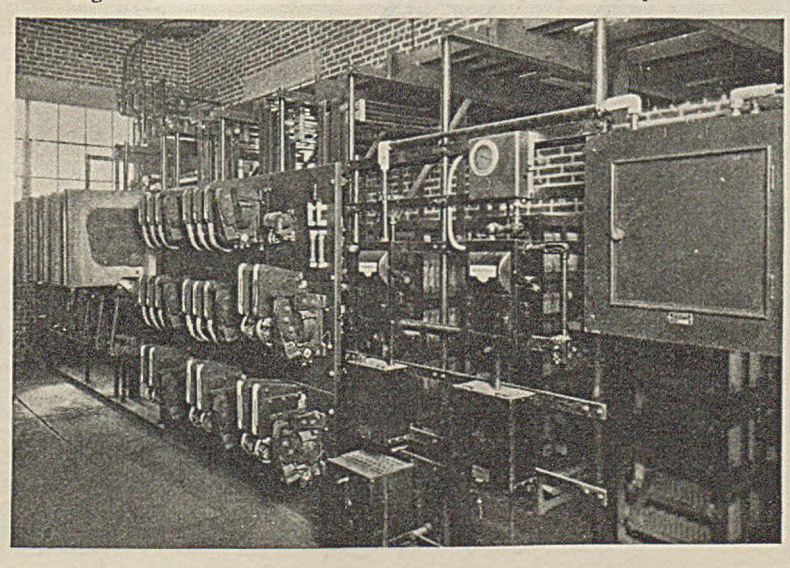
(*Concluded from page 441*)

based on the ⅜ to 0-in. material fed to the deduster, is given in the accompanying table. At five Illinois mines the

Cost Per Ton of ⅜ to 0-In. Feed to Deduster For Certain Running Times and Tonnages

	Days of Operation per Year		
	250	200	150
Tons per Hour	Cents	Cents	Cents
57 (minus 20-mesh).....	2.88	3.12	3.50
57 (minus 48-mesh).....	2.70	2.95	3.34
105.....	2.00	2.12	2.28
300.....	1.50	1.58	1.72
500.....	0.82	0.89	1.06

Fig. 3—Control Panel and Busbar Resistance for 1,600-Hp. Hoist.



⅜x0-in. coal averaged 19 per cent; of this, 23.5 per cent was minus 20-mesh and 10.5 per cent was minus 48-mesh.

D. R. Mitchell, assistant professor of mining, University of Illinois, Urbana, Ill., delivered an address to the institute on the "Coal Cleaning Problems in Illinois," which J. B. Morrow, preparation engineer, Pittsburgh Coal Co., Pittsburgh, Pa., discussed. H. A. Treadwell, general superintendent, Chicago, Wilmington & Franklin Coal Co., Benton, Ill., also read a paper, and in the evening the members attended a banquet addressed by Judge Walter C. Lindley.

C. H. Hamilton, vice-president in charge of operations, Pyramid Coal Co., Chicago, was elected president; Mr. Treadwell, vice-president; these to be assisted by an executive board including G. F. Campbell, Old Ben Coal Corporation; Paul Halbersleben, O'Gara Coal Co.; E. H. Johnson, Safety Mining Co.; G. C. McFadden, Peabody Coal Co.; J. G. Millhouse, State Department of Mines and Minerals; H. M. Moses, United States Fuel Co.; F. S. Pfahler, Superior Coal Co.; C. J. Sandoe, Perry Coal Co.; J. W. Stedelin, Marion County Coal Co.; H. Taylor, Jr., Franklin County Coal Co.; T. J. Thomas, Valier Coal Co.; and Paul Weir, Bell & Zoller Coal & Mining Co. B. E. Schonthal was reelected secretary-treasurer.

NOTES

. . . from Across the Sea

IN EARLIER years British and possibly other mining men made much use of compressible materials like fagots, which allowed some motion of the roof but supported any rock that was broken and ready to fall. Sometimes it was put over timber sets. Today, with the growing use of concrete arches, it could be used, if properly baled with wire, as a substitute for wood wedges. Even after crushing and rotting it would still furnish resistance.

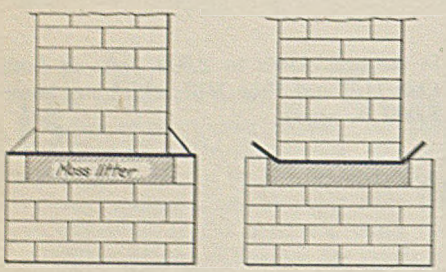


Fig. 1—Cushion of Peat Keeps Stoppings from Crushing

An example of the use of peat moss to protect a stopping where there is much pressure is shown in Fig. 1. The bricks are laid so as to give a base 27 in. thick and 12 in. or so in height. On the top of the base, says C. H. Leeds, in the *Colliery Guardian*, the bricks are set on edge flush with the face, so as to form a trough 21 in. wide running the full length of the stopping. This is filled with peat-moss litter, such as is used for horse bedding. An undressed board, 27 in. long, ½ in. thick and about 5 in. wide, is laid across the trough and the wall is built on its upper surface. When the pressure comes, it crushes down the peat litter and breaks the board at the edge of the trough. A coating of cement between the board and the brickwork on which it rests will serve to prevent air from leaking through the peat. On first weighting, the cement will be broken, but the peat will be compressed so as to inhibit the passage of air.

The use of such vegetal buffers has many possibilities, though they involve fire risk in some places. If put over or behind lagging, they will admit of some movement of the supported strata. If rock falls they will absorb the momentum even better than ashes, which have been used as a protection and have often saved timber sets from destruction, but with fagots the undesirable corrosive quality of ashes is avoided. With metal bands, a baling press and a few acres of straight scrub, it would be easy to provide for this class of secondary support at little expense, and the practice, even though ancient, deserves more than passing consideration.

BACKFILLING in the United States is too often a second thought. In Germany it is part of the regular mining scheme. T. F. S. Brass, who has made a careful study of German methods of mining, recently gave the results of his elaborate investigations at a meeting of the Midland Institute of Mining Engineers in Great Britain. In his paper he showed the accompanying illustration, Fig. 2, which shows a modified longwall working on a 45-deg. pitch, the face being carried on an angle of about 45 deg. to the strike. The material is put in place by dumping it from the upper level between two lines of props, the rock being held in place by wire netting. The lower level, where the coal is loaded, is protected by rock-filled cribs with short dry walls between them. The coal runs down a planked surface to the loading point, the inclination being about 70 per cent. The men work on planks resting on props, and are protected in their work by planks similarly supported, which deflect the coal to the planks by which the coal is carried to the bottom of the longwall face.

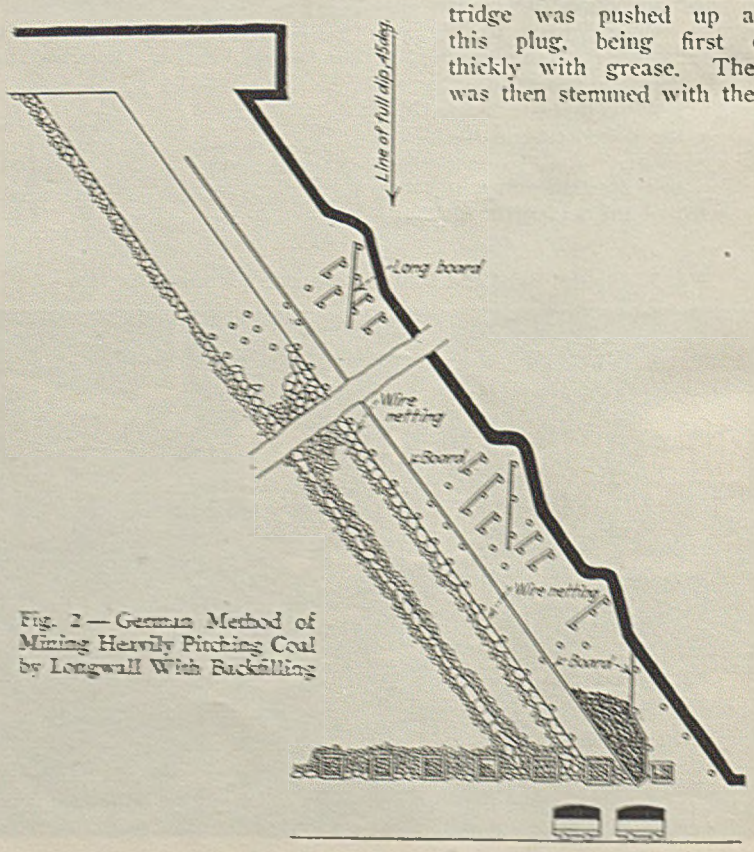


Fig. 2—German Method of Mining Heavily Pitching Coal by Longwall With Backfilling

With this means of filling, which is used in pitches up to 75 deg., the packing cannot be very tight, especially if the material is large. The coal is brought down by pickhammers and falls to the plank chute, sliding down the slope. This causes much breakage. If it were shot down, large pieces in falling might loosen the props from their moorings or clog the plankway, but Germany is fortunate in having coal that is easily dislodged by pickhammers.

WEST JAMURIA Colliery, in India, is troubled with an excessively wet coal which formerly was shot with gelignite. The use of the explosive proved expensive, possibly because of the high cost of transporting it to the mines. Consequently, the management desired to replace it by gunpowder, to the use of which less exception could be taken, because the mine used naked lights.

Experiments were made using a tin casing constructed by rolling thin sheets of that metal, 5¾x20 in. long, on a form of 1½ in. diameter. The cartridge was finished with a "concertina" joint running lengthwise of the cylinder. A cap, or end-piece, made of the correct size, and stamped out of tin, was fitted into the end of the open tin cylinder. In all but exceptionally wet places, the cartridge has given entire satisfaction.

In very wet workings the ends of the holes had to be plugged with a "matty," which is described by S. C. Ghosh, in *The Quarterly Journal of the Geological, Mining and Metallurgical Society of India*, which supplies this information, as ordinary earth molded into the form of a cartridge, 9 in. long and 1¼ in. diameter, and dried. The tin cartridge was pushed up against this plug, being first coated thickly with grease. The hole was then stemmed with the same

kind of material as that used for the manufacture of the plug. In heavily watered places the joints of the casings were soldered. Sometimes water poured from the holes in a continuous stream, one-fourth of the size of the hole drilled.

This note is not inserted in advocacy of the use of black blasting powder but as a suggestion to those who are having trouble with wet holes, whatever the nature of the explosive used.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Elektrizität unter Tage, by W. Philippi. S. Hirzel, publisher, Leipzig, Germany. 188 pp. Price, M. 17.40.

This monograph, the ninth in a series on industrial applications of electricity, covers the field of underground mining. No attempt has been made to give an exhaustive description of the equipment involved, and the mining engineer with a fair knowledge of electrical science should have no difficulty in assimilating the contents. Among the chapters may be mentioned a general description of the common types of motors, generators, transformers, and converters; underground cables and transmission lines; hoisting and pumping machinery; drilling and cutting equipment; scraper hoists and various types of conveyors; and underground haulage.

The discussion of underground lighting arrangements—the ordinary types as well as floodlighting—deserves special attention. A series of tests conducted over a period of two years at the Wenzeslaus mines in Lower Silesia has shown an increase of about 25 per cent in the tonnage of clean coal handled per man-day after substituting stationary electric lights for the portable lights formerly used. Another interesting feature was the reduction in the quantity of refuse contained in the coal trammed, a drop of about 50 per cent.

Economic considerations and safety devices also have been discussed. Prolific use of excellent illustrations and sketches adds to the value of the book. —B. H. Strom.

* * *

Automatic Heat With Mechanical Stokers. Educational Bulletin No. 5, Committee of Ten—Coal and Heating Industries, Chicago. Price, 25c.

Paralleling the increased interest in automatic heating with stokers, increased activity has been manifested by the coal and allied heating and equipment industries in developing this market. How and where this activity should be directed are set forth in this bulletin, which, while written for the layman, offers a digest of information on the application of stokers to home and small industrial heating plants where technically trained or skilled men frequently are not available.

The bulletin covers stoker selection, automatic control, types of stokers, fuels, efficiencies, domestic hot-water supply, stokers and air-conditioning, and comparative fuel costs. Emphasis is placed on the importance of proper cleaning and sizing of stoker coal, and the necessity for close coordination between the type of stoker and the fuel available. Anthracite domestic stokers usually burn buckwheat or rice, although large apartment or office building models frequently operate on barley or silt with high efficiencies. Bituminous stokers usually require a coal which will pass a 2-in. screen, though residential types, as a rule, are better adapted to minus 1¼-in. coal. In general, stoker coal should not contain more than 60 per cent of material larger than ½ in., and not more than 40 per cent should pass a ¼-in. screen.

When properly installed, it is pointed out that the "combined efficiency" of a stoker heating plant will range from 62 to 75 per cent. Supplementary material included in the bulletin deals with terms and definitions pertaining to stokers and heating, and with miscellaneous data for use in estimating and installing stokers.—Ivan A. Given.

* * *

Laboratory Testing of the Inflammability of Coal and Other Dusts Conducted by the Bureau of Mines, by H. P. Greenwald. Bulletin 365, U. S. Bureau of Mines; 45 pp.. Price, 10c.

Many efforts have been made to obtain, in the laboratory, results comparable with those made at great expense in the Experimental Mine. Such tests have been made more or less continuously since the organization of the Bureau on July 1, 1910. Some of the difficulties are illustrated by the fact that with the Clement apparatus, which was that first devised, the order of flammability of the various dusts was different with 10 per cent of inert dust from that which obtained with 50 per cent of such dust.

The bulletin describes the Clement and Clement-Frazer apparatus, the Large-Scale apparatus, those of Bouton and Griffin and the laboratory galleries, horizontal and vertical, including the Allison gallery. Godbert's electrically heated furnace for dust ignition is the latest development. A. L. Godbert developed his furnace for the British Safety in Mines Research Board and is now in Pittsburgh developing a furnace for the Bureau of Mines. The present furnace gives results as consistent as, or possibly more consistent than, those obtained in the Experimental Mine and is capable of handling dust as coarse as 20-mesh. The limits of flammability can be obtained with all the desired accuracy.

From this furnace the addition of 86 per cent of inert dust is necessary to produce complete immunity to propagation of flame, as against 75 per cent for pulverized dust in the Experimental Mine, but the dust, which was from the Pittsburgh seam, was more carefully sized than that in the mine. It passed a 150-mesh screen and was retained on one of 200-mesh.

* * *

Carbonizing Properties and Constitution of Black Creek Bed Coal From Empire Mine, Walker County, Alabama, by A. C. Fieldner and Others. U. S. Bureau of Mines Technical Paper 531. Price, 10c.

This report presents the results of experimental work done by the Pittsburgh Experiment Station of the U. S. Bureau of Mines in cooperation with the American Gas Association. These results cover: physical examination of columnar sections, microscopic examination of thin sections, extraction of components by solvents and rational analysis, plastic and miscellaneous properties, low- and high-temperature assay distillation tests, and carbonizing tests with experimental equipment, at various temperatures from 500 to 1,100 deg. C. Included in the discussion of results of the carbonizing tests are: coke yield, analysis and physical properties; yield and physical and chemical properties of gas, tar, tar distillates, light oils and ammonia.

Coming Meetings

Coal Mining Institute of America: annual meeting, Dec. 15 and 16, Auditorium, Chamber of Commerce Building, Pittsburgh, Pa.

American Mining Congress: annual meeting, Dec. 15-17, Mayflower Hotel, Washington, D. C.

Anthracite Club of New York: third annual banquet, Jan. 19, 1933, Hotel Astor, New York City.

American Society Heating and Ventilating Engineers: annual meeting, Jan. 23-25, Cincinnati, Ohio.

Eastern Ohio Coal Operators' Association; annual meeting, Feb. 13, Cleveland, Ohio.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Successful Bonding of Secondary Tracks Achieved With Removable Terminal

RECOGNIZING the importance of proper bonding of mine track as a negative circuit in transmitting electric current to operate its mines, and the relation of bonding to economical maintenance of locomotives, mining machines, drills, pumps and other equipment, the Clinchfield Coal Corporation, operating six mines in Virginia, began a careful study of the question two years ago. One of the major results of this investigation was the development of a bond for secondary tracks which would meet the necessary requirements of efficiency, safety and economy.

Poor bonding, according to W. E. Wolfe, chief electrician for the Clinchfield operations, results in increased power consumption, slows down production, and decreases the life of armature and field coils, locomotive and machine cables, and electrical equipment generally. It also has been proved that premature explosions have resulted from "stray currents" picked up by firing wires. The presence of these currents is directly due to poor bonding or failure to confine return currents to low-resistance paths.

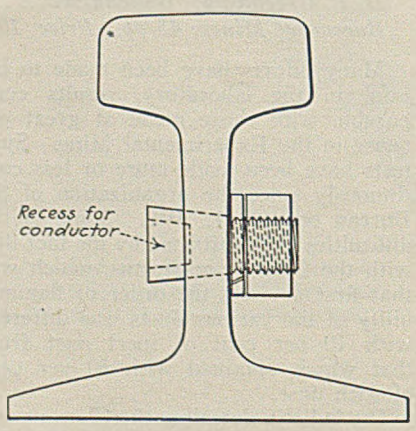
In view of the usual conditions prevailing underground, it is difficult to maintain roadbeds for mine tracks in good condition, particularly where light steel is used. Shifting or moving such tracks, which frequently is necessary, tends to loosen and/or break bond connections. Most failures, however, are caused by improper electrical contacts.

Generally speaking, the bonds in most mines apparently are in good condition and mechanically tight, but when the resistance of the joints is compared with the number of feet of solid rail, it will be found that there is a wide difference between proper electrical and mechanical contacts. Electrical engineers know this, and have overcome the difficulty by introducing the welded bond. The cost of this type of bond, however, is unduly high unless the track is permanent and well maintained, the bonds are installed by trained welders, and wrecks are eliminated to insure that the life of the bond is sufficient to return the investment. Cost of an electric welded bond installed is about $1.20.

One of the most common types used today is the channel-pin bond. This bond offers the cheapest method of joining rails to make an electric circuit, but its use may be the worst form of false economy. Only a small part of the copper wire conductor is in contact with the rail; heating at the contact points is usual; corrosion is inevitable; and the solid wire will not flex with the rail joint. This type of bond costs about 30c. installed.

The pin-terminal bond is widely used. This bond is a factory-made product of flexible copper wire, and is tightened in the rail by driving a steel pin through a hole in the center of the terminal. The pin expands the terminal to fill the hole, and thus brings the bond metal into tight contact with the rail metal. This bond rarely fails when properly installed in a newly made hole of proper size. Its limitations are due to field conditions, which may make it necessary to use an old rail hole or purchase bonds of different lengths. The cost of a pin-terminal bond installed is about $1.

Terminal in Place in Rail



After consideration of the entire question of bonding, operating officials of the Clinchfield Coal Corporation decided that efficiency, safety and economy would best be served by the development of a bond with a terminal that would insure a satisfactory electrical contact unaffected by mine water or mine atmospheres, and which could be reclaimed and used over again with an efficiency equal to the original. Successful application by unskilled workmen was, of course, a necessity. Furthermore, the design of the bond terminal should be such that inaccuracies in drilling would automatically be compensated for, and the terminal could be manufactured by automatic machinery, thus reducing initial cost. Another desirable feature was the development of a bond which could be made up by workmen at the mine, using scrap copper wire and the manufactured terminal. Finally, the bond wanted was to be of such a design that special or expensive equipment would not be required for its installation. Through the cooperation of the National Armature & Electric Works, the terminal shown in the accompanying illustration was developed to meet these specifications.

The secret of dependable bonding is the contact, and experience with this terminal in Clinchfield mines has demonstrated its ability to meet this test. In installing the bond, the hole in the rail is reamed out with a reamer having the same pitch as the terminal. This is done whether the rail hole has a fresh surface or not, thus insuring a contact area free from rust or dirt. The terminal is inserted in the hole, and is tightened by screwing up the nut. In this way, sufficient pressure can be applied to insure a perfect contact that will exclude water and air. Bonding on secondary tracks is done by the trackman. The only addition to his tool kit is a reamer, which

can be carried in his pocket. To remove the bond, the nut is merely backed off the terminals, and the ends are struck a light tap with a hammer.

At Clinchfield mines, the wire preferably is soldered into the recess in the terminal, as the solder acts as a safety valve in case an overload comes on the circuit. When derailments occur, only the conductor is subject to damage, inasmuch as the terminal is protected by the ball of the rail. Using the terminals herein described, the cost of a bond installed is about 45c. when new flexible wire is employed and about 35c. when scrap wire is used. The terminals also may be used for other purposes, including ground connections for pumps, fans and other equipment.

Prevent Misfires in Shooting

At the Susquehanna Collieries Co. shots occasionally failed because the leads being looped around the primer cartridge sometimes gathered up sufficient borings in the borehole that they were dragged out of place, thus pulling the electric detonator out of its hole in the primer cartridge. So dangerous is a shot that fails to fire that tests were made of another manner of arranging the leads that would obviate this possibility.

Today, the men are carefully instructed to make a small hole of the correct diameter with a wooden needle in the axis of the first cartridge to be pushed into the borehole. This small hole is so positioned that the detonator will face outwardly when the cartridge is in place. Leads from the detonator are taken back on the cartridge toward its farther end and are passed through another hole pierced, by the same needle, through the stick of explosive, from which they pass without kinks to the mouth of the borehole.

Fig. 1 illustrates the former method and Fig. 2 the method by which it has been replaced. Miners are charged not to prime their shots until ready for use. No explosives or detonators may be kept in a blind crosscut, nor less than 50 ft. from the working face, nor may mixed explosives be used. Files, nails or other metal instruments may not be used for sinking fuse holes or piercing sticks of explosives. It has been suggested that manufacturers insert a wooden punch in each box of explosives.

Gangway miners and chute miners are required to use separate firing lines, the gangway line being carried on the low side of the gangway and the chute line on the high side. In this way, shots are not fired prematurely or in one place when a shot in the other place is expected.

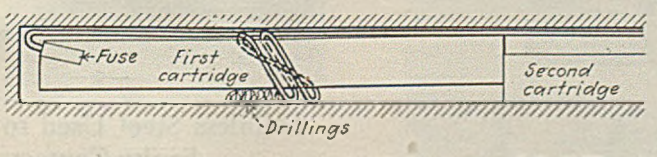


Fig. 1—Old Way. Loops Gather Drill Cuttings and Pull Electric Detonator From Cartridge

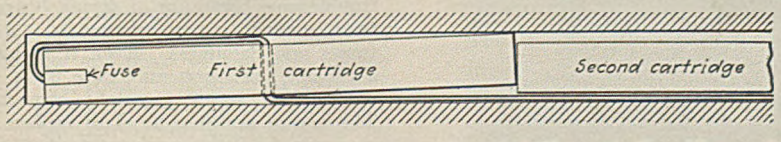


Fig. 2—New Way. Shooting Wires Are Threaded Through Cartridge and Do Not Pull on Electric Detonator

Knowing How Pays

Make a better mousetrap, and the world will beat a path to your door, even though your house be in the wilderness. This, briefly, is the reward of the man who is able to offer a better solution for the problems with which he is confronted. But ability to solve problems rests on knowledge, and in these pages *Coal Age* offers the selected and edited knowledge of practical operating men throughout the coal industry. These items have met the test of actual operation. Perhaps you also have developed a money- or time-saving short cut which merits a place in these columns. If so, *Coal Age* will welcome it. A sketch or photograph may help. Acceptable ideas are paid for at the rate of $5 or more each.

Open Field Switch May Not Cause Load Loss

It should be the ambition of a power-plant shift engineer to be ready to meet any emergency which may arise. An alert operative examines himself, so to speak, as to what he should do if this or that should happen. One circumstance which may perplex him is the accidental opening of the field switch of an alternating-current synchronous generator while the machine is carrying a load in parallel with other generators.

Shall the generator be disconnected from the bus and restored in the regular way, or is there a possibility that if the field switch is closed immediately the generator will recover its normal load without further manipulation? The first method takes considerable time and may involve the loss of the station load. As a general rule it is permissible to follow the second course; that is, restore the field circuit as soon as possible and not disconnect the machine. Unless some unusual complication has arisen, the generator will recover its full voltage and its adjusted load in a few seconds.

Sequence in Welding Terminals A Real Bonding Factor

Occasionally a welder will discover that one terminal of a bond that has just been welded will be porous, rough, and lacking in solidity, though the weld is sound in every other respect. The cause of this condition and its remedy is one of the tricks of the trade that every welder can put in his bag for future use, declares *O-B Haulage Ways*. To obtain good welds on both terminals, the proper procedure is to weld the terminal farthest away from the source of power first and the one nearest the power source last. With this sequence, shown diagrammatically in Fig. 2, the welding current *I* does not pass through the bond.

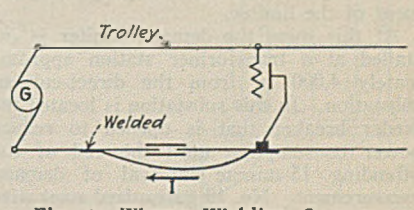


Fig. 1—Wrong Welding Sequence

Usually there is a coating of dust, dirt or corroded material between the splice bars and the rail, which means that the resistance between the bars and the rail is high. In cases where the bond terminal nearest the power source is welded first, as in Fig. 1, the bond, having a low resistance, will carry the majority of the welding current on the return side of the circuit during the welding of the second terminal. The welding arc is drawn on the bond terminal only, and while the welding metal will deposit and build on the rail, there will be little or no fusion to the rail metal. As a result, the bond may appear perfect

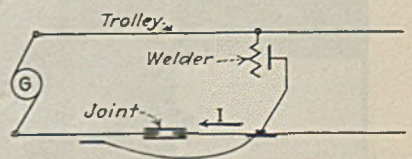


Fig. 2—Correct Welding Sequence

to the eye but will be sadly lacking as far as strength and low resistance are concerned when tested.

When the terminal away from the source of current is welded first, the current in returning to the generator is forced to travel through the rail and splice bars, and none of it goes through the bond. With the entire current traveling through the rail, there is an even fusion of metal between both the bond terminals and the rail, and the finished bond will have a low resistance and high mechanical strength.

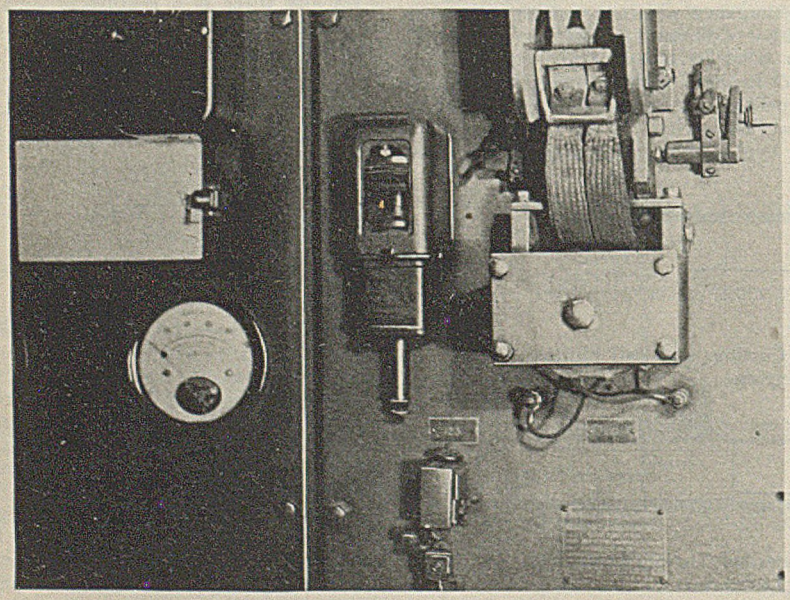
Counter on Demand Limiter Aids in Its Adjustment

In many cases where a demand limiter is installed and arranged to open an automatic reclosing feeder breaker the question arises as to how many of the circuit interruptions caused by breaker openings are due to action of the demand meter and not to circuit overload. The accompanying illustration shows the two mechanical counters and a record card used at the Slagle (W. Va.) mine of the Logan County Coal Corporation to aid in proper adjustment of the limiter.

At this mine the demand limiter is installed at a transformer station approximately 4,000 ft. from the direct-current substation. In this substation is located the feeder breaker that is opened to reduce power consumption until the end of the offending 15-minute interval of demand measurement. No. 10 galvanized steel wire is used for the limiter control circuit between substations. The potential of 110 volts alternating current on this circuit operates a relay located beside the automatic breaker.

The breaker was already equipped with a counter prior to the installation of the limiter. This counter appears at the upper right hand of the illustration. Another counter was attached to the limiter relay (upper left) by means of a small wire rod operating through a hole drilled in the bottom of the case. On the white card beside this counter a daily record was made of the readings of the two counters. The limiter at the transformer station was adjusted until the circuit breaker "outs" due to the limiter alone seldom exceed three per day.

Counters Installed on Breaker Panels



Braces Used to True Up Eccentric Arms

A system of braces to make self-aligning eccentrics run true has been devised by J. A. Ray, electrician, Imperial Mine, Virginia Iron, Coal & Coke Co., Leona Mines, Va. The trouble, which lasted over a year while different schemes were tried, arose when the eccentric straps began to run sidewise on the eccentrics, as shown in Fig. 1. This

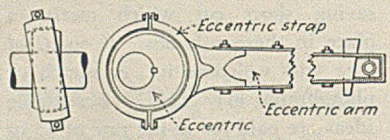


Fig. 1—Showing Position of Eccentric Strap and Arm Before Braces Were Applied

condition caused the eccentrics to heat up and made oiling difficult. Braces were employed, as in Fig. 2, to bring the eccentric arms and straps back to the proper position. On the inside eccentric arms, the braces, consisting of angle irons, were bolted directly to the top and bottom of the arms.

Slightly different treatment was necessary for the outside arms. In this case, an angle was bolted to the outside of the arms, extending up or down, as the case might be, and two cross angles were bolted to the projecting parts of the vertical angles. In applying the

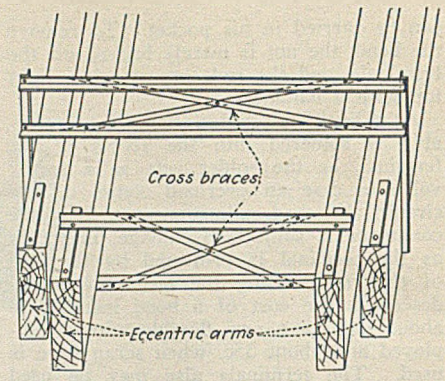
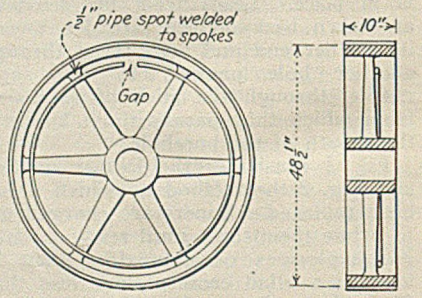


Fig. 2—Braces Applied to Eccentric Arms

cross angles to the outside arms, care must be taken to place them high or low enough to clear the inside arms. Cross braces were then applied to both inside and outside arm installations, making it impossible for the arms to turn sidewise. The braces were mounted as close to the eccentrics as possible.

Pipe on Gear Stops Noise

An unusually noisy herringbone gear on the No. 8 slope hoist, Richards colliery, Susquehanna Collieries Co., Mt. Carmel, Pa., was silenced by the application of a ½-in. pipe to the spokes, as shown in the accompanying illustration. The hoist is operated by a 250-hp., 600-r.p.m. motor. There are 24 teeth on the pinion, and the gear reduction is 4.04:1, making the r.p.m. of the gear 148½. The



Gear With Pipe Applied to Stop Noise

pipe, bent into a circle slightly smaller in diameter than the gear, was applied by spot welding, leaving a small gap (shown in the illustration) between the two ends.

Stainless Steel Used to Reduce Faulty Contacts

Mine electricians are familiar with the troublesome corrosion of spring brass electrical contacts when exposed to corrosive fumes and dampness. Even if inclosed in a cabinet, corrosion may take place unless the cabinet is of gas-tight construction. The use of stainless steel to replace brass contacts of existing equipment offers a solution to the difficulty.

One of the first appearances of stainless

steel electrical contacts at mines was on battery charging racks for electric cap lamps. The new material practically eliminated the former contact troubles. This same material could be utilized to advantage in numerous other places, especially in control circuits of certain types of old equipment.

Special Pinion Puller Developed For Loading Machine Motors

Renewal of pinions in the Crocker-Wheeler Type 35 KT motors used on Joy loading machines presents a difficult task if properly designed equipment is not available. The pinions are of the spline type and, of necessity, fit very tightly. Clearance between the back of the pinions and the oil guards on the bearing housing is $\frac{1}{16}$ in. Depth clearance is the same.

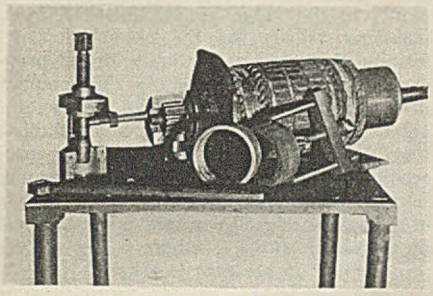


Fig. 1—Showing Construction of Pinion Puller

For removing these pinions, the electrical department of the Bell & Zoller Coal & Mining Co., Zeigler, Ill., has developed the equipment shown in the accompanying illustrations. Scrap shafting was used in its construction. The puller (Fig. 1) is made in half sections, and fits snugly over the pinion with a $\frac{1}{16}$-in. shoulder engaging the back of the pinion and exerting an equal pressure around its circumference. A sleeve prevents the halves of the puller from spreading when pressure is applied through the center thread bar.

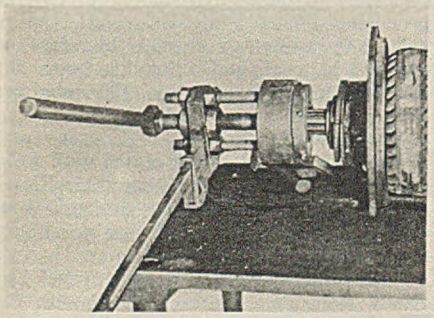


Fig. 2—Pinion Puller Applied

After the pinion is removed, removal of the bearing and brass oil sleeve is another difficult operation. For this job, the puller shown in Fig. 3 is designed to take the place of the bearing end shield, and removes the parts with little effort and no damage. A few pieces of material which can be found in any mine shop, a small amount of machining, and a little arc welding are all that are needed to produce these tools for the otherwise tedious job of pinion-pulling.

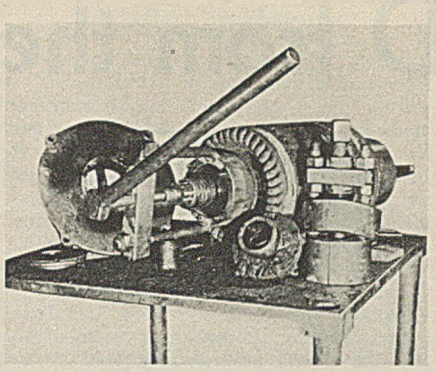


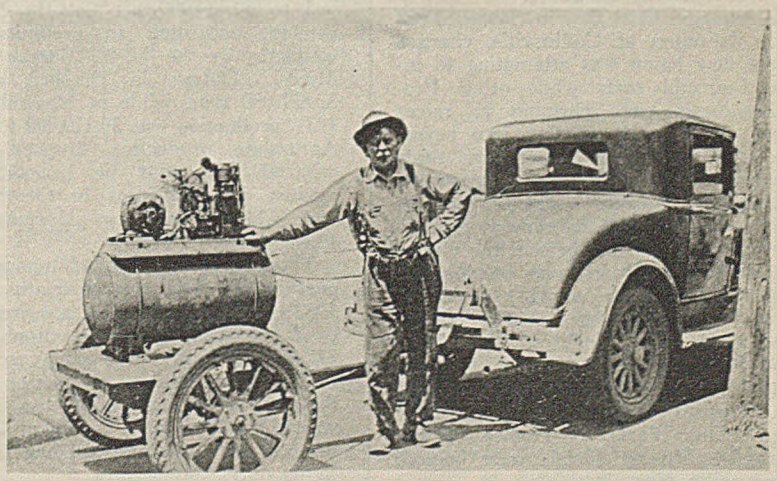
Fig. 3—Puller for Removing Bearing and Brass Oil Sleeve

Trailer Mounting Makes Compressor Portable

Cleanliness is next in importance to lubrication in the maintenance of motors and substation equipment, and compressed air therefore is a necessity in freeing the dust and dirt from motor windings and control equipment. It has been common practice to install compressors in substations, and not unusual to have a truck-mounted compressor for the same duty. Use of a trailer for carrying the compressor from place to place is a new idea supplied by A. S. J. Hopkins, manager of mines, Amherst Coal Co., Amherstdale, W. Va.

With the Amherst equipment, shown in the accompanying illustration, air receiver, electric motor and compressor are one unit, which is detachable from the two-wheeled trailer. Once a week, the compressor is taken to each substation and tipple and left for an entire day. Cleaning of the tipple motors is done at convenient times by the tipple crew. Isolated machinery which cannot be reached by automobile can be served by detaching the compressor unit from the trailer and carrying it to the equipment.

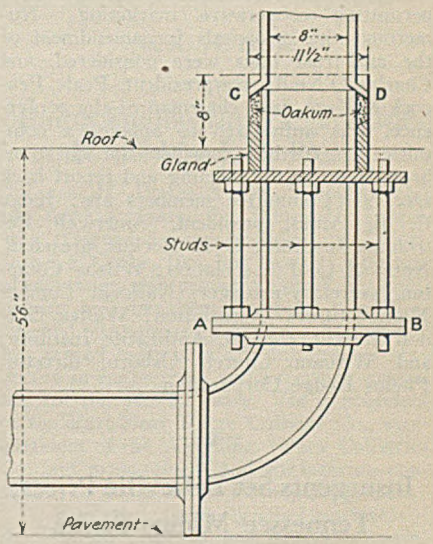
Compressor on Its Trailer Mounting Ready for a Trip to the Job



Roof Serves as Stuffing Box In Column Line Repairs

Making a strong roof serve as a stuffing box in repairing a break in a column line is described by E. C. Tillson, Cassity, W. Va. The installation in question consisted of a 1,000-g.p.m. centrifugal pump discharging to the surface through an 8-in. wrought column line. Pumping head was 325 ft. The column line gave way at the flange *A-B*, shown in the illustration, and repairs were made as follows:

The roof, being exceptionally good, was cut around the pipe, making a stuffing box 11½ in. in diameter and 8 in. deep. The column line was then cut off at *C-D* with an oxyacetylene torch, after which the end was heated with the torch and a bell formed on it, using a special tool. A piece of pipe was cut to extend from the flange to the bell on the bottom of the column line. A packing gland was taken from a discarded plunger pump and bored out to slip easily over the pipe. The stuffing box was packed with oakum, and the gland was forced up tight with four ¾-in. studs. A tight joint resulted, which gave no trouble afterward.



Details of Column Line Repairs

WORD from the FIELD

Map Drive on Anti-Trust Laws

Modification of the anti-trust laws to assist the natural-resource industries was the subject of an extended conference of representatives of these industries in New York City, Dec. 1. The conference was called by the National Coal Association, which presented, on behalf of its members, a proposal to extend to the natural-resource industries the exemptions from the anti-trust laws granted the agricultural industry by the Capper-Volstead act of 1922, permitting cooperative marketing. Numerous other proposals for amendment of the anti-trust laws were considered, and Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., chairman of the conference, was authorized to appoint a committee to further consider the questions brought up at the meeting and report back Dec. 9. Committee members are: Judge C. B. Ames, president, American Petroleum Institute; C. E. Bockus, president, National Coal Association; Wilson Compton, secretary-manager, National Lumber Manufacturers' Association; Walter Gordon Merritt, counsel, Anthracite Institute; and William Church Osborn, director, Phelps Dodge Corporation.

Insurgents Set Belleville Prices; Tennessee Miners Strike

To protect company assets and miners' wages, Local No. 4 of the Progressive Miners of America last month notified members of the St. Clair-Madison County Coal Operators' Association, operating in the Belleville district of Illinois, that it would take steps to enforce a uniform scale of selling prices. This scale, set after conferences with an operator group, is as follows: mine-run, $1.75; 6-in. lump, $2.50; 2-in. lump, $2.25; furnace lump (not over 1¼ in.), $2; egg, $2; nut, $1.75; pea, $1.25; slack, 50c. Contract prices are to be 15c. less than the above.

The Lumaghi Coal Co., in closing down one of its mines at Collinsville, charged that the new union was attempting to increase Lumaghi costs while other Progressive locals were cleaning up mines without charge and entering into agreements to work at $1 to $4 per day. State highway police used tear gas on insurgents attempting to prevent reopening of the Peabody Coal Co.'s Cora mine at Springfield, Nov. 17, with members of the United Mine Workers. Progressive officials declared that picketing would continue as long as the company attempted to operate with United Mine Workers. The tipple of the Shuler Coal Co., Alpha, Ill., was damaged by dynamite Nov. 10, after the mine reopened under contract with the United Mine Workers. Homes of two Progressive Miners officials were bombed at Taylorville, Nov. 28.

Five National Guard companies moved

into the Wilder field of Tennessee on Nov. 26, after several weeks of difficulties between miners and the Brier Hill Collieries, Fentress Coal & Coke Co., and Davidson Coal Co. These companies discontinued relations with the United Mine Workers upon expiration of a one-year contract in July, and announced a wage reduction, whereupon the miners struck.

Propose Bituminous Laboratory

Preparation of a detailed report to cover the major objectives of a research laboratory, cost of organization and operation, and suggested articles of incorporation was voted at a meeting of a subcommittee of the research committee of the National Coal Association, at Washington, D. C., Nov. 23. Formation of the subcommittee was decided upon at the Nov. 11 meeting of the Research Section of the association, which, after considering the work of gas, oil and anthracite interests, came to the conclusion that a laboratory independent of equipment manufacturers was the best means of fostering both domestic and industrial consumption of bituminous coal.

John C. Cosgrove, president, West Virginia Coal & Coke Corporation and the Cosgrove-Meehan Coal Corporation, is chairman of the Research Section. Members of the subcommittee are: Douglas Gorman, president, Cumberland Coal & Coke Co.; Howard N. Eavenson, president, Clover Splint Coal Co.; W. A. Marshall, president, W. A. Marshall & Co., Inc.

Coal Production Off

Bituminous coal production dropped to 30,634,000 net tons in November, according to preliminary estimates by the U. S. Bureau of Mines. Output in October was 32,677,000 tons, while in November, 1931, production was 30,110,000 tons. Anthracite production dropped to 4,260,000 net tons in November, against 5,234,000 tons in October, and 4,141,000 tons in November, 1931.

Total production of bituminous coal in the first eleven months of 1932 was 274,559,000 tons, a decrease of 21 per cent from the output of 347,850,000 tons in the same period in 1931. Anthracite production in the first eleven months of this year was 44,250,000 tons, a decline of 19.5 per cent from the corresponding 1931 figure of 54,959,000 tons.

Attack Power Rates

Hearings on the request of the Virginia Coal Operators' Association and the town of Norton for a reduction of approximately 52 per cent in the wholesale power rates of the Old Dominion Power Co. opened before the Virginia Corporation Commission at Richmond, Nov. 28. Charging that the power company's assets had been swelled to $5,258,168.49 by "arbitrary and excessive" write-ups and the inclusion of abandoned and unused equipment and plants to the value of $2,749,694.17, complainants asked that the commission determine the present fair value of all properties at present operated by the company in Lee and Wise counties, as well as the value of unused properties, and establish just and reasonable rates. Similar proceedings have been started by other groups in southwest Virginia, where a reduction of approximately 50 per cent is sought, and in eastern Kentucky, where a cut of approximately 25 per cent is asked.

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations in November were reported as follows:

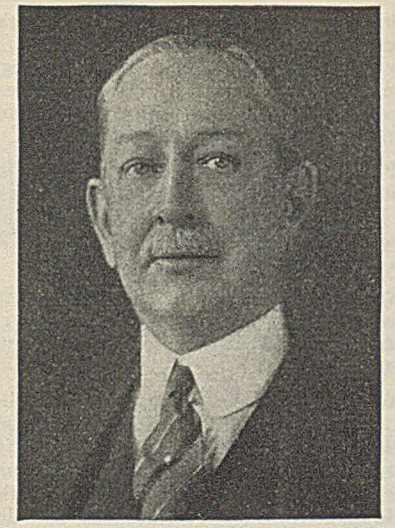
Elkhorn Collieries Corporation, Winters No. 2 mine, Farraday, Ky.; contract closed with the Morrow Mfg. Co. for two-track, two-grade screening equipment; capacity, 100 tons per hour.

Glendora Coal Co., Sullivan, Ind.; contract closed with the McNally-Pittsburg Mfg. Corporation for rescreening plant consisting of high-speed shaker screens for producing minus ⅜-in. slack and 1¼x⅜-in. and 2x1¼-in. nut, a storage bin for the minus ⅜-in. coal, and a loading boom for the 2x1¼-in. nut; capacity, 100 tons per hour.

Northern Illinois Coal Corporation, Wilmington, Ill.; contract closed with Roberts & Schaefer Co. for Stump "Air-Flow" coal-cleaning plant to treat pickings from picking tables; capacity, 50 tons per hour; to be completed Dec. 31.

Sandy Run Miners' & Producers' Co., Sandy Run, Pa.; contract closed with the Chance Coal Cleaner for installation of a 15-ft. Chance cone and auxiliary equipment formerly used by the Harleigh Coal Co. Capacity of the new Sandy Run plant will be 1,400 gross tons of egg to rice, inclusive.

Wyoming Valley Collieries Co., Harry E. colliery, Forty Fort, Pa.; contract closed with the Chance Coal Cleaner for installation of one 15-ft. and two 8-ft. Chance cones, shaker screens and auxiliary equipment for cleaning and sizing domestic and steam coal down to and including No. 4 buckwheat; capacity, 280 tons per hour. The installation went into operation Nov. 1.



Harry N. Taylor

Harry N. Taylor Dies

Harry N. Taylor, for years one of the outstanding leaders in the industry, passed away from a heart attack at Chicago, Nov. 10. Born in Columbus, Ohio, April 20, 1865, Mr. Taylor began his coal career in the mines of the Sunday Creek Coal Co., while still in his teens. From the mines he was promoted to managership of the retail yards of the company at Columbus, then to direction of dock properties at Milwaukee, Wis., and later transferred to Chicago in charge of all Western business of the company.

In 1891, he organized a number of companies in the northern Illinois field and later became interested in the Taylor Coal Co., in southern Illinois, and in the Powhatan Coal Co., in northern Missouri. Resigning his Sunday Creek connections to devote all his time to his personal interests, he became president of the General Wilmington Co., organized to handle the output of all the Wilmington field mines, and also launched the Western Coal & Dock Co.

Mr. Taylor shifted his major activities to the Southwest in 1914, when he went to Kansas City, Mo., as vice-president of the Central Coal & Coke Co. During the World War he represented that section as District Representative of the U. S. Fuel Administration. In 1923 he came to New York to head the U. S. Distributing Corporation and its subsidiaries, Pattison & Bowns and Sheridan-Wyoming Coal Co. Under his direction the mines of the last-named company were the first in the country to become completely mechanized. He relinquished his interests in U. S. Distributing in March, 1931, to join the United Electric Coal Cos. as chairman of the board and general manager. In February of this year, he was made president of the Penn Anthracite Collieries Co.

Harry Taylor played a prominent part in labor negotiations. He was one of the signers to the call which resulted in the first joint interstate agreement. He served several terms as president of the Illinois Coal Operators' Association and was one of the early heads of the National Coal Association. Enjoying the deserved confidence of both capital and labor, Mr. Taylor frequently was called upon by Washington to advise on labor problems.

Relation of Timber to Coal Detailed by Meguire

"The coal-mining industry of Kentucky has an interest in forestry hardly less vital than that of agriculture, or even the industries that use forest products as their raw material," declared Kenneth U. Meguire, president, Dawson Daylight Coal Co., Louisville, Ky., at a meeting of the Central States Forestry Association held in Louisville, Nov. 17-19. As the largest owner of timber-bearing surface and growing timber, and the largest consumer of rough and finished lumber, the Kentucky coal industry, as a business necessity, must protect itself by insuring a supply of props and ties throughout the life of the coal seams. Pending the exhaustion of these seams, its inteerst and duty should dictate a program by which depletion of underground values should be compensated for by enhancement of surface values. Such compensation, due to the mountainous nature of the country, can come only from timber.

In 1930, Kentucky mines used 356,677,370 b.ft. of lumber, or 7 b.ft. per ton of coal mined. Mr. Meguire saw no apparent reason why this figure should change substantially in the future. Use of steel ties has increased in the past few years, but the substitution has been confined largely to light tracks in rooms. Substitution of steel I-beams for timbers has been confined to a comparatively few operations using longwall.

In the future development and conservation of timber supplies, both timber growers and Kentucky coal companies, said Mr. Meguire, should keep in mind the following points:

1. Land owners within convenient distance of the mines should avail themselves of all possible opportunities of thinning out defective trees, selling such good timber and improvement cuttings as are obtained to the coal companies. This policy, in conjunction with systematic planting and protection of standing timber, should be more profitable than burning over the land for the sake of a few years of high fertility.

2. In growing new timber primarily for mining purposes, coal companies and adjoining owners should study carefully the selection of the best types of trees for this purpose. These should be considered in the light of rapidity of growth, ability to withstand rot, and soil retention and improvement.

3. Tree planting at the present time seems to be an obvious answer to unemployment, and, without the intervention of any governmental agency, such a program may be undertaken with good prospects of future profit, provided land owners economically expend the capital necessary to plant the proper trees on the right land and provide fire protection. On prepared ground, two men can plant about 1,100 seedlings 6 to 8 ft. apart per day. At current wage rates, the unit cost per tree should be low.

James A. Paisley Dies

James A. Paisley, 66, president, Valley Camp Coal Co., died at the Cleveland (Ohio) Clinic Hospital, Nov. 30, of diabetes. Mr. Paisley, who began his career as a brakeman and later went into the retail coal business at Ashtabula, Ohio, moved to Cleveland in 1907 and incorporated the Valley Camp Coal Co., subsequently forming the numerous operating, distributing and lake shipping companies which he headed at the time of his death.

James H. Pierce

Mining Engineering Organization Formed by J. H. Pierce

James H. Pierce & Co., Scranton, Pa., has been organized by James H. Pierce, who resigned as vice-president of Stuart, James & Cooke, Inc., last month. The new organization will render a consulting engineering and management service to anthracite and bituminous executives. Mr. Pierce has served anthracite and bituminous producers in engineering and executive capacities for the past 22 years. He is president of the East Bear Ridge Colliery Co., vice-president of the Wyoming Valley Collieries Co. and management and engineering consultant to a number of mining companies.

A. E. Yetter, formerly chief engineer of the Hudson Coal Co. and general superintendent for the Glen Alden Coal Co., has joined the new firm in an executive position.

Revise Track Standards

The Standardization Division of the American Mining Congress has issued a revised edition of its mine track standards, covering all structural details for a complete mine turnout, including frogs, switches, plates and braces. R. L. Ireland, Jr., vice-president, Hanna Coal Co., headed the committee on revision.

I.C.C. Hits Reciprocity

Holding that railroads generally make purchases in return for traffic, and that shippers, by actual or threatened diversion of traffic, influence the placing of orders by the carriers, the Interstate Commerce Commission on Nov. 9 decided that carriers and shippers will be given an opportunity to correct their present transactions and practices with relation to purchases and routing. Further consideration of the desirability of legislation requiring that purchases of materials be made on competitive bids was deferred, and the proceedings in the commission's study of reciprocity in purchasing and routing were discontinued.

Pocahontas Operator Dies

The Pocahontas field lost one of its best-known leaders late last month when James Ellwood Jones, vice-president, Pocahontas Fuel Co., died at his home at Switchback, W. Va., from a heart attack on Nov. 25. Colonel Jones, who was in his sixty-first year, began his mining career in that district immediately after his graduation from Columbia University in 1895. He was responsible for the design and introduction of several pieces of coal-mining equipment, including the "Coloder." The colonel took a deep personal interest in community welfare work and assisted many in the region to realize their educational dreams.

Receivers for Two Companies

The Continental Coal Co., operating three mines in northern West Virginia with a daily capacity of 8,700 tons, was placed in receivership early in December as a result of a friendly action brought by another subsidiary of the Edward Hines lumber interests. Howard W. Showalter, president, was appointed receiver, with power to continue operation of the properties.

As a result of a friendly suit for back salary brought by an employee, J. W. Galloway, president, and David Williamson, general manager, were named receivers of the Maryland Coal Co. of West Virginia, operating a mine at Wendel, W. Va. The receivers will continue operations.

Personal Notes

CHARLES DORRANCE, vice-president, Penn Anthracite Collieries Co., Scranton, Pa., has been elected president of that company, vice the late Harry N. Taylor.

FRED S. MARTIN, president, Coal Sales Corporation, Chicago, has been elected to succeed Mr. Taylor as chairman of the board, United Electric Coal Cos.

DAVID WILLIAMSON, co-receiver, Maryland Coal Co. of West Virginia, has been elected president of the Maryland Coal Co., vice J. W. Galloway, resigned on account of ill health.

V. N. HACKER, president, Pruden Coal & Coke Co., was made president of the Southern Appalachian Coal Operators' Association at its annual meeting in Knoxville, Tenn., Nov. 18. R. S. YOUNG, secretary, Blue Diamond Coal Co., and S. M. REAMS, president, Clear Fork Coal Co., were chosen vice-presidents.

W. J. JENKINS, president, Consolidated Coal Co. of St. Louis, has been reelected president of the Illinois Coal Operators' Association. C. F. HAMILTON, Pyramid Coal Corporation; C. T. HAYDEN, O'Gara Coal Co.; G. A. SHAFER, Pana Coal Co., and T. J. THOMAS, Valier Coal Co., were elected members of the executive board.

S. J. DICKENSON, president, Mary Helen Coal Corporation, Coalgood, Ky., was again the choice of the Harlan County Coal Operators' Association for president at the annual meeting. B. W. WHITFIELD, SR., president, Harlan Collieries Co., Brookside, Ky., was reelected vice-president.

James Ellwood Jones

P. TOULMIN, president, Lehigh Coal Co.; D. A. THOMAS, president, Montevallo Coal Mining Co., and W. H. OLDHAM, vice-president, Republic Steel Corporation, were elected to the board of governors of the Alabama Mining Institute at its annual meeting in Birmingham last month.

L. E. WOODS, president, Crystal Block Coal & Coke Co., was reelected president of the Operators' Association of the Williamson Field at the annual meeting in Williamson, W. Va., Nov. 29. GEORGE W. COFFEY, president, War Eagle Coal Co., was chosen vice-president, and W. S. Leckie, president, Leckie Collieries Co., treasurer.

Industrial Notes

GEORGE M. SHARER has been appointed Eastern division sales manager of the Link-Belt Co., with headquarters in Philadelphia, Pa. MOORE-HANDLEY HARDWARE CO., 25 South 20th St., Birmingham, Ala., has been appointed distributor of Link-Belt elevating, conveying and power transmission machinery.

C. E. STEPHENS, formerly commercial vice-president, with headquarters in New York, was elected vice-president of the Westinghouse Electric & Mfg. Co. in November, and N. G. SYMONDS, Chicago commercial vice-president, was elected vice-president in charge of sales, with headquarters at East Pittsburgh, Pa.

FALK CORPORATION, Milwaukee, Wis., has appointed the following representatives: G. J. STURMFELSZ, 1620 East 32d St., Baltimore, Md., and H. DOUGLAS STIER, 101 Marietta St., Atlanta, Ga.

ROCKBESTOS PRODUCTS CORPORATION, New Haven, Conn., has removed its Chicago sales office and warehouse to 140 South Dearborn St.

WHITCOMB LOCOMOTIVE CO., Rochelle, Ill., has acquired the business and goodwill of the Milwaukee Locomotive Mfg. Co. under a plan whereby the Westinghouse Electric & Mfg. Co., former owner of the Milwaukee company, becomes a stockholder in the Whitcomb company.

HUGH BENET has been appointed manager of the Harrison (N. J.) works of the Worthington Pump & Machinery Corporation, vice WALTER F. PERKINS, who resigned to become vice-president of the Bartlett Hayward Co., Baltimore, Md.

Fatality Rate Rises Slightly

Coal-mine accidents caused the deaths of 79 bituminous and 22 anthracite miners in October, 1932, according to information furnished the U. S. Bureau of Mines by state mine inspectors. This compares with 65 bituminous and 14 anthracite fatalities in September, and 97 bituminous and 41 anthracite deaths in October, 1931. The death rate at bituminous mines dropped from 2.47 in September to 2.42 in October, while the anthracite rate rose from 3.41 to 4.20. Comparative figures are as follows:

BITUMINOUS MINES

	Oct., 1932	Sept., 1932	Oct., 1931
Production, 1,000 tons	32,677	26,314	35,700
Fatalities	79	65	97
Death rate per 1,000,000 tons	2.42	2.47	2.72

ANTHRACITE MINES

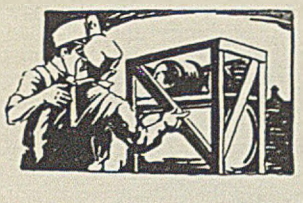
Production, 1,000 tons	5,234	4,108	6,551
Fatalities	22	14	41
Death rate per 1,000,000 tons	4.20	3.41	6.26

Comparative fatality rates for the first ten months of 1932 and 1931 are given in the following table:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

Cause	Bituminous: Number Killed	Bituminous: Killed per 1,000,000 Tons	Anthracite: Number Killed	Anthracite: Killed per 1,000,000 Tons	Total: Number Killed	Total: Killed per 1,000,000 Tons
January-October, 1931						
All causes	893	2.810	341	6.723	1,234	3.349
Falls of roof and coal	523	1.646	184	3.628	707	1.919
Haulage	173	.544	40	.789	213	.578
Gas or dust explosions:						
Local explosions	12	.038	16	.315	28	.076
Major explosions	41	.129	5	.098	46	.125
Explosives	11	.035	22	.434	33	.089
Electricity	51	.160	2	.039	53	.144
Surface and miscellaneous	82	.258	72	1.420	154	.418
January-October, 1932						
All causes	674	2.763	185	4.626	859	3.026
Falls of roof and coal	375	1.537	110	2.751	485	1.708
Haulage	107	.439	24	.600	131	.461
Gas or dust explosions:						
Local explosions	9	.037	7	.175	16	.057
Major explosions	54	.221	....	.....	54	.190
Explosives	15	.062	9	.225	24	.085
Electricity	35	.143	5	.125	40	.141
Surface and miscellaneous	79	.324	30	.750	109	.384

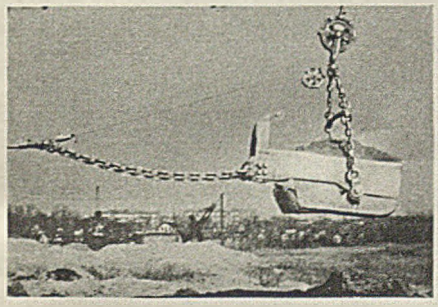
*All figures are preliminary and subject to revision.



WHAT'S NEW
IN COAL-MINING EQUIPMENT

Dragline Bucket

Bucyrus-Erie Co., South Milwaukee, Wis., offers the new "Red Arch" dragline bucket (Type X) for general dragline work. Sizes range from ½ to 8 cu.yd. Features emphasized by the company are: maximum strength and wear; minimum weight; easy digging; quick filling; easy carrying; free dumping; arch



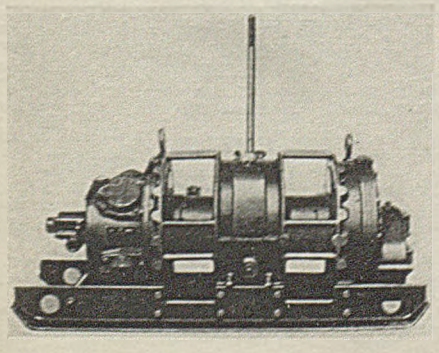
"Red Arch" Dragline Bucket

made of a one-piece annealed steel casting; strong, smooth manganese steel lip with renewable teeth secured by simple wedges; and easily replaced runners and wearing plates.

Double-Drum Air Hoists

Ingersoll-Rand Co., New York City, has developed four sizes of double-drum air hoists for slushing and scraper loading in mines or wherever portable air hoists are required. Single-lever control is one of the features pointed out by the company. Operation of the one lever controls the clutch, speed and starting of the motor. The lever automatically returns to neutral if the operative's hand is disengaged. A compact cast-steel housing incloses and protects the drums, clutches and brakes. Each drum is

Ingersoll-Rand "Utility" Air Hoist



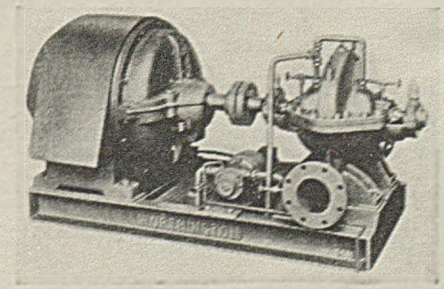
equipped with an internal expanding brake. The air motor is of the radial four-cylinder type, and the entire hoist is mounted on steel skids. Ratings for the four sizes are: HX, 1,500 lb. at 175 ft. per min.; HXC and KX, 2,000 lb. at 130 to 215 ft. per min. at 80 lb. air pressure; KXB (low pressure), 2,000 lb. at 140 ft. per min. with 60 lb. air pressure.

Explosion-Resisting Linestarter

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., offers a new line of explosion-resisting linestarters for use in Class 1, Group D hazardous locations, as defined in the National Electric Code. The starters consist of standard linestarter units mounted in heavy cast-iron cabinets with wide flanges made in accordance with underwriters' specifications. De-ion contactors and combination hand and automatic reset thermal overload relays have been incorporated, and the starters are made with either built-in or separately mounted pushbuttons. Explosion-resisting buttons for two-wire control (low-voltage release) and three-wire control (low-voltage protection) are available.

Automatically Primed Pumping Unit

Worthington Pump & Machinery Corporation, Harrison, N. J., offers a new self-contained automatically primed centrifugal pumping unit, consisting of an electrically driven high-efficiency ball-bearing centrifugal pump mounted with its motor on a fabricated steel bedplate



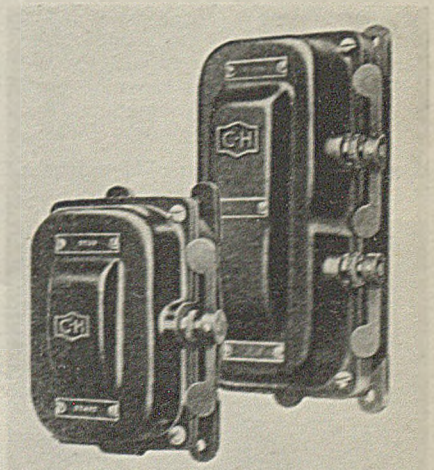
Worthington Automatically Primed Centrifugal Pump Unit

together with a wet vacuum type "Monobloc" priming pump controlled by an electric pressure switch. The priming motor is connected in the pump motor circuit, so that the priming pump is started when the pump motor starts, thus, it is declared, making it necessary to use the priming pump motor only when starting or repriming. No more power, therefore, is used than when operating a non-priming unit.

Other advantages pointed out by the company are: no more floor space or headroom required than with a non-priming unit; effective remote control is possible; wet and dry pit installations and foot valves are eliminated; air binding is prevented; suction loss is overcome; and priming tanks and hand primers are eliminated. These new units are now available with Worthington Types R, U, L and F centrifugal pumps up to No. 6 size, and shortly will be manufactured for all Worthington pumps.

Electrical Control Equipment

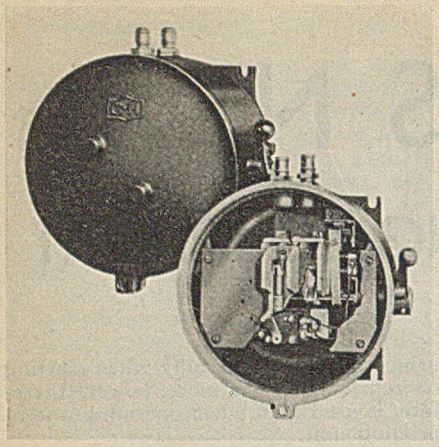
For use under severe weather or atmospheric conditions, Cutler-Hammer, Inc., Milwaukee, Wis., has developed a new line of master stations operated from levers placed on the sides of the cases, instead of pushbuttons on the fronts. It is asserted that this construction



Cutler-Hammer Lever-Operated Weatherproof Master Station

assures a watertight case. Lever shafts operate in stuffing boxes and the cover joint is sealed with a rubber gasket. Stations are available in all normal rating in one-button (on and off), two-button (start and stop) and three-button (hoist, lower and stop) types.

A new air-break type of d.c. explosion-proof across-the-line manual control, approved as permissible by the U. S. Bureau of Mines, also is offered by Cutler-Hammer. These two-pole starters have thermal overload and low-



Cutler-Hammer Explosion-Proof Control

voltage protection, and are rated at 4 hp., 230 volts, and 5 hp., 550 volts. A main fuse is built directly into the case. The overload relay, when tripped, is reset by an outside lever.

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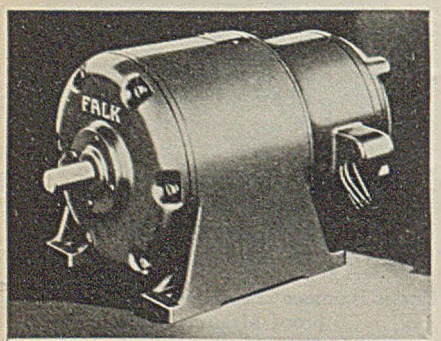
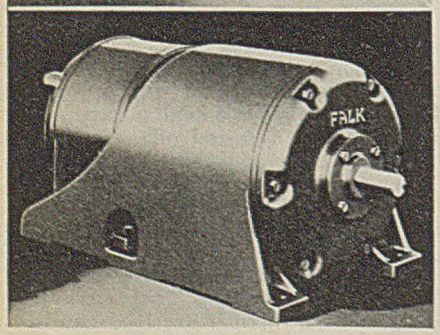
Motor and Reducer Combined

Falk Corporation, Milwaukee, Wis., offers three styles of "Motoreducers" (combined motors and speed reducers), which are said to retain all the advantages of separate motors and reducers and at the same time result in greater compactness, simplicity and economy. Gear housings act as the motor support, thus, it is said, assuring the necessary rigidity. The motor end bell is removed in the "Integral" type and the motor is close-coupled through a bayonet-type joint to the gear case. In the "Flexible" type, the round-frame motor is used and the end bell is retained. Any standard horizontal motor may be used with the "All-Motor" type, the motor being connected through a Falk flexible coupling to the reducer housing. "All-Motor" construction is said to sacrifice compactness to some extent, but makes for universal adaptability.

All three types are available in sizes from ¾ to 75 hp., and with speed ratios varying from 4.6 to 288. Non-planetary helical-type Falk gears are used throughout, as well as oversized bearings in all but the larger sizes. A minimum efficiency of 97 per cent is claimed by the company.

Top—Falk "Integral" Type "Motoreducer."
Bottom—"All-Motor" Type





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New Mill-Type D.C. Starters; Gasket Material

A new line of general-purpose mill-type starters for constant-speed d.c. motors is offered by the General Electric Co., Schenectady, N. Y. These starters, the company says, utilize newly developed accelerating contactors which have been designed to act not only as a relay to provide time delay but also to short out the starting resistor by means of a contact finger. The new starters are said to be sturdy and to embody unusual mechanical and electrical simplicity, thus cutting maintenance cost to a minimum. Accelerating contactors are equipped with silver-faced tips. The starters are available in sizes from 1 to 75 hp.

General Electric Co. has developed a new No. 1281 gasket compound for use where resistance to hot oil is important; where exposure to naphtha, gasoline, kerosene, benzine and similar solvents may occur; where moisture is to be excluded; where there is prolonged exposure to ozone; or where electric corona may occur. Gaskets of the material, according to the company, may be used as follows: assembly of solid-type compound-filled bushings for oil-filled apparatus, and between the bushings and the apparatus; under the covers of oil-filled apparatus; under manhole covers of oil-filled switchgear; and similar applications. The compound may be used in contact with cemented joints. Neither dilute acids nor alkalis affect it, it is asserted, and oil or other liquids will not attack exposed edges. The material is said to be flexible and practically incompressible, and there is no noticeable hardening or stiffening out of doors. At present, the compound may be obtained in 13x36-in. sheets in thicknesses from 1 mil to ¼ in. Maximum present diameter of round gaskets is 12½ in. and maximum thickness is ¼ in.

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V-Pulleys

Dayton Rubber Mfg. Co., Dayton, Ohio, announces a new line of "Day-Steel" single and multiple V-groove pulleys for use with Dayton "Cog-Belts" rated at 7½ hp. or less. The pulleys are said to be lighter in weight, thus making them suitable for use with smaller horsepower machines. Accurate formation from maximum-strength heavy-gage pressed steel, strongly welded at both the rim and web, and rigid assembly on an improved hub are said to result in an accurately balanced, true-running pulley of exceptional sturdiness and pleasing proportions.

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