

COAL AGE

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

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New York, January, 1936

Brighter Days

OPTIMISTIC PRODUCERS naturally try to see the market demand for their output in rosy colors—if for no other reason than to whip up flagging spirits. Any cynical observers frequently suspect that that is the only reason for the optimism expressed. But, when the buyer of a commodity publicly forecasts expanding consumption, even the apostles of gloom must be confounded. That was the happy situation presented by the forecasts at the 1935 Coal Division meeting of the American Institute of Mining and Metallurgical Engineers.

Representatives of large consuming interests who spoke at the St. Louis gathering (*Coal Age*, Vol. 40, p. 543) foresaw heavier tonnage demands from railroads, public utilities and general industry. They offered convincing arguments on coal's supremacy as an industrial fuel which the coal men themselves might well study. Beyond that, however, they made practical suggestions on how coal might take the leadership in developing and holding its markets through increased technical counsel to the consumer. Some groups in the industry actually are doing that very job; the fuel engineering service of Appalachian Coals, Inc., has done outstanding work in this field: others might both fittingly and profitably emulate their example.

Forestalling Trouble

ROOFS are often what we make them. A good roof in mine roadways is often made dangerous and expensive to maintain by leaving insufficient pillars so that the headings have to withstand all the stresses to which the rooms adjacent are subject. Wing pillars, two or three hundred feet wide, are a good investment. If

sizable pillars are to be left, they should be large enough to be effective and save both roof and floor from excessive strain, especially where the roof has to develop its first break.

Coal thus left is not wasted; it is a great asset when the mine is being abandoned. When the day arrives that there is no longer any coal but that adjacent to the main and face headings, these barrier, or wing, pillars provide enough tonnage to justify operation. Otherwise the tonnage will fall so low that it would be economy to draw out the rails and leave the small bodies of crushed coal unmined, as their recovery would be a source of loss, not profit. Such pillars also provide opportunity for making additional intakes and returns should such airways be found necessary.

Immunity in Illinois

BEFORE Illinois started rock-dusting it had many serious disasters, but after rock dust was introduced, explosions caused much less havoc; whereas in Pennsylvania, after rock-dusting was practiced an exceedingly severe explosion occurred in a rock-dusted mine. Why was Illinois relatively immune? Was it because in that State it was the practice to follow an unusual technique, in which haulage was on the return and all the gas and fine dust were exposed to the sparks of the trolley line? Hardly; yet as the trolley roads were well rock-dusted and regularly sampled, the enemy when it came was faced with a cloud of inert rock dust.

In the Pennsylvania mine the gas and fine dust went to airways along which the trolley locomotives did not travel, and these were provided only with ill-placed barriers holding rock dust probably caked. A man went into the return to smoke or a blast of flame came from

the workings, and an explosion was started in the unprotected or ill-protected return, and the result was obvious.

The moral needs no explanatory words. Haulage in a dusty and gassy return certainly is not the answer. Untraveled airways should be the return and should be well rock-dusted, even better than the intake roadways, for in the returns, whether used for haulage or only for airways, is where danger lies. Such rock-dusting is difficult but it is the price of safety. And winter is here!

Discarded Posters

AFTER a poster has been used at the mines it may be given to the school children or sent to the public school for display. Drama may be added to its appearance if the children receive the bulletin to give to the teacher, who thanks the child for it and puts it on the bulletin board in the presence of the class. One company has a mailing list of children who make such use of bulletins, but selection is perhaps unfortunate. Children have been known to be actuated by a poster to ask their father if he wears goggles—"Because I don't want a blind daddy." Such an appeal is not resented, whereas sometimes it comes with bad grace from a foreman whose every suggestion, rightly or wrongly, is regarded as a reprimand.

Where to Put Stoppings

OBVIOUSLY, stoppings placed in the center of a crosscut are less likely to leak than when placed along the rib line, for the roof, coal and floor are more solid and more resistant to the passage of air. When so placed, however, they may give rise to air vortexes which create resistance. A counsel of perfection would be to put a strong stopping in the center of the crosscut and two curtains of reinforced projected concrete, one at either end, wherever large currents of air have to be carried past the ends of the crosscut—these curtains not necessarily tight enough to act as stoppings, though in part they would serve that end. It would seem well, whenever projected concrete is used on the roof and sides of a roadway or airway, to provide at the same time such curtains to assist in reducing air resistance where large volumes of air are passing.

Only where the roadway is wide enough to dispense with manholes could this be done with advantage, because elsewhere the crosscut itself serves, or should serve, as a manhole. In the advance workings, where currents are slower, the purpose of the stopping is solely to prevent waste of air, and a single stopping near the pillar center seems desirable. Experiments to show how much the distance of a stopping from an airway increases resistance in that airway would be well worth while, because if that distance is preferably short, the stopping should be nearer the untracked airway, where falls are not cleared promptly and air velocities accordingly must be correspondingly higher over most of the distance traveled. Always the question arises whether it is better to decrease velocity by many or larger airways, which will lower velocity, or to attain the same power saving by reduction of air resistance while maintaining the same speed.

Double Jeopardy

ANTHRACITE PRODUCERS and labor will meet soon to negotiate a new wage agreement. In a very real sense, the future of the industry may hang upon the outcome of these negotiations. While details as to individual rates and working conditions may offer a fair field for bargaining, no amount of argument can erase two overshadowing facts: (1) Management cannot risk a prolonged suspension without endangering its hold on its remaining markets; (2) labor cannot accept an agreement which would result in higher prices to consumers without jeopardizing its own job security.

Under such circumstances, for either side to exert economic pressure to win a victory which could be only disastrous to both would be the reverse of industrial statesmanship. Responsible leadership must know this. Unfortunately, however, the glow of past glories when anthracite output could hardly keep pace with demand still seems to blind too many workers to the realities of the present competitive situation in domestic fuels. They must be made to realize that the future prosperity of the industry and greater earnings for its employees depend upon increased tonnage and lower costs—not higher prices. This is no time for serious consideration of extravagant demands.



15-ton locomotive with trip on 6,000-ft. outside tram road to Bergoo No. 2 headhouse

WEBSTER FIELD

+ Enters List of West Virginia Producers

With Twelve Mines

LARGELY developed and brought into production since 1929, the new Webster coal field of West Virginia brings additional tonnage to the already substantial output of Sewell seam coal in that State. Geographically, the Webster field lies to the north of the older Sewell fields of southern West Virginia and consists of mines in Webster and Randolph counties on the waters of the Elk and Gauley rivers. Excluding operations classed as truck or wagon mines by the West Virginia Department of Mines, twelve mines are now in operation or in process of development in the field.

Producing mines in the total of twelve include both those with and without rail connections. Two operations—Gauley River Nos. 1 and 2, Elk Lick Coal Co.—fall in the latter classification, although these mines move coal by railroad by trucking it to the nearest loading point. Other mining operations in the field are served either directly by, or by logging roads connecting with, the Baltimore & Ohio and Western Maryland railroads. Mines either on or with rail connections to the Richwood branch of the Baltimore & Ohio are Loubert No. 10, H. & G. Coal Co., and Lilly mine, Lilly Coal Co. The Cherry River Boom & Lumber Co. road receiving coal from Gauley River Nos. 1 and 2 also connects with the Baltimore & Ohio. The major tonnage in the field,

however, moves over a branch of the Western Maryland R.R. connecting with the Durbin branch at Cheat Junction. Western Maryland mines are: Baldwin mine, Elk Coal Mining Co., a subsidiary of the West Virginia Pulp & Paper Co.; Bergoo Nos. 1, 2, 3 and 4, Pardee & Curtin Lumber Co.; Golden Ridge Nos. 5 and 6, Minds Coal Mining Corporation; and Redoak No. 1, Redoak Smokeless Coal Co.

Truck and wagon mines in the field are listed in the latest report of the West Virginia Department of Mines as follows: Brown No. 7, Britton Coal Co.; Carpenter, Mack Carpenter; Halo, George Crosby; Dry Bread, Ed. Woods & Son; Elk View No. 1, B. E. Miller; and Sand Run, A. W. Talbert & Son.

The Sewell seam in the Webster field is found near the tops of the mountains at elevations ranging from about 3,000 to 3,700 ft. above sea level. Thickness of the cover generally is less than 700 ft., and the seam has a general dip of approximately 2 per cent to the northwest. Locally, however, the grades are subject to wide irregularities in occurrence and steepness. Thickness of the seam varies widely, in some places being so thin as to be unminable while running up to a maximum thickness of 5 ft. 8 in. at Golden Ridge No. 6. Average at No. 6 is 5 ft. The average at the Bergoo mines, however, is 4 ft.; maximum, 4 ft. 8 in. Maximum thickness,

including cannel coal, at Redoak No. 1 is 4 ft., and mining is carried down to 36 in.

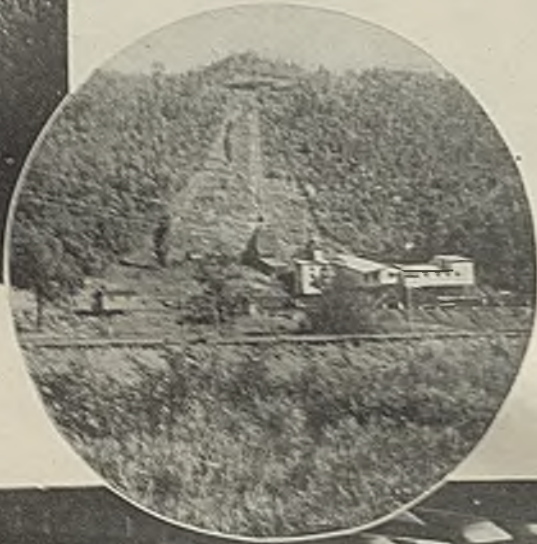
The seam is without partings or banded impurities and is characterized by streaks of mother coal. At Golden Ridge No. 5 and Bergoo Nos. 1 and 2 the seam frequently is overlaid by a streak of shale on top of which is found a laminated high-ash "head coal," the two occasionally running up to a total thickness of 24 in. from a minimum of 2 in. A stratum of slate varying up to 6 ft. in thickness overlays the head coal in places, and where not present is replaced with sandstone. At Bergoo No. 3 (including the 3A opening) and Redoak No. 1, cannel coal appears in the top of the seam, reaching a maximum of 10 in. Except for occasional bone, no foreign material is found in the top of the seam at Golden Ridge No. 6, where the roof varies from good to bad in character and from sandstone through slate and drawslate to soapstone in nature.

As compared with coal from the same seam in the southern part of the State, the Webster Sewell is harder in structure and higher in volatile matter. Fines have a distinctive granular nature. The coal, which is non-swelling, retains its shape fairly well in the fire, opening up just enough to render the use of a slice bar unnecessary in many cases. On the basis of tests made in 1934, the "average" analysis of the 5-in. resultant after preparation is about as follows: moisture, 0.9 per cent; volatile matter, 30.9; fixed carbon, 62.8; ash, 5.4; sul-

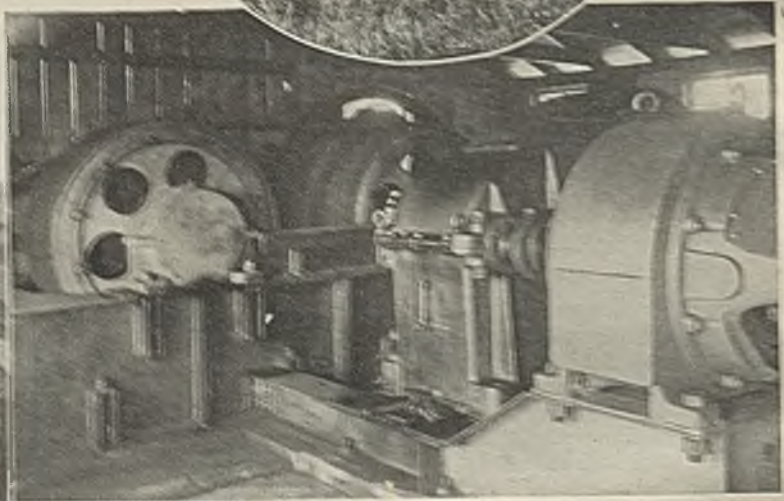


3 ft. of clean coal at Golden Ridge No. 6 mine. Kneeling are W. M. Stuart, foreman, and W. R. Cordee, night boss

Bergoo No. 2 tippie. The headhouse at the top of the incline is at approximately coal level



Showing shale and rider coal at first-aid station and office in Bergoo No. 2 mine. In the background, right to left, are F. K. Day, general superintendent, Purdee & Cuzin, Lumber Co. mines, and A. E. Phelps, superintendent, and Wade H. Mendeny, foreman, No. 2 mine



Electric incline machine. Bergoo No. 2



Mining a block at Bergoo No. 2 after a topcutting machine

phur, 0.6 per cent; B.t.u., 14,480; fusion temperature of ash, 2,876 deg. F. By far the larger part of the tonnage moves in the industrial steam-raising and by-product trades, with domestic shipments standing third in the list of outlets.

Because of its occurrence high in the mountains, the Sewell seam in the Webster field generally is reached by inclines and specifically in the cases of the Minds, Pardee & Curtin and Redoak companies, with whose operations this article deals. Lengths of the shortest incline operated by any of these three companies—that at Redoak No. 1—is 1,850 ft., while the longest, at Bergoo No. 1 and Golden Ridge No. 6, have lengths of 2,800 ft. Incline gradient at Redoak is 40 to 56 per cent. At Bergoo No. 1 it varies from 25 to 70 per cent. Monitors vary in size from 8 tons at Redoak and Bergoo No. 3 to 15 tons at Bergoo No. 2. All are of the end-dump type, with the exception of Golden Ridge No. 6, where Sanford-Day bottom-dumping units with a rated capacity of 10 and an actual capacity of 12 tons are employed.

Kanawha, Stine and (Redoak No. 1) Southside Foundry & Machine Co. incline machines are used at all mines but Bergoo No. 2. At Golden Ridge No. 6, now in process of development and equipped with a Marcus tippie with a capacity of 350 tons per hour, a Stine incline machine is connected to a 200-kw. generator converted from d.c. to a.c. service. Bergoo No. 2, the largest of the Pardee & Curtin mines in regular operation, with an average daily output of 1,800 tons, is equipped with 15-ton Link-Belt end-dump monitors controlled by a Link-Belt electric incline machine. Length of this incline, on a 30- to 65-per cent gradient, is 2,700 ft., and monitors are controlled by two lowering drums connected to a 200-hp. Westinghouse wound-rotor induction motor through a speed reducer. This equipment automatically limits monitor speed to 800 f.p.m. regardless of grade. A Thrustor-operated brake and automatic electrical control panel relieve the monitor operator of all duties but that of moving a control handle from one position to another and opening the gates in the bin chutes to fill the monitors. The Link-Belt unit replaced friction-type lowering gears at Bergoo No. 2, and eliminated trouble that previously had been encountered in operating monitors at this mine. With the exception of Bergoo No. 3, where two bins are installed at the headhouse to take care of both regular and cannel coal, coal-handling facilities at the various mines consist essentially of a bin at the headhouse into which the mine cars are dumped, plus a second bin at the tippie in the valley into which the monitors discharge.

The "Consolidation block system," with rooms and crosscuts on 90-ft. centers, is the standard working method at

all except the Golden Ridge mines. Development at the Bergoo mines is based on the use of main entries comprising five headings 12 ft. wide on 35- to 50-ft. centers. Room entries—three headings—generally are turned from the mains at intervals giving a room depth of 250 ft. An average of eighteen rooms are turned from one side of each room entry. Room width is 12 ft. and the track is carried on one side of the place, leaving a 30-in. clearance between car and rib. A row of timbers is set on the wide side. To increase the efficiency of gathering units, a sidetrack generally is constructed at the mouth of each room entry.

Where conditions permit, the usual practice at Bergoo mines is to drive up three room entries as a unit and then pull pillars on a 45-deg. line, starting at the inner end of the first entry to be driven up, the pillar line at its greatest length extending across the three entries. Modifications frequently are necessary, however, because of the irregular nature of the outcrop and the tendency of the coal to thin out locally. These conditions also make development a real problem. To cut down winding hauls in the mine and provide easier access to the various bodies of coal, drift openings are made at intervals along the outcrop and outside tram roads to the headhouse provided.

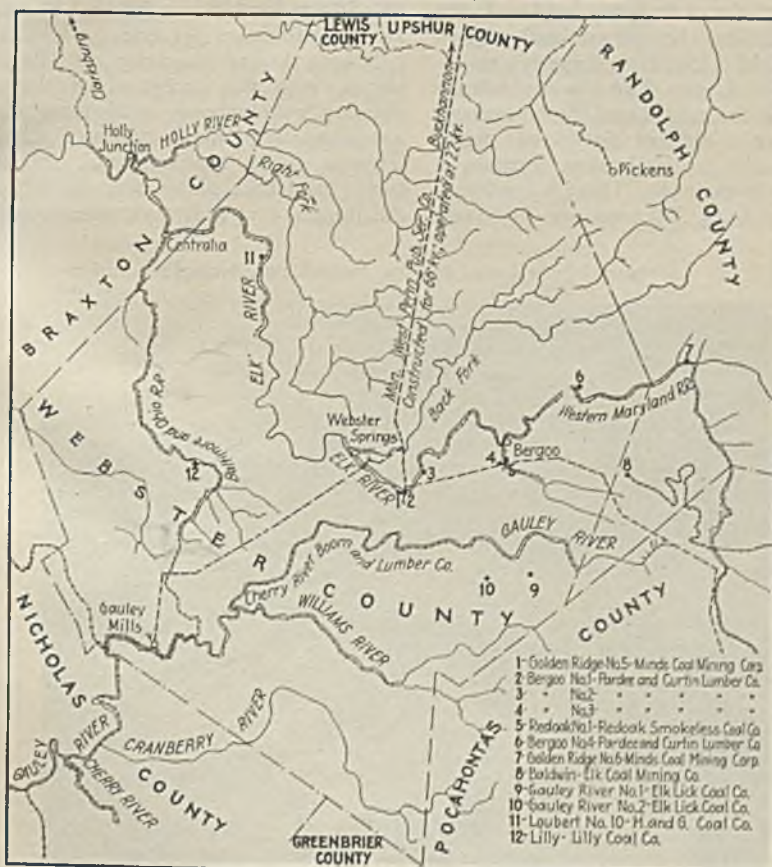
In mining individual blocks, the "pocket-and-stump" method of attack is employed, except that in starting away

from barrier pillars blocks may be opened until a fall is obtained, whereupon a change is made to pocket-and-stump working.

At Golden Ridge No. 5, operations in the various coal bodies were divided into solid work to the limits of the coal area followed by robbing back to the drift opening. The robbing cycle in the last body of coal to be worked is now entering the final stages. Main entries driven to open up the various areas were made up of five headings 10 to 12 ft. wide on 60-ft. centers. Originally, the block system employed at the other mines was used, but this was later changed to room-and-pillar mining, with rooms approximately 12 ft. wide and 300 ft. deep on 50-ft. centers. Substantially the same room measurements have been applied at Golden Ridge No. 6, although mains are made up of four headings instead of five. Four headings (15 ft. wide on 50-ft. centers) also comprise the main entries at Redoak No. 1. Room entries consist of two headings 15 ft. wide. At this mine, however, room width is 20 ft., or the maximum which can be cut by the arcwall machines used. A row of timbers is carried on each side of the track in rooms and on one side in entries.

With assistance from G. B. Southward, consulting mining engineer, Pardee & Curtin officials are conducting a conveyor test at Bergoo No. 2 to determine the possibilities of this equipment under their conditions. In addition to

Mines and railroad connections, Webster field



the conveyor unit, a Jeffrey 44C loader has been used in entry-driving work. Further mechanization in the field is presaged by the installation of a Joy 7BU loader at Golden Ridge No. 6.

Shortwall cutters are the predominant type of mining machines employed, with arcwall cutters as the second major class. Use of the arcwall type of machine was dictated by the nature of the top and the presence of cannel coal over certain areas. At Bergoo Nos. 1 and 2 and Golden Ridge No. 5, where the shale and rider coal appear, the shale and the good coal, where the places are wet, tend to stick together, with the result that both the shale and rider come down with the coal. In dry sections, the good coal is easily separated and the shale and rider stay up, except in pillar sections. Consequently, to avoid admixture of the shale and rider coal with the mine product, top cutters are employed as far as possible in wet sections in Bergoo No. 2 and also in pillar work. One topcutter at Golden Ridge No. 5 is employed in substantially the same way.

At Bergoo No. 3, entirely equipped with topcutters, the machines cut mostly in the cannel coal, overlapping the good coal just enough to make sure that no cannel is left adhering to it. The cuttings are discarded and the cannel coal is loaded separately. Substantially the same system is followed at Redoak No. 1, where the cuttings and cannel coal are loaded out and the place is swept before the good coal is shot.

At the Bergoo No. 3A workings, where territory which eventually will be tapped by No. 3 is being explored, the coal is top-cut, bottom-cut and center-sheared with a Sullivan Type 6A track-mounted coal saw. The top cut is made just below the cannel and the bottom cut just above a band of dirty coal. After shearing, the coal is broken down by a pop shot in each rib. The 3A workings produce 200 to 250 tons per day (one

shift) with 60 1½-ton cars and two 5-ton gathering locomotives.

Hand drilling is the general practice in the field, and permissible explosives are standard. Particular attention is devoted to cleaning at the face and to face preparation methods which will exclude cannel coal, other types of top material or other impurities, particularly from the standpoint of their exclusion from the fine sizes, from which they cannot be removed by hand-picking, the standard method of surface preparation.

Locomotive haulage prevails at the mines of the three companies with which this article deals. Makes include Goodman, Ironton, Jeffrey, Morgan-Gardner and Westinghouse and sizes include 15, 10, 8, 6, 5, 4½ and 4 tons, in addition to a few special rebuilt units ("doodlebugs") used at one operation. While some of the gathering units, all of the cable-reel type, also function as haulage units, sizes from 8 tons up generally are employed in main-line service.

Although some 20-lb. rail has been used at one of the earlier mines dealt with in this article, the usual weights in rooms and room entries are 30 and 35 lb. These weights also are employed on main lines, except at Bergoo No. 2, where mains are laid with 45-lb. steel and where 60-lb. steel is used on a 6,000-ft. outside haul—most of it double-tracked—from the major present opening to the headhouse. To gain height, steel ties are universally employed in rooms. Wood ties are used on main lines. Main-line motive equipment at Bergoo No. 2 consists of one 15- and one 10-ton locomotives hauling as many as 75 2½-ton cars per trip.

Standard car capacity at Bergoo mines, with the exception of the 3A opening noted above, is 2½ tons. Cars are primarily of wood construction, with Timken roller bearings and, in later types, steel flare plates over the wheels. All Bergoo cars (Helmick manufacture)

are of the end-gate type for use with kick-back dumps, except at No. 2, where a rotary dump is employed. Capacity of the plain-bearing Phillips cars used at Golden Ridge No. 5 is 2 tons, and a similar car is being used at present at No. 6, although adoption of a 4- or 5-ton type is under consideration. Fifty Sanford-Day all-steel drop-bottom cars equipped with "10-year" ball-bearing wheels are in service at Redoak No. 1, equipped with a tippie rated at 100 tons per hour. Capacity of these cars is 2½ tons.

Bergoo and Redoak mines are served with purchased power by the Monongahela West Penn Public Service Co., while the Golden Ridge operations are served by mine generating plants operating on mine-run coal. With the exception of one 150-kw. rotary converter at Bergoo No. 1, motor-generator sets (Allis-Chalmers, General Electric, Ridgeway and Westinghouse) are employed to convert a.c. to d.c. for mine use. Mine voltage is nominally 250. Bergoo No. 1, in addition to the rotary converter, is supplied by a 300-kw. m.-g. set. Both units are located in a substation at the drift mouth.

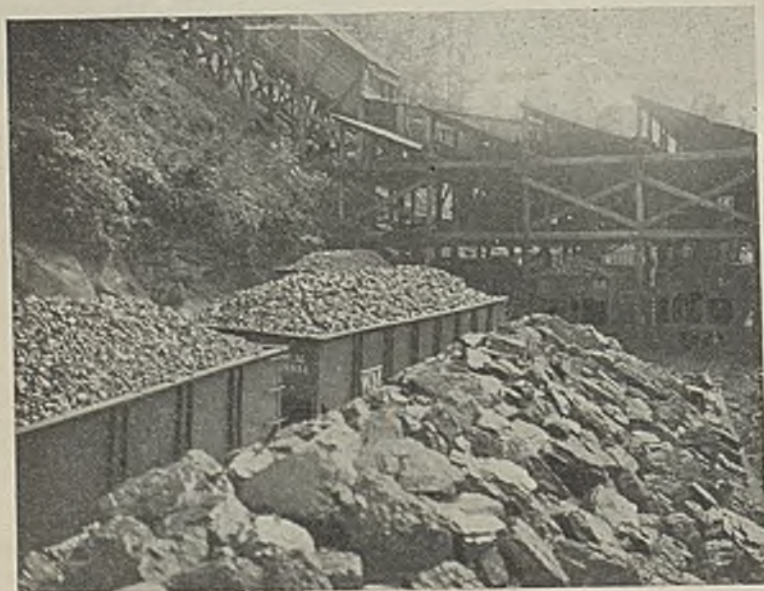
Bergoo No. 2, on the other hand, exemplifies the general practice of moving substations from time to time as one coal area is exhausted and another opened up. At present, the five m.-g. sets (two at 200 kw., two at 150 and one at 75 kw.) are installed in three substations built on the outcrop at spots where both haulage lines and working sections can be served with the least voltage drop. Two substations each are in service at Bergoo No. 3 and Redoak No. 1. In addition, a small steam plant has been installed at the latter operation to handle men and materials on the incline.

Equipment at the Golden Ridge No. 5 power plant, built adjacent to the tippie, consists of three hand-fired 150-hp. h.r.t. boilers (two in use), one engine-driven 2,300-volt a.c. generator and one 250-kw. Ridgeway d.c. generator. The a.c. equipment serves a 200-kw. m.-g. set on Laurel Run on the opposite side of the mountain from the tippie. Golden Ridge No. 6 is at present supplied by a temporary steam plant on Elk River near the tippie. A permanent plant is under construction on Hewitt's Run, across the mountain and near the center of the coal acreage. Proposed equipment includes three 150-hp. h.r.t. boilers, three 250-hp. high-pressure h.r.t. boilers, one engine-driven 400-kva. 2,300-volt a.c. generator to supply power while the mine is working and one engine-driven 200-kw. d.c. generator for use in idle periods.

With the exception of one Robinson 4½x6-ft. centrifugal fan at Bergoo No. 1, disk and propeller-type fans are employed for ventilating purposes. Bergoo No. 2 is equipped with one 6- and one 5-ft. Aerovane fans; Bergoo No. 3

(Turn to page 12)

Prepared Sewell coal leaving Redoak No. 1 tippie



LOADING AND CLEANING

+ Both Included in Mechanization Program

At Templeton Mines

SUCCESSFUL application of mechanical loaders under more than ordinarily difficult conditions characterizes the history of mechanization of loading at the Templeton mines in the Linton and Sullivan fields of Indiana, where natural disadvantages, depending upon the operation in question, vary from extreme and irregular grades to unusually bad top requiring extensive timbering. Track-mounted machines have been adopted throughout, and the seventeen in use at the three operations, with one or two pit-car loaders driving entries, account for an average daily output of 4,800 tons. Included in this figure is an average of 1,700 tons per day from three loading machines at one mine in the Linton field, where adverse grade conditions are most pronounced.

The Linton operation referred to is the New Hope mine of the Linton-Summit Coal Co., near Linton, Ind., which began operations late in 1932 on a 100-per-cent mechanical basis. Surface facilities include a washing plant for cleaning the minus 3-in. sizes. Stripping is the general practice in the vicinity of the New Hope mine, and the cover therefore is relatively light, ranging from 75 to 100 ft. The No. 5 seam worked is reached by a 35-deg. slope 107 ft. long, and the coal is dumped underground and brought to the surface by a chain-and-flight conveyor 150 ft. long with a maximum capacity of 375 tons per hour.

Thickness of the seam ranges from 5 to 7½ ft. The presence of slate bands and sulphur lenses increases the difficulty of shooting and also dictated the installation of mechanical cleaning equipment. Immediately over the coal is a stratum of black slate varying from 4 to 8 ft. in thickness and from good to bad in character. This is overlain by the hard limestone "steel band" characteristic of the No. 5 seam. Experience to date has indicated that the thinner the black slate is the more difficult it is to hold. The bottom at New Hope is a hard fireclay.

Development at New Hope is dependent largely upon the grades encountered, which vary from 5 to 8 per cent on the average, although 22 per cent has been encountered in one place in the mine. Both occurrence and direction of grades are marked by extreme irregularity, with the result that all projections are subject to modification from time to time in accordance with conditions encountered. The general plan, however, is to apply the panel system, with necessary modifications, wherever possible. Rooms are turned both ways from the panel entries, which consist of three headings 12 to 15 ft. wide on 24-ft. centers. Track is laid in all three headings, with crossovers from the side to the center headings every third breakthrough as a general rule.

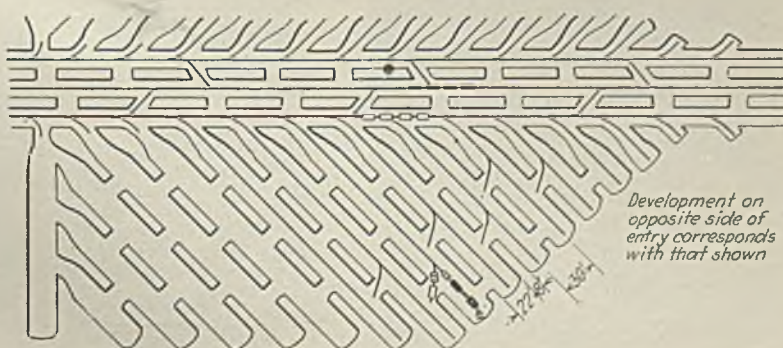
To eliminate one source of lost time—lack of coal—stress is laid on keeping a total of 20 to 25 working places, including entries and breakthroughs, available for the loader, which normally cleans up twelve to seventeen places in seven hours. Originally, development was projected on the basis of 90-deg. turns in all cases, but present plans call for a 45-deg. layout where possible (Fig. 1) to increase curve radius and thus facilitate the movement of equipment at high speed. Under this system, the first few rooms on each side of the entry are picked up from a haulage

room turned at right angles to the entry (Fig. 1), thus getting away from the triangular block of coal that otherwise would have to be left. Room standards are as follows: width, 22 ft.; centers, 30 ft.; width of neck, 12 to 15 ft.; thickness of room pillar, which is left in place, 8 ft. As the track-mounted cutting equipment has a reach of 15 ft. from the center of the track, it is possible to make crosscuts by making two 4-ft. deep cuts from opposite sides of the pillars. Room depth is dependent upon conditions encountered, particularly grades.

One Goodman 260-A track-mounted loader, one Goodman track-mounted cutter with 8-ft. cutter bar, one Chicago Pneumatic post-mounted portable electric drill and two General Electric 6-ton cable-reel locomotives comprise a loading unit at New Hope. This equipment is operated by a unit crew made up of nineteen men (Table I). Where conditions permit close grouping, one foreman is employed to oversee the operation of two loading units.

Operations in an individual place, assuming loading completed, begin with extension of the track and clean-up in preparation for cutting. To provide a substantial support for the loader and cutter while in operation, room track is laid with 40-lb. rails on steel ties, and is extended each time to within 4½ ft. of the face. A clean-up man in the meantime shovels up loose coal, scales top, if required, and picks loose coal off

Fig. 1—To facilitate haulage and movement of equipment, rooms are turned at an angle of 45 deg. at New Hope mine



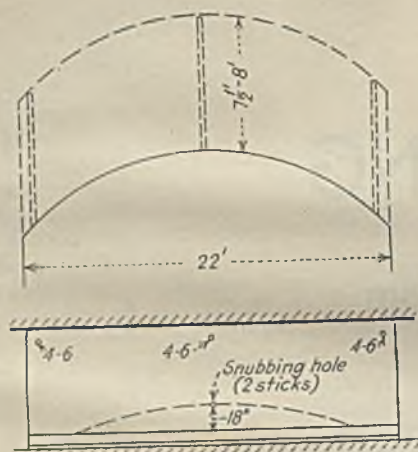


Fig. 2—Shooting plan, New Hope mine. Coal broken down by the snubbing shot is pulled out of the cut before the top holes are shot

the face and ribs. The cutting machine is followed up by a bugduster and two drillers. The latter put four holes in the face, as shown in Fig. 2, and then load the lower center snubbing hole, as well as the others, if time permits. The snubbing hole is shot immediately after the regular shift is over, by the drillers, who start late in the morning to have time to complete the firing of all snubbing shots in a section. The coal broken down by the snubbing shot is pulled out of the cut by hand, and the top holes are then shot by the shotfirer, who completes the loading of such holes as the drillers find it necessary to leave, whereupon the place is ready for the loading machine. Such timbering as may be required is done while the track is being extended or while loading is going on. Snubbing holes are loaded with U. S. permissible powder, which gives the necessary breaking force. Other holes are loaded with slower U. S. pellet pow-

der to increase the yield of coarse sizes.

Car-changing methods and equipment at New Hope have been designed with an eye to securing maximum efficiency in this department. The first step was the adoption of big cars—A.C.F. and Sanford-Day bottom-dumping types with a capacity of 5 tons of coal—thus reducing the number of car changes required. Two serving locomotives are employed instead of one, to reduce as much as possible time spent in waiting while changes are made. Track is laid in the crosscut nearest the face, and while one car is being loaded the other locomotive with an empty runs in on the breakthrough track, where it is in position to pull out and go to the loading machine as soon as the load passes the switch on its way out of the place.

Loaded trips are made up in either the center heading or the adjacent room, where they are picked up by the 12-ton main-line locomotive hauling to the dump at the foot of the slope. Empty trips generally are spotted in the side heading serving the rooms in which the loader is working, the serving locomotives picking off one car at a time. To insure rapid transit on main lines, they are laid with 60-lb. steel with generous curves.

Average daily output of the three New Hope loaders at the time this article was written was 1,400 to 1,500 tons of cleaned coal per shift. Including material rejected in preparation, the average output was 1,700 tons, or 565 tons per machine. The number of men employed underground, including night men, bosses and the crew of one Jeffrey pit-car loader driving an entry, was 98; number employed at the mine, including the surface crew, was 126. Individual New Hope loading machines in the past have loaded, under better

Table I—General Make-up of Loader Crews at New Hope, Baker and Peerless Mines

	Jeffrey 44C, 44CC (Baker, Peer- less)	44D (Baker)	Goodman New Hope	Baker, Peer- less
Loader operators (\$7.45).....	1	2	1	1
Helpers (\$7.45).....	1	1	1	1
Cutters (\$7.45).....	1	1	1	1
Drillers (\$6.65).....	1	1	1	1
Bugdusters (\$5.07).....	1	1	1	1
Motormen (\$5.19).....	1	1	1	1
Tripriders (\$5.07).....	1	1	1	1
Chunkers (\$5.07).....	1	1	1	1
Timbermen (\$5.07).....	1	1	1	1
Trackmen (\$5.07).....	1	1	1	1
Can-up men (\$5.07).....	1	1	1	1
Saubbers (\$5.07).....	1	1	1	1
Shotfirers (\$6.65).....	1	1	1	1
Wiremen (\$5.07).....	1	1	1	1
Bosses.....	1	1	1	1

*Men in this classification not assigned to specific loading units. At Baker and Peerless, drillers also do shotfiring.

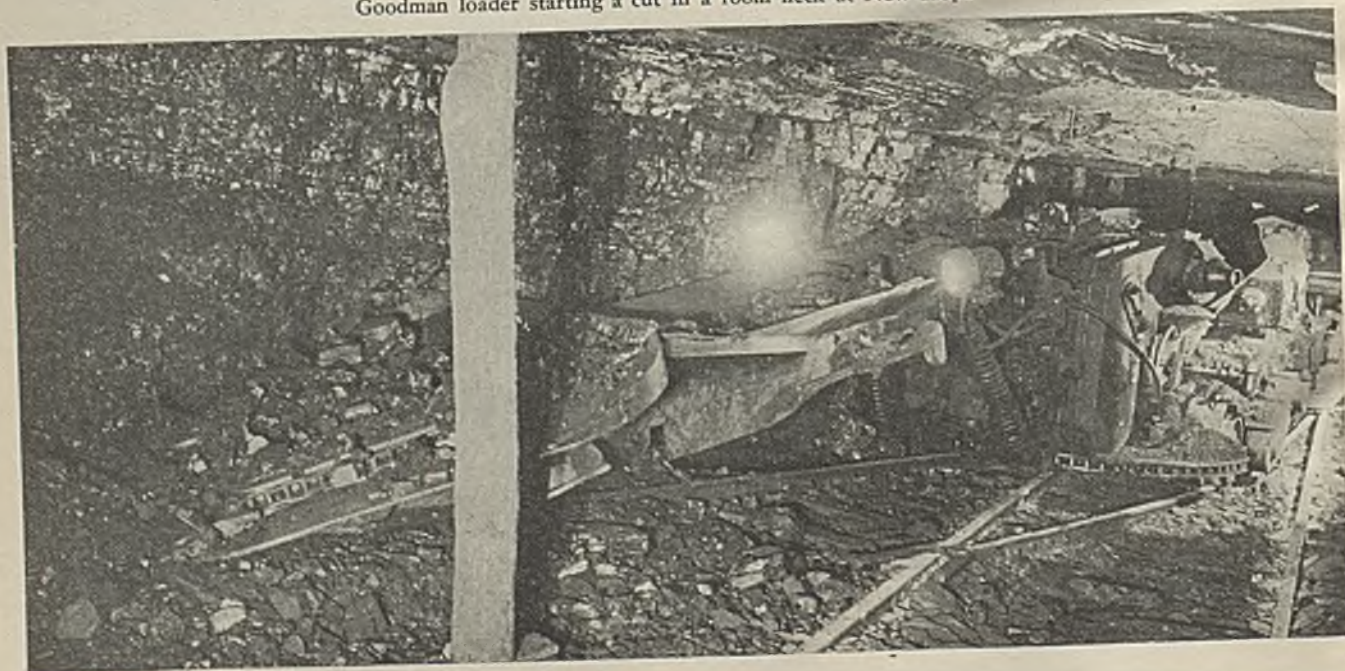
†Also fires shots.

working conditions, as much as 700 tons of cleaned coal in eight hours.

Mechanization at the Baker mine of the Glendora Coal Co. and the Peerless mine of the Templeton Coal Co., originally hand-loading operations, represents an evolution from transitional to high-tonnage equipment. Original purchases of mechanization equipment were concentrated on pit-car loaders, all of which have been displaced, except for units occasionally employed in entry driving. Medium-capacity track-mounted equipment was next chosen for use at the two mines, and, having demonstrated the practicability of machine loading, gave way to high-tonnage equipment installed to raise individual loader output and concentrate production in a smaller area. The final step at Baker and Peerless was completed late in 1935.

Both Baker and Peerless are shaft operations in the Glendora seam, which occupies approximately the same posi-

Goodman loader starting a cut in a room neck at New Hope



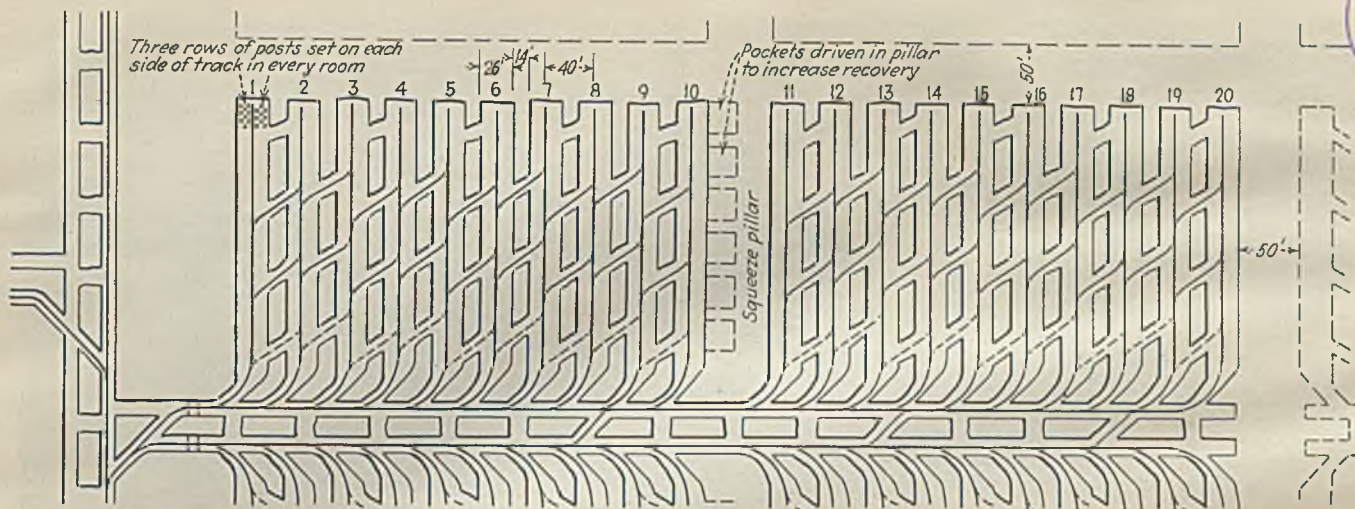


Fig. 3—Panel system of mining at Baker and Peerless mines. Room tracks are connected through the last two crosscuts and a squeeze pillar is left in the center

tion as the Indiana No. 5 but is radically different in character. Thickness of the seam ranges from 6 to 7½ ft., and it is overlain by 12 to 15 ft. of gray chalky slate which must be timbered carefully as soon as the coal is removed to prevent falls. Over this stratum is the black slate normally overlying the No. 5 coal. One feature of the top at Baker and Peerless is the occurrence of gas under sufficient pressure to force it down 3 or 4 in., with the result that if it is not drilled in advance, accidental release of the pressure causes the timbers to fall out. While the coal is rolling at the two mines, the heavy grades characterizing the New Hope operation are seldom encountered.

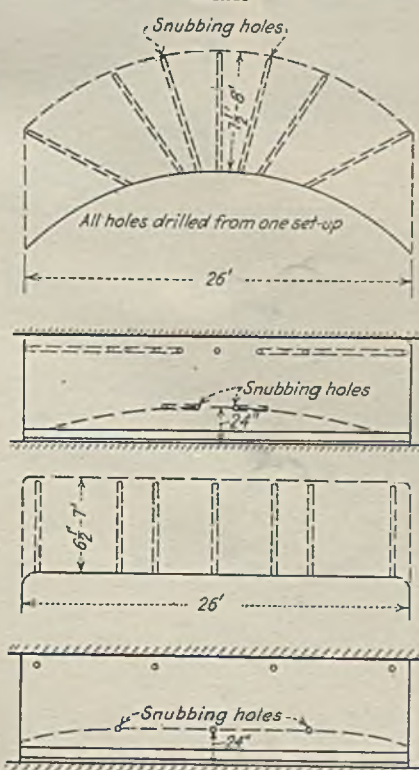
Development at Baker and Peerless is predicated on the use of panels surrounded on three sides by solid pillars of coal, the pillar on the fourth side being broken only by the panel headings, of which two, driven 12 ft. wide on 29-ft. centers, make up the panel entry. Rooms are turned both ways from the entry (Fig. 3) and a complete panel comprises 40 working places. Squeeze pillars are left in the centers of the panels by omitting a room. These furnish protection in case trouble is encountered in the inner rooms and permit sealing when desirable. Most of the coal in squeeze pillars is recovered by splitting them from Room 10, as indicated in Fig. 3. Upon completion, panels usually are sealed at the mouth.

Rooms at Baker and Peerless are necked 12 ft. wide, as shown in Fig. 3, the angle neck allowing the use of a larger-radius curve and thus facilitating equipment movement. Widening to the full width of 26 ft. starts with the fourth cut. Room centers are 40 ft., making the thickness of the pillars 14 ft. Where only one machine is installed in a panel, the inner group of twenty rooms usually is worked out first. If two machines are installed, all 40 rooms are worked simultaneously. Room depth varies somewhat in accordance with

conditions, but generally it is 250 ft.

Loading and auxiliary equipment at Baker consists of four Goodman 260-A loaders, one Jeffrey 44D loader, two Jeffrey 44C loaders, two Goodman track-mounted cutters identical with those at New Hope, three Sullivan shortwall cutters with 6- and 7-ft. cutter bars and five Dooley Bros. one-man post-mounted electric drills. Equipment at Peerless includes: four Goodman loaders, three Jeffrey 44CC loaders, two Goodman track cutters, three Sullivan shortwall cutters and four Dooley Bros. drills. Loaders are served with 6-ton General Electric locomotives.

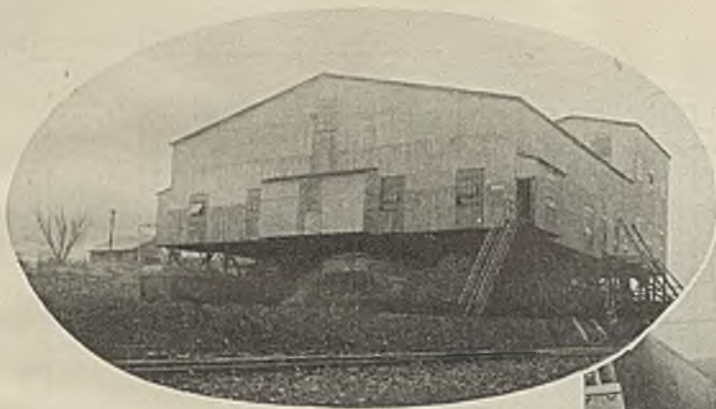
Figs. 4 and 5—Shooting plans (top and bottom, respectively) with track-mounted and shortwall cutters, Baker and Peerless mines



Extending track is the first operation in starting a new cycle in a working place at Baker and Peerless, supplemented by cleaning-up where Goodman loaders are employed, after which the place is cut on the bottom by a shortwall or track-mounted machine, as the case may be. In the cases of the Goodman loaders, two of these machines operate in a single panel of 40 rooms, one taking the group of twenty places on one side of the entry and the other the corresponding group on the opposite side. This permits one track-mounted cutter to cut for both loaders. Cutting for each Jeffrey loader is handled by a shortwall machine.

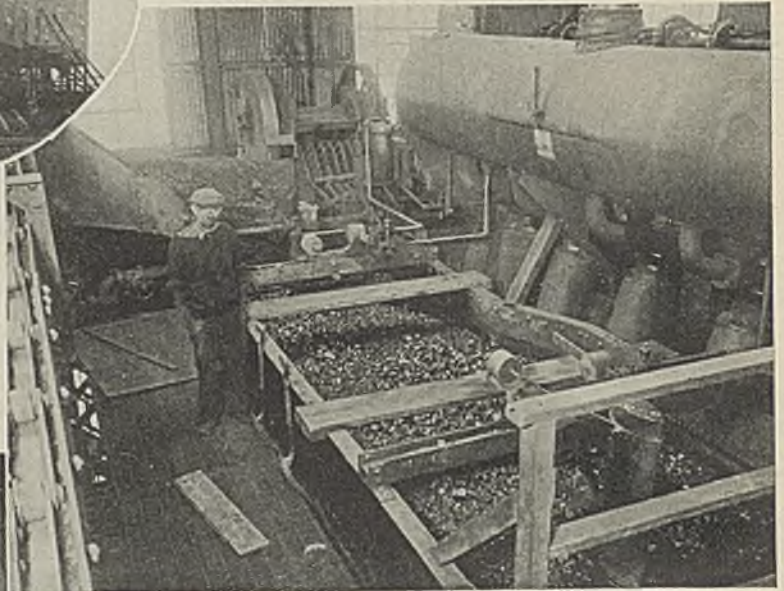
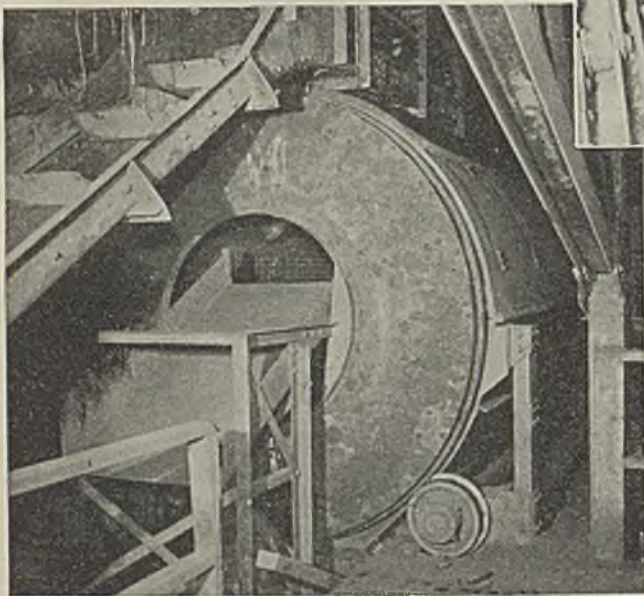
Extension of timbering and drilling follow cutting. Three rows of posts on 4- to 6-ft. centers are set on each side of the track as a general rule, with safety posts at the face. Faces at Baker and Peerless are shot with seven holes, as in Figs. 4 and 5. Two snubbing holes are used in places cut by track-mounted machines and three in places cut by shortwall machines. Holes are loaded with U. S. permissible powder and approximately ten sticks are used per cut.

In starting a cut with a loading machine, the general practice at Baker and Peerless is to dig to the back of the cut directly in front of the track. A safety post is then set at the face by the timberman and the right and left sides are cleaned up, other safety posts being set as required. Goodman loaders are served by two locomotives; Jeffrey loaders by one locomotive. To shorten equipment travel and also reduce car changing to compensate in part for the greater number of charges required for the small car (slightly over 2 tons when mechanically loaded) now in use, room tracks are connected through the last two crosscuts (Fig. 3). Rear cross-cut tracks are moved forward as fast as new openings are made. Track, laid on 3x5-in. wood ties, is carried in the center of the room. Partings are established on the cross entries between every

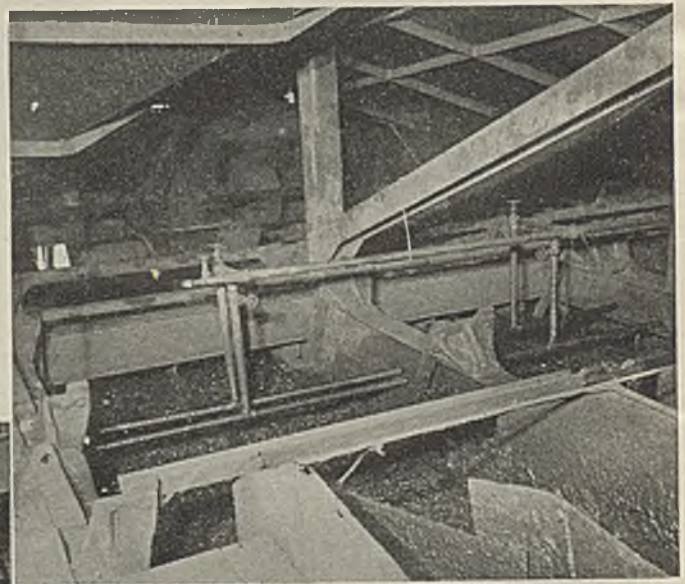


New Hope coal is screened and cleaned in this all-steel preparation plant with five loading tracks

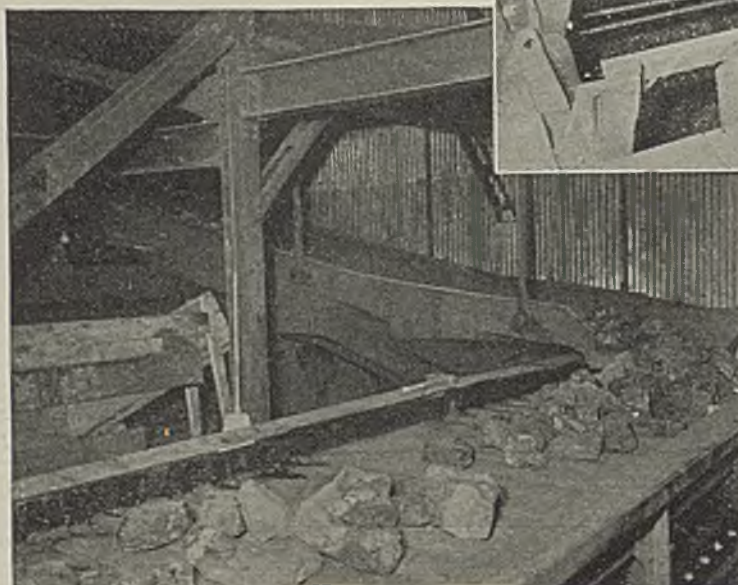
Coal adhering to material removed on the picking tables is reclaimed in a rotary breaker with 2-in. perforations. Refuse flows down the chute to the refuse hopper.



Minus 3-in. coal is cleaned in a five-cell washer equipped with counterpoise type automatic reject control



Minus $\frac{1}{4}$ -in. cleaned coal is de-watered on three high-speed shakers equipped with $\frac{1}{4}$ -mm. wedge-wire sieves



Lump and egg discharged from the main screen are picked in horizontal section of the lump and egg picking table-loading booms

of the combined picking table-loading boom type—and a slack belt are provided for loading the primary sizes which the plant is designed to ship. These are, at present: hand-picked 6-in. lump and 6x3-in. egg, and washed 3x2-in. nut, 2x1½-in. nut and 1½-in. slack. By changes in screen plates and handling and mixing routines, however, it is possible to ship any size or combination of sizes desired by the market. As a rule, however, the principal product is a 6x1½-in. engine coal.

Raw mine-run brought out of the mine by the slope conveyor is discharged onto the main shaker screen at New Hope, where it is separated into 6-in. lump, 6x3-in. egg and minus 3-in. resultant. The latter is discharged onto the conveyor-elevator leading to the washer, while the egg and lump go to the picking sections of the egg and lump booms. Lump and egg degradation is removed on 1½-in. round-hole screen sections, the undersize dropping onto a short cross conveyor leading to the washer-feed conveyor.

Picking at New Hope is designed to yield two products: pure refuse and lumps containing recoverable coal. The pure refuse goes to one compartment of a chain-and-flight conveyor in which it is transported to the dry-refuse hopper. The other material is carried in the second conveyor compartment to a rotary breaker with 2-in. perforations. Material through the perforations is conveyed to the main slope conveyor by a short screw conveyor, while material retained by the perforations (refuse) drops into the dry-refuse hopper.

Minus 3-in. coal from the main shakers normally goes to the washer, although it can be bypassed to the classifying screen for separation into dry nut and slack. In this case, the minus ¾-in. material from the upper section of the classifying shakers goes directly to the slack-loading belt, bypassing the dewatering screens. The New Hope washer also was used to clean slack from the company's No. 1 mine, now worked out, and to handle this material, brought in in railroad cars, a dump hopper was constructed under the egg track on the upper side of the plant. From the hopper, a chain-and-flight conveyor elevated the coal directly to the washer.

Cleaned coal from the washer flows with the water to the washed-coal classifying shakers, on which it is separated into 3x2-in. nut, 2x1½-in. nut, 1½x¾-in. nut and ¾-in. slack. Refuse from the washer is discharged onto a belt conveyor leading to the wet-refuse hopper. The 3x2- and 2x1½-in. nut made on the classifying shakers go directly to their respective loading booms, while the ¾-in. slack flows with the water to a battery of three high-speed dewatering shakers operating in parallel. These shakers are equipped with ¼-mm. wedge-wire sieves, which reduce

moisture to approximately 7 per cent. Dewatered material is discharged to the slack-loading belt, where it joins the 1½x¾-in. nut to make 1½-in. slack.

Material through the ½-mm. wedge-wire sieves on the dewatering shakers flows with the wash water to a sump, from which it is pumped to a conical settling tank. Clarified water overflowing the tank returns to the washer. Solids settling to the bottom generally are run to waste, although they can be returned by gravity to another battery of three high-speed shakers with ¼-mm. wedge-wire sieves in case recovery of the coal or water, or both, is desirable. If slurry is treated on the screens, the ½x¼-mm. material usually is discharged to the refuse conveyor, although it can be run to the slack belt for loading. Minus ¼-mm. material is returned with the water to the pump sump.

Mixing at New Hope is accomplished by a chain-and-flight conveyor arranged to receive coal from the loading booms and slack belt when in raised position. Mixing, as such, is done on the bottom strand. Between this and the top strand a double-roll crusher is mounted, receiving lump and egg from the lump and egg booms on the top strand of the mixing conveyor. The crusher is adjustable for breaking the feed to as small as 3 in. and under, if desired. A double discharge chute and fly gate allow the crusher product to be chuted either to the bottom strand of the conveyor for mixing or transportation to the proper loading point or to a return belt conveyor, which elevates it to the head of the main screen for re-sizing, the coal thereafter following the normal channels until it again returns to the loading points.

Webster Joins West Virginia Producing Fields With Twelve Mines

(Concluded from page 6)

with a 6-ft. Aerovane and a 5-ft. disk fan. Golden Ridge No. 5 is the only other mine besides Bergoo No. 1 where conditions have permitted ventilation with only one fan—a 10-ft. Stine disk unit. As in the case of substations, removal of fans to new locations from time to time and the use of more than one unit is necessary for substantially the same reasons.

Surface preparation at Webster field mines is largely based on screening and hand-picking of the large sizes to remove impurities. As noted above, the greatest stress is laid on cleaning at the face, with picking at the tipples therefore taking on the nature of a polishing process. Cannel coal is classed as impurity, and particular care is taken to eliminate this material from all shipments, especially for byproduct use.

Shaker screens are standard at all but

one operation for sizing, and are supplemented at Bergoo No. 2 and Redoak No. 1 by vibrators for making nut and pea from slack. Loading booms are employed for the larger sizes, and at Bergoo No. 2, Pardee lowering chutes are used to lower the nut and pea into the railroad cars. Marcus tipples moved from the Pennsylvania operations of the Minds Coal Mining Corporation serve Golden Ridge Nos. 5 and 6. The Bergoo No. 2 tipples, all-steel, was supplied by the Link-Belt Co. and is equipped with mixing equipment, crusher, pea and slack bins and a rescreening plant for nut and pea served by auxiliary conveying equipment. Bergoo No. 4 is at present equipped with a temporary three-track Fairmont tipples, which will be replaced by a permanent six-track installation. Other tipples were erected by the companies themselves.

Table 1—General Characteristics of Preparation Plants and Sizes Produced, Bergoo, Golden Ridge and Redoak Mines*

	No. 1	Bergoo No. 2	No. 3	Golden Ridge No. 5	No. 6	Redoak No. 1
Hourly capacity, tons.....	150	250	150	150	350	100
Type of screen.....	Bar	Shaker†	Shaker	Shaker	Shaker	Shaker†
No. loading tracks.....	Three	Five	Four	Four	Four	Four
No. loading booms.....	One	Three	Two	Three	Three
Sizes Produced, Other Than Mine-Run, in Inches						
Lump.....	1, 2, 3	5	5	1, 2, 3, 5, 6		2, 3, 5
Egg.....		3x5	3x5	2x5, 2½x5, 3x5, 2x6, 2½x6, 3x6		3x5
Stove.....		2x3				2x3
Nut.....		1x2		1x2, 1x2½, 1x3		1x2
Pea.....		½x1				½x1
Resultant.....	3, 2, 1		3, 1	5		
Byproduct.....	Up to 5					
Slack.....		5, 4, 3, 2, 1		3, 2½, 2, 1		3, 2, 1, ½

*Sizes included in the table are those customarily shipped; other sizes can be supplied by changes in screens. Temporary three-track tipples at Bergoo No. 4 (not included in table) will be replaced by six-track permanent tipples when warranted by output. Additional sizes are contemplated at Golden Ridge No. 6 by adding two more loading tracks to the four included in the original design.

†In addition to three vibrators for making nut and pea; these sizes are loaded by Pardee lowering chutes.

‡In addition to vibrator for nut and/or pea.

TIPPLE RECONSTRUCTION

+ Gives Mona Mine Modern Preparation Facilities At Less Than Cost of New Plant

OF THE TWO general methods of meeting the demand for a better-prepared coal—construction of an entire new plant or revision of existing facilities—the Arkwright Coal Co., operating the Mona mine, on the Monongahela River near Morgantown, W. Va., chose the latter as the less costly means of meeting the more stringent market requirements of late years. In making this decision, officials of the company were swayed by the fact that most of the refinements characterizing a modern tippie could be added to the existing plant and its capacity materially increased with an outlay substantially under the estimated cost of a complete new preparation plant.

While adequate in the days when preparation standards were less rigid, the shortcomings of the old tippie, of which the principal one was lack of picking facilities, began to make themselves felt as far back as 1929. Picking on the car was instituted to meet the demand for a cleaner coal and served the purpose until early this year. Lack of facilities for making mixtures and inadequate screening equipment also played a part in the progressive decline in the plant's ability to meet market requirements, which necessitated slowing down the rope-and-button conveyor from the dump to the tippie early in 1935 to allow the plant to perform at the required efficiency, thereby bringing the situation to a head.

Normal capacity of the old plant—a wooden structure with wood sheathing—was approximately 150 tons per hour, although a maximum of 200 tons per hour was attained at times. To handle the production of the mine, considerable tippie overtime was necessary in late years. Capacity of the reconstructed plant is 350 tons per hour. In addition to a crusher installed in 1929, major equipment in the old plant comprised a shaker screen, two loading booms, a slack storage bin with loading chutes, and a truck-loading plant consisting of

auxiliary screening equipment and bins for domestic sales.

When operating on a screening basis, lump and egg made in the old plant were loaded over the respective booms and the slack was conveyed to a 70-ton slack bin, from which it generally was chuted to the present No. 3 track, then the egg track, although an auxiliary chute permitted the loading of slack on the present No. 2, or old lump, track. By closing the gates on the screen then in use it was possible to run the entire output or lump and egg together or separately onto an apron conveyor leading to the truck-loading bins, where it was passed over the screens and deposited in the proper bin or bins. The crusher originally was installed at the end of the present nut, or old egg, loading boom with a chute from the present egg, or old lump, boom, thus making it possible to crush lump to egg and smaller for loading with the egg coal made on the original shaker.

In reconstructing the tippie, no changes were made in the original

dumping facilities, consisting of a kick-back dump, storage bin and reciprocating feeder for moving the coal onto the rope-and-button conveyor. Under the present arrangement, the conveyor discharges onto the upper section of the double-deck shaker screen, although the coal can be bypassed to the crusher, which was relocated under the lower end of the conveyor. When running coal to the crusher, the sliding plate over the bar screen ahead of the unit is moved back, thus bypassing the fines around the crusher to an elevating conveyor leading up to the shaker screen. Oversize, after passing the crusher, is discharged into the same conveyor, where it joins the undersize. Crushing was found necessary some years ago, due to the fact that the Pittsburgh seam coal in this region is relatively soft, with the result that domestic sizes are subject to disintegration in shipment and therefore are at a disadvantage in competition with harder coals. This and the trend to smaller sizes led to the introduction of crushing, and the present arrangement allows all sizes to be reduced to slack, if necessary—an impossibility with the original layout.

Mona preparation plant as rebuilt for greater efficiency



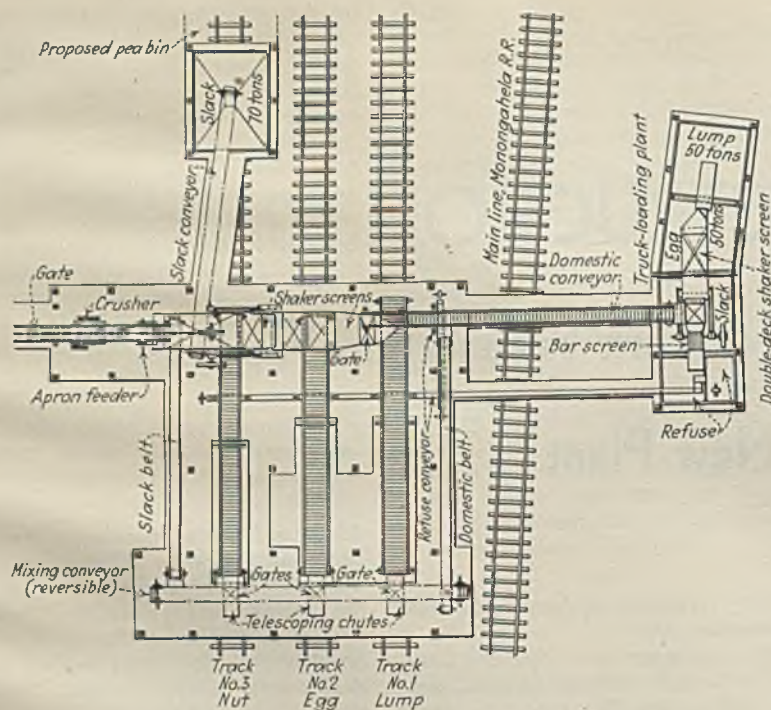


Fig. 1—General plan of reconstructed tippie at Mona mine

The new shaker screen, equipped with wooden springboard hangers and wooden connecting rods, is 7 ft. wide and includes 14 ft. of 1-in. round perforations for slack, 9 ft. of 2-in. perforations for nut and 7 ft. of 4-in. perforations for egg, with lump as the oversize over the end of the screen. Total screening area therefore is 210 sq.ft., divided as follows: slack, 98; nut, 63; egg, 49. Total screening surface of the old screen was 70 sq.ft., making it difficult to obtain reasonable accuracy in screening without unduly reducing the tonnage.

Under the present arrangement, slack taken off on the upper section of the screen generally goes to the slack-loading bin. However, as a result of the addition of a 24-in. belt conveyor and a chain-and-flight mixing conveyor, the slack can be mixed with any one or all of the three prepared sizes in shipping mixtures and picked mine-run. Also, by means of a second 24-in. belt conveyor, another addition to the plant, it is possible to run slack around to the truck-loading bins, if desired. By making the mixing conveyor reversible, the maximum of flexibility in loading arrangements was secured.

Nut and egg from the shakers are loaded over the original steel-apron booms, which were lengthened 12 ft. to provide picking space. A new picking table-loading boom of the same type was installed for lump. This boom discharges to cars on a third tippie track 700 ft. long, also an addition to the old plant. Pickings from the three tables are transported to the refuse bin, made by partitioning one of the original truck-loading bins, on a new chain-and-

flight conveyor. When lump is being run to the domestic bins, picking stations added along the old apron conveyor to the truck-loading plant are employed, a short transfer conveyor carrying the pickings to the main refuse conveyor.

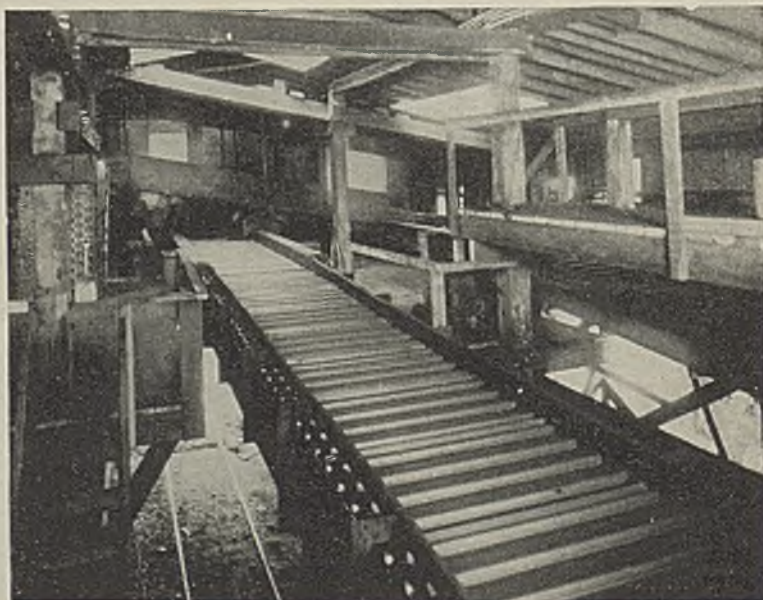
As indicated in the plan view of the new plant (Fig. 1), the center line of the new shaker screen corresponds to that of the old one, although the new screen is approximately twice the length of the old unit. Practically all of the other new equipment was added around the space occupied by the old, one new bay being constructed to accommodate the new lump boom. Auxiliary screen-

ing equipment, shown over the domestic bins in the figure, it is expected, will be removed and simple bar-type degradation screens installed. Plans also are under consideration for the installation of a new bin adjacent to the present slack bin to permit the shipment of a pea size, which would be made on two vibrating screens operating in parallel and receiving the slack from the present slack conveyor. While the new bin would be over No. 3 track, pea would be loaded on No. 2 track to allow installation of degradation screens in the loading chutes.

As a result of revisions in the Mona plant, made from plans drawn by the Fairmont Machinery Co. with the assistance of Joseph Arkwright, president; Roy H. McLain, sales manager; and E. D. Gall, superintendent, Arkwright Coal Co., the connected load was increased 50 hp. Connected load in the old plant was 100 hp. Actual operating horsepower, however, will not be increased over 25 per cent, it is expected, as all of the new units will not be in operation at once as a general rule. Texrope drives predominate.

The truck-loading station at Mona mine is equipped with calcium-chloride spraying equipment for treating lump, egg, nut and, as a matter of convenience, slack sizes. A substantial tonnage of slack is sold for stoker use in Morgantown and other near-by communities. Wetting with some liquid is desirable in this trade, and the use of calcium chloride serves not only this purpose but offers protection against creation of dust in the consumer's premises. The use of dustless treatment has met with a favorable reception at the hands of purchasers and has been an advantage to the company in that it has either given it a competitive advantage or enabled it to secure a premium in price.

Picking floor in Mona tippie, with shaker screen in the background



FAN DESIGNED

+ On New Aerodynamic Principles

By A. L. BARRETT

*Pittsburgh Coal Co.
Library, Pa.*

ALTHOUGH the general theory and characteristics of centrifugal fans are well known to mining engineers and their efficiency has been improved recently—with some further improvements still possible—yet in the light of aerodynamic theory it must be recognized that the practical limit of their efficiency has been nearly reached. On entering a centrifugal fan the air must make two abrupt changes in direction: one to an axial direction as it enters the fan from the fan drift, another to a radial direction as it enters the fan wheel. Intake velocity of a centrifugal fan is high, and its pressure losses at these points are approximately equal to the velocity pressures.

The cross-section of the air path from the inlet opening to the outside of the fan wheel increases at a rate much too high for efficient expansion, hence vortices are formed behind each blade, resulting in immediate back-flow losses, and where the air stream enters the scroll these vortices introduce additional losses. As clearances must be provided between the side of the fan wheel and the casing on each side of the fan, air inevitably will pass in centrifugal fans from the discharge through these openings to the inlet side of the fan, resulting in power losses. Though further improvement in design may reduce these back flows of air, they cannot be eliminated, and they definitely limit the maximum efficiency of this type of fan.

Fairings Reduce Resistance

Being free from most of these losses, propeller fans of the Troller type operate at higher efficiencies. Essentially, this fan consists of a propeller mounted to revolve in a ring which is a part of a straight streamlined air duct from inlet to exhaust. Air passes from the intake, which may be rectangular in cross-section, to the propeller ring through a gradually contracting duct and then is exhausted through a concentric duct with a similar gradual expansion.

A streamlined fairing, or shield,

guides the air past the propeller shaft and bearings, blocking off the central portion of the propeller ring. Fixed vanes also guide the flow of air. Thus it is caused to travel in a nearly straight path through a duct having no sudden expansions or contractions; all parts are streamlined to prevent the formation of vortices. Fans of this type have been designed and built at the Pittsburgh Coal Co.'s shops, Library, Pa., to accord with the fan theory developed by Theodor Troller, director, Guggenheim Airship Institute, Akron, Ohio.

Method of Streamlining

A shop view of one of these fans, belt-driven from a motor located just outside of the fan proper, is shown in Fig. 1. Welded-steel construction is used throughout. The base, made of H-beams to keep down the over-all height, consists of two members running the full length of the fan tied together at the ends and under each bearing. To facilitate the streamlining of the vertical supports which carry the bearings, a pipe is used as a support on the upstream and a channel on the downstream end. Side supports for the bearings pass through the lower belt fairing to short braced vertical members tied to the base on the motor side of the fan. Like the vertical bearing supports, these bearing support braces consist of a pipe upstream and a channel downstream to simplify the construction of a streamlined fairing around them.

The upper half of the belt runs in a streamlined fairing of identical shape with that built around the bearing braces. The outer casing of the fan is made of sheet steel stiffened externally by angle irons. The propeller ring is made in the form of a channel opening to the inside of the fan. Heavy material is used for this part to insure permanent concentric location with respect to the path of the propeller tips.

After completion of all other welding

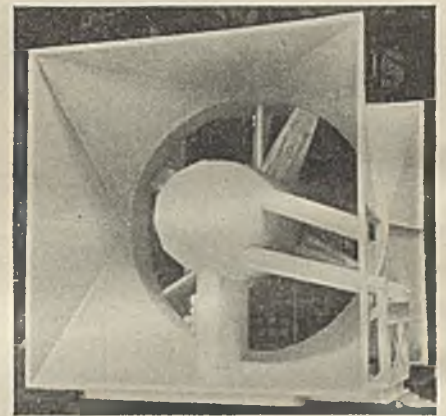


Fig. 1—Fan and casing. Note fairings on pedestal, motor and bearings and on belts

in the construction of the fan, a $\frac{1}{8}$ -in. sheet-metal ring is located inside the heavy channel ring, closing it and defining the small propeller-tip clearance. The air is propelled by four wood blades, protected by brass coverings at leading edges and tips and shielded from moisture by a heavy rubber coating. Self-aligning ball bearings sealed in steel pillow blocks carry the short propeller shaft and insure it of long life, even though it be subjected to misalignment or dust.

The inner fairing, which incases the pulley and bearings, has the relative proportions of a dirigible headed upstream. This shape contributes to efficient contraction of the air as it approaches, and to its low-loss expansion as it leaves the propeller. This fairing, made in two parts, is supported on the upstream side by the bearing supports and on the downstream side by the vanes which aid in straightening the flow of the air as it leaves the fan.

Has Low Installed Cost

In the fall of 1933 the first mine fan of this type to be erected in this country was built and installed by the Pittsburgh Coal Co. It was a rather crude structure, built underground and using the ring, foundation and bearing supports of an old disk fan. Only a few of its parts were streamlined and some errors in design were made, but, in spite of this, the fan delivered 200,000 cu.ft. of air per minute at a pressure of 4 in. of water gage with an efficiency of 78 per cent. The cost of the fan in place and the efficiency were so satisfactory that further studies were made. A new design was evolved which seemed desirable in installed cost, efficiency, portability and adaptability to varying mine conditions. Construction was started and has continued until, at the present time, the company has nine of these fans in service. Static efficiencies at the fan as high as 86 per cent have been attained.

The characteristic curves of a fan of

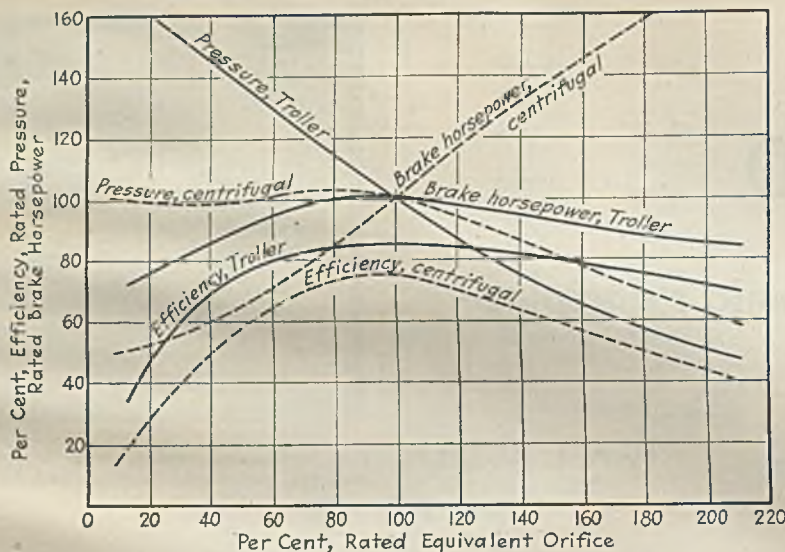


Fig. 2—Characteristic curves of centrifugal and propeller fan

this type and those of a modern centrifugal fan running at constant speed are shown in Fig. 2. The flat-topped efficiency curve of the propeller fan is particularly desirable in that it allows a wide variation of the mine equivalent orifice without a great sacrifice of fan efficiency. Maximum static pressure obtainable with fans of the Troller type is about the same as with the centrifugal type, which is approximately 20 in. of water for air under atmospheric conditions.

Pressure produced by this type of fan at a given speed is inversely proportional to the volume of air passing through it. Working range of the pressure curve is essentially expressed by the formula: Per cent of rated pressure = $200 - \text{per cent of rated volume}$. With suddenly increased mine resistance, such as would be caused by a large fall in a main airway, the pressure increases, and the volume will not decrease as much as with a centrifugal fan, for which the pressure is more nearly constant from rated volume to zero. Also the power input at a given speed reaches a maximum at rated equivalent orifice, decreasing if the equivalent orifice either increases or decreases.

Such a power characteristic allows the fan motor to be operated at a load very near its rated power output, as changes in airway resistance cannot cause an overloading of the motor. On the other hand, the power input to a centrifugal fan increases with the equivalent orifice throughout its working range, and a motor fully loaded at the rating of the fan will be overloaded if the equivalent orifice increases.

Reasons for these characteristics may be seen in the design of the fan. The propeller is so shaped that the axial velocity of the air over the whole fan area is nearly constant at a given fan speed. Propeller-tip clearance is held to

a tenth of an inch. The air at the propeller tip has a high axial velocity, and, due to viscosity, the air in the small clearance space is mechanically pulled along with it, preventing back flow. Vortices of appreciable magnitude do not form in this space because the particles of air in the boundary layer at the outer casing are continuously receiving energy from other air particles being moved axially past them. The particles in the boundary layer, except those at microscopic distances from the outer case, thus continue to move forward and no air moves backward, though flow at this point may be less than the theoretical value.

Expansion losses are minimized by holding the expansion rate to such a low value that the sum of all the forces on the particles near the outer and inner fairings tend to move these particles to the discharge side of the fan. The uniformity with which velocity is distributed over the fan area is a big factor in insuring efficient expansion at the greatest possible rate. Parasitic friction losses are held to a low value by the complete streamlining of all parts of the fan which project into the air stream. Both sides of the belt run in

streamlined casings. The bearing supports are similarly streamlined, and the inner fairing streamlines the pulley and bearings. Straight-line flow of the air through the fan makes effective the streamlining, which could not otherwise be obtained. The total air-friction losses in the fan bearings is less probably than 2 per cent of the fan power input.

The propeller, of course, is the most important part of the fan. It must be designed in such a way that every element of the blade adds an equal quantity of energy to the air passing by it if the velocity is to be uniform over the fan area at the propeller. That the action of a propeller may be better understood, the airfoil theory will be described briefly.

If a flat plate is placed in an air current it is at once apparent that a force is acting on it. If the plate is perpendicular to the air current, the force will be in the direction of flow. When the plate is turned at some angle to the flow, the force is inclined and may be resolved into two components, one in the direction of flow and one perpendicular to that direction. The cross-wind component of force may be much greater than the drag in the direction of flow.

An airfoil is a body so shaped as to provide a maximum cross-wind force, or lift, with minimum down-wind force, or drag. Fig. 3 shows a cross-section of a typical propeller airfoil with the resultant force acting on it when it is inclined at an angle to the air. For practical purposes air may be considered as a fluid having no viscosity or compressibility. The forces on a body in an air stream may be expressed as a function of the largest projected area of the body and the velocity of the air stream. The expression $R = K S V^2$ is a good approximation for the resultant force on the airfoil. K is an experimental resistance coefficient which is constant for a given airfoil under working conditions, S is the projected area of the airfoil and V is the air velocity. The components of the force R are expressed in a similar way. Lift

Fig. 3—Lift and drag relations

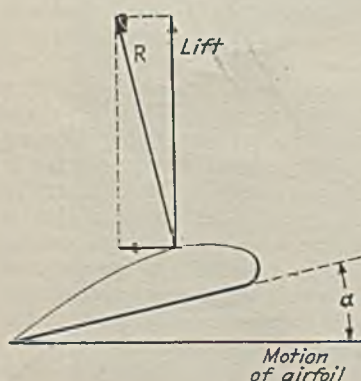
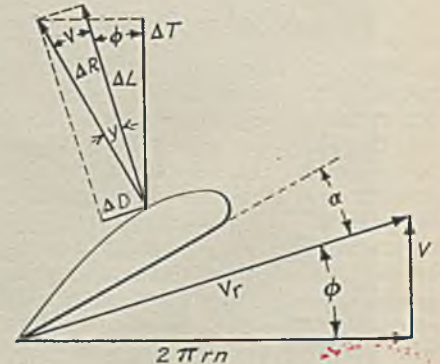


Fig. 4—To determine air pressure



$$\frac{\rho}{2} V^2 S C_L \text{ and drag} = \frac{\rho}{2} V^2 S C_D$$

where C_L and C_D are dimensionless coefficients and ρ is the density of the air.

The first part of the expression $\frac{\rho}{2} V^2$

is the dynamic pressure of the air. The ratio of the lift to the drag is a useful measure of the effectiveness of an airfoil in producing lift or pressure at the cost of drag. The aerodynamic characteristics of the Gottingen section No. 384 are shown in Fig. 6. It will be noticed that the lift coefficient increases with the angle of attack up to a certain point and then drops off as the angle becomes greater.

At the angle of attack corresponding to the maximum-lift coefficient, it will also be noticed that the coefficient of drag is increasing very fast. Air flow around the airfoil is streamlined and non-turbulent for the part of the lift curve which has a positive and constant slope. As the maximum value of the coefficient of lift is approached the slope begins to decrease, and it is at this angle of attack that streamline flow around the airfoil section begins to break down. Vortices appear in the wake of the section and consequently lift decreases and drag increases rapidly. The angle of attack for fan-propelled sections must be chosen low enough to allow some in-

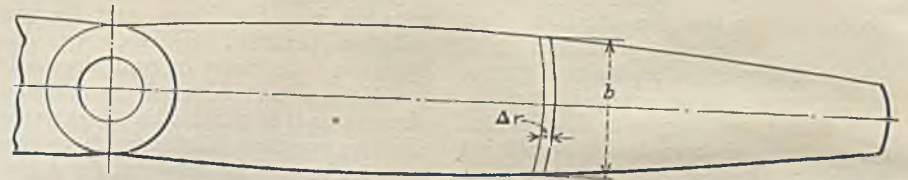


Fig. 5—Propeller blade showing element to be studied

crease in the lift coefficient without breakdown in streamline flow if fan efficiency is to be maintained when mine resistance becomes higher than the resistance for which the fan was designed.

To Keep Pressure Constant

The principle of the propeller fan perhaps is most simply illustrated by a study of propeller-blade-element theory. In order to investigate propeller action in detail the blades are considered as consisting of small elements of length in the radial direction. Consider an element with a length Δr and a width b at some radius r as shown in Fig. 5. For convenience we will consider the air at rest and the blade-element moving through it. The motion of the element as it moves through the air is along a helical path determined by the axial velocity V of the air through the propeller, and the tangential velocity, $2\pi r n$, of the element in the plane of the propeller, n representing the number of revolutions of the propeller per unit

time. The velocity of the element with respect to the air, V_r , is then the resultant of the axial and tangential velocities as shown in Fig. 4. Let ϕ be the angle between the resultant direction of motion of the element and the plane of rotation, and α the angle of attack. Applying the ordinary airfoil coefficients, the lift force on the ele-

ment is: $\Delta L = \frac{\rho}{2} V_r^2 C_L b \Delta r$. Let

y be the angle between the lift-force component and the resultant force on the element.

$y = \arctan D/L$ where D is drag and L is lift — then the total force on the

element is: $\Delta R = \frac{\rho V_r^2 C_L b \Delta r}{2 \cos y}$

The thrust of the element in the direction of the propeller axis is:

$$\Delta T = \frac{\Delta R \cos(\phi + y)}{\rho V_r^2 C_L b \cos(\phi + y) \Delta r} = \frac{1}{2 \cos y}$$

and as $V_r = \frac{V}{\sin \phi}$

$$\Delta T = \frac{\rho V^2 \cos(\phi + y) \Delta r C_L b}{2 \sin^2 \phi \cos y}$$

if Z propeller blades are used

$$\Delta T = \frac{Z \rho V^2 \cos(\phi + y) C_L b \Delta r}{2 \sin^2 \phi \cos y}$$

converting to pressure

$$P = \frac{\Delta T}{2\pi r \Delta r} \text{ as the blade elements cover a}$$

circular fan element $2\pi r$ in length and Δr in width.

$$\text{So } P = \frac{Z \rho V^2 \cos(\phi + y) C_L b}{2\pi r \sin^2 \phi \cos y}$$

As the pressure over the whole fan area is to be constant, values of ϕ , y , C and b

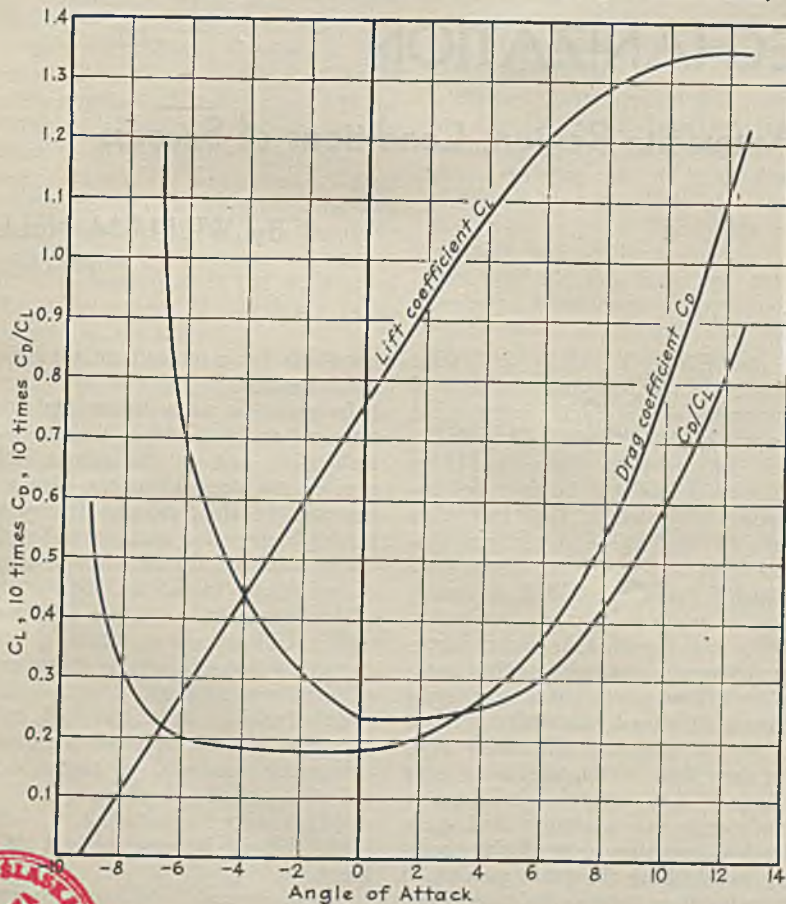
must be chosen to keep $\frac{\cos(\phi + y) C_L b}{r \sin^2 \phi \cos y}$

constant for all values of r .

More Blades Undesirable

In elementary theory the propeller is regarded as a screw advancing through the air, but we cannot determine the correct blade angles to produce uniform flow from that principle alone. Blade width, angle of attack, thickness of profile and characteristics of airfoil used all enter into a determination of the

Fig. 6—Characteristic curves for propeller section; aspect ratio infinity



blade angle so that the propeller pitch may be quite different at various radii. Also, the number of blades used cannot be determined in an arbitrary fashion. If a fan is designed with four blades, the addition of extra blades would not materially increase the volume of air delivered at a given speed, and it would certainly reduce the efficiency of the fan.

Efficiency is not uniform over the radius of the propeller. It is highest at the inner fairing and varies inversely with the radius. The efficiency of a blade-element is a function of ϵ , the drag-lift ratio of the element, and of λ , the ratio of the axial velocity of the air through the fan to the rotational velocity of the propeller with respect to the air passing the element. That is,

$$\text{Efficiency} = \frac{1 - \epsilon\lambda}{1 + \frac{\epsilon}{\lambda}}$$

Propeller design effects this efficiency largely through the factor λ , as airfoil characteristics are well standardized. Theoretical propeller efficiency normally lies between 90 and 95 per cent. Refinements in the fan design for improving the efficiency introduce extra expense in the first cost of the fan. The savings to be made by higher efficiency must be weighed against the cost of making those improvements to determine how far such refinements should be carried.

As has been mentioned before and illustrated by Fig. 2, propeller fans of the Troller type have a very flat-topped efficiency curve. This is true because the ratio of drag to lift for an airfoil section does not vary greatly for angles of attack up to the burble point. Should the mine equivalent orifice change to such an extent that fan efficiency is no longer satisfactory, the installation of another set of propellers and vanes designed for the new condition will bring the fan back to or near the original efficiency. This can be done for less than \$500, thus making it practicable to operate fans always near their maximum efficiency.

The ease with which propellers may be changed makes it possible to install a set of test propellers when placing a fan in service at a mine the ventilation characteristics of which are not known. As an example, one of the Pittsburgh Coal Co.'s recently reopened mines had been shut down for some years and was well filled with water and roof falls. From the inception of the clean-up program the mine had to be ventilated, but the equivalent orifice of the mine when cleaned up could be calculated only approximately. A fan of the proper dimensions for the ultimate volume was installed, using a spare set of propellers.

When the mine is cleaned up and operating normally, propellers will be designed for the equivalent orifice then existing. The new propellers will be

installed in a few hours, and the fan will then operate at peak efficiency. Although a wide range of equivalent orifice is possible in a fan of given casing dimensions it is practicable to vary the effective propeller diameter with volume in order to provide economically a low velocity at the fan discharge.

In the fans built at Library a velocity of 1,500 ft. per minute at the discharge has been used as a rough basis for determining the minimum dimensions of the opening. The propeller diameter is 2 ft. less than the diameter of the discharge opening, or 1 ft. less than the side of the opening, if a square discharge is used. Conical discharge stacks appear to provide more efficient expansion than stacks which start with a circular section and end with a square section. Discharge openings 8, 10, 12 and 14 ft. in diameter corresponding to propeller diameters of 6, 8, 10 and 12 ft. should provide a range of fan sizes which could handle almost any mine ventilation requirement.

A drive of the Rockwood type has been used on most of the Pittsburgh Coal Co. fans. This type of drive is a cheap, flexible and highly efficient method for coupling the motor to the

fan, using a short flat belt with flat pulleys. Normal propeller speeds range from 500 to 1,000 r.p.m., which make possible the use of high-speed motors with a resulting lower motor cost. The fan is entirely self-contained and readily portable.

At a given speed the fan will produce from 60 to 70 per cent of its rated volume if it is run in the reverse direction. This provides sufficient air to ventilate our mines when conditions make it necessary to reverse the ventilating current. With a reversing switch on the motor and without any changes in the fan, the direction of the ventilating air can be quickly and economically reversed at any time.

The first cost of these fans has been low, usually about 33 per cent of the cost of a centrifugal fan with the same rating. Installation cost is low, as a motor house about 12 ft. square and a fan foundation usually not requiring more than 7 cu.yd. of concrete is all the field construction necessary. The total cost of the installed fan complete with motor, drive and electrical control equipment is normally about one-third the cost of an installed centrifugal fan of the same rating.

MECHANIZATION

In Anthracite Region, Conditions of Success

By WILLIAM NELLEN

Mahanoy City, Pa.

IN RECENT YEARS anthracite operators have followed the lead of bituminous men and have mechanized large parts of their mines. Though the steepest of pitching beds need no mechanization and can be operated inexpensively by hand, the fact that mechanical loading underground increased from 5,433,340 net tons in 1932 to 9,284,486 net tons in 1934, or nearly doubled, is evidence that mechanization has been found profitable under favorable conditions. But, while many operators have been quite successful, some who have attempted mechanization still aver that it presents difficulties with which they find it impossible to cope and declare that natural conditions in the anthracite mines always will make mechanical operation unprofitable, completely overlooking the great number of others who after long experience would

not think for a moment of returning to hand methods.

In visits to many mines and inspections of many kinds of mechanical installations, and in the actual installation of mechanical devices here and in Europe, the chief reasons I have found for high operating costs have been:

(a) Multiplicity of haulages because of variations in dip and bad condition of haulageways.

(b) Difficulty in maintaining conveyors because of severe weight and inefficient roof support.

(c) Inability to control roof, in large measure because of slow advance, unsystematic methods of timbering and enforced periods of idleness.

(d) Faulty organization.

(e) Unsatisfactory method of payment.

These several hindrances to success,

if uncorrected, will inevitably lead to failure. A few of them are in a degree due to natural and inherited conditions, but with proper provisions they all can be met.

To handle a mechanical installation successfully:

All machinery installed must be operated continuously and to full capacity. A face conveyor having a 35-ton-per-hour capacity in a 20-ton-per-hour face is not efficient, nor will be a conveyor of 15 tons per hour capacity in the same face. The conveyor capacity also should be suited to the capacity of the haulage facilities which the conveyor supplies.

All unnecessary work, such as "turning back" coal to the end of a short conveyor, cutting out solid corners by hand, hand-hewing of badly blasted coal and other similar wastes of time and effort, should be eliminated. Yet in how many mechanically operated faces are they found? The only operations necessary in a machine-cut and machine-conveyed installation are: (a) cutting coal, (b) drilling shotholes and blasting coal where necessary, (c) loading prepared coal, (d) moving conveyor forward where conveyors are used, (e) setting and drawing of roof supports, (f) attending loading point. All other work, no matter what it may be, not entering the above categories is unnecessary and should be eliminated.

Definite Planning Needed

All work to be done should be definitely apportioned as to time and shift. It should be determined in advance who is to do it and the way in which it is to be done, and all those concerned should be fully apprised of their duties. If the installation is new, those who supervise it must be patient, enthusiastic and determined to make it successful. It must be remembered that, by systematic and intensive methods of mining without the use of machinery, amazing economies often have been made in the working of coal. The system of operation is as important as the plant.

Good ventilation is essential for satisfactory operation. Bad air has caused many disappointments and forced the abandonment of certain forms of mechanization.

Provision must be made for bringing timber and material to the working face. Unless this material is delivered when needed and at minimum expense, mechanization is loaded with a burden that is not rightly so chargeable.

Good haulage roads and satisfactory secondary haulage must be provided. Without them an otherwise efficient installation will be rendered completely ineffective. Too often a conveyor is found heaped with coal and awaiting cars to receive it. If several conveyors discharge onto a belt or main conveyor, a rapid and continuous flow of coal arrives at the loading point and a good system of placing trips of such cars is

needed to keep the conveyor in efficient operation. Incidentally, where a number of conveyors discharge onto a mother conveyor (a method coming rapidly into favor), the manager is confronted with the necessity of keeping his roadways open and in good condition for a long time. If these roads become out of condition or impassable, the mechanical installation which depends on them is likely to be hampered or put completely out of operation. The ordinary system of trapezoidal wood timbering will not withstand heavy pressures. Arched steel at 2½-ft. centers, properly installed, has been found far more satisfactory.

A method of conveyance must be suited to the place in which it is to operate; for instance, scraping conveyors should not be placed where the bottom is soft or heaves badly or where the rolling of the bottom causes the scraper to dig into the underlying shale. When this occurs it causes trouble and delay, for the scrapers "get fast," the ropes break too frequently, the legs of timber sets are gradually undermined, causing them to work inward, and heavy falls occur in the main conveyor road, requiring increased timber crews and material.

Where machinery is driven by compressed air, the air pressures must be adequate and the air be free of entrained water. Low pressures result in a slow, jerky motion ending in a complete stop, and water in the air freezes on the exhaust valves so that they will not work, involving in either case expensive delays. Installation of an air dryer would save much money.

Efficient organization and supervision are the two most important factors in obtaining successful operation of conveyor installations. It is absolutely essential to have a number of officials and men with previous knowledge and experience in machine mining to form the "nucleus" of the team, so that their keenness, knowledge and experience will enable them to enthuse and train the other men. The importance of the attitude of labor toward the mechanical methods introduced in the success or failure of machine mining has not always been appreciated. Some men are quite unfitted for, and will never be a success in, mechanization. Such men must be eased out without inviting disturbance.

Wage Rate a Major Problem

Methods of payment for workers in sections mechanically operated must be carefully considered or serious trouble will result. It is obvious that under the old hand-loading systems the miners were overpaid in some sections and underpaid in others. In a number of mechanized operations men are being paid only a day's pay for a day's work, and this leads to dissatisfaction, because the men soon find that they are giving

an increased output and demand a higher rate. When this is refused a grievance is laid before the umpire, and in every case a decision favorable to the men has been rendered. In some cases the old rate sheets have been enforced; in other cases a 10 or 20 per cent increase of the miner's gross earnings has been ordered. In still other cases separate arrangements were reached between local unions and operators. It is true that the fixing of new contract rates is difficult in the anthracite region, and the umpire has often little indeed on which to base his rulings. The men themselves have only a faint idea as to the output they can produce with equipment with the operation of which they are unacquainted, and they look with justifiable apprehension at any rate that may be proposed.

If a feeling of goodwill is established, however, it should not be impossible to arrange a satisfactory rate sheet. No doubt the men will eventually earn more than before, although in the beginning they will have some difficulty in duplicating their rate of pay under the old conditions, and some adjustment may have to be made.

Prompt Action on Grievances

Grievances of any one man or of all the men should be immediately and sympathetically considered, provided always that the employees give the management opportunity of doing so, instead of "downing" their tools without a preliminary protest. Management should discipline itself to listen willingly to any grievances, and, where they are legitimate, should take prompt steps to remedy them. Failure to do this has been the undoing of many installations that otherwise would have proved successful.

Wrong choice of coal cutters has often led to expensive experimentation. Machines that have been very successful in bituminous mines and in the long-wall workings have failed to give satisfactory results in anthracite mines. Local conditions determine whether undercutters should be used and whether they should be chain or arcwall cutting machines. Frequently several units are bought without any previous experience and thus \$50,000 to \$100,000 is booked against mechanization that should be charged against errors in management.

Managers who are rather reluctant to recognize the merits of mechanization because their own installations have not shown any reduction in cost would do well to question whether any such faults as those described have been the source of their own lack of success. They will find that with properly installed and managed installations, machinery will pay for itself in a reasonably short time and will thereafter be instrumental in lowering production cost. Such installations will be a good and wise investment and of real benefit to officials and men.

NEW MINE CARS

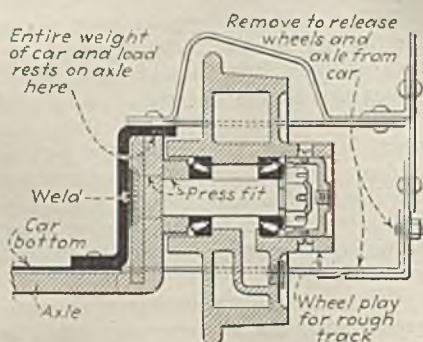
+Raise Mine and Per-Man Outputs

At Summerlee Shaft

WHEN at one stroke, on Jan. 1, 1935, 500 new mine cars were installed to replace the 550 old cars in the Summerlee shaft mine of the New River Co., Fayette County, West Virginia, the production per loader per day immediately began to increase. Within a few months the miners were profiting by the earnings from loading an additional ton of coal per day and the company was benefiting by a production increase of 400 tons per day—all with the same organization and equipment other than cars. This was accomplished during the time the average thickness of the coal being mined was decreasing due to the working out of the mine sections in the thickest coal.

To accommodate the new cars, which are unusual in design, the feeder and cage dogs had to be changed. Also as a complement to the improved mine efficiency and greater safety with the new cars, automatic sectionalizing breakers were installed to place electrical distribution on the same basis. Last fall, the hoisting capacity was increased five cars per hours by installation of a drum of different design.

Cage dogs were changed to engage the ends of the car body. To clear the shaft timbers the link is turned sidewise and dropped over a stud that projects from the top of the bumper



The rectangular section cross member of the axle takes no weight

Although the cars displaced, purchased in 1926 and 1927, were designed for maximum capacity within the limits of hoisting-compartment dimensions and seam thickness and were featured by anti-friction bearings and hooded-wheel all-steel construction (except that about half the number were composite bench type), the new cars are 4 in. lower and have an additional level-full capacity of 5 cu.ft. The loading of these new cars is averaging 840 lb. more than the old



Use of an inside lifting endgate allowed making the car 1½ in. wider on the inside

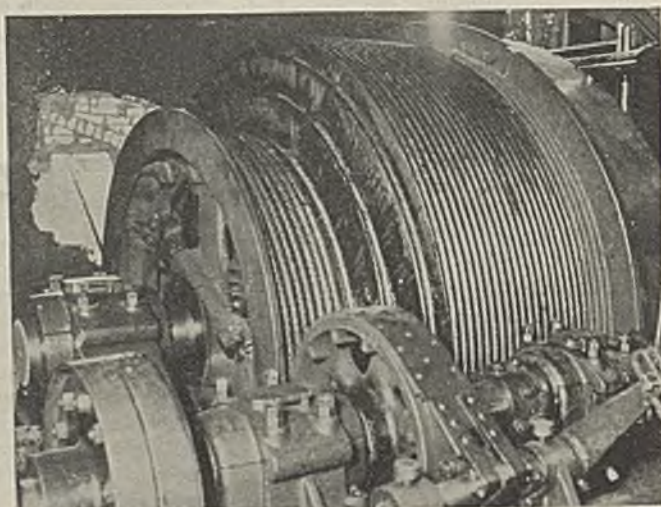
cars. Mining is in the Sewell seam, which lies generally flat but presents local rolls and dips.

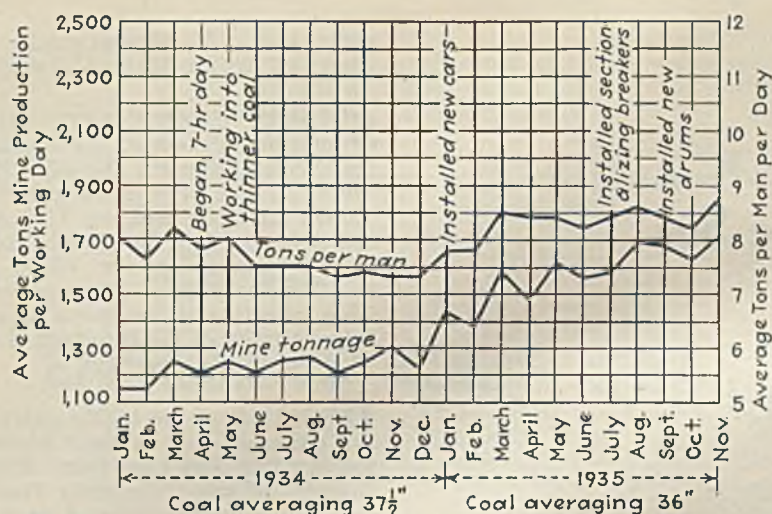
The major feature of the new cars is a drop axle which permits lowering the flat bottom of the car to within 2 in. of the lowest rail-clearance point and at the same time provides a means for holding the wheels in true gage and alignment and keeping them perpendicular to the track in spite of a flexibility equal to that of four-axle cars. The cars were built by the Bethlehem Steel Co. under patents owned by the Long Super Mine Car Co., Oak Hill, W. Va.

Wheels can drop 1 in. to follow irregularities of rail level. Normally the weight of the car body and its load is taken by the top flange of a Z-iron (forming a side of the wheel-hood structure) which rests on top of the double-thickness plate into which the wheel axle is pressed and welded. Wheels are 14 in. in diameter and the bearings are Timken on 400 cars and Tyson on the remainder.

Principal dimensions of the cars are: width inside, 59½ in.; length inside, 10 ft. 3 in.; and height above rail, 24 in.

Substituting a cylindrical stepped drum for the original conical drum added 5 cars per hour to the hoisting capacity at Summerlee shaft mine of the New River Co.





Gains by new equipment offset factors which temporarily reduced production

The level-full capacity is 78 cu.ft. and the loading under the present mean seam thickness of 36 in. is averaging 5,200 lb. All of the cars are equipped with spring draft gear and a small percentage of them with both spring draft and spring buffer gear.

By using inside lifting endgates instead of the outside lifting type, 1½ in. of additional inside width was gained over the old cars. Three inches of inside length was gained by using one straight coupling link instead of the old three-link coupling and by turning the one link sidewise onto a projecting bolt on the bumper when the car is caged for hoisting. The height, 24 in., is 4 in. less than that of the old cars, but the track clearance is 3 in., which is the same as provided on the old cars. Brakes are not fitted to the new cars nor were there any on the old.

Because derailments are fewer with the new cars, haulage delays have been reduced and the chances for accidents from that cause dropped in the same ratio. During the eleven months of operation with the new cars not one accident chargeable to cars has occurred. Loaders raise the coal 4 in. less than before and to handle lumps have even more car-side-to-roof clearance, although the average working height in rooms is 1½ in. less.

Installation of the new cars required that the men become accustomed to certain changes in handling, especially at the shaft bottom, yet production per man showed an immediate increase. During the last months of 1934, while the old cars were still in use and the mean coal thickness was close to 37½ in., the production per man averaged 7.5 tons. A year later, with the new cars and a 36-in. mean thickness, the average was 8.5 tons per man per day.

Cage and shaft-bottom feeder dogs were changed to a type which engages the end of the car instead of the wheels, thus confining the strain to the car body instead of subjecting both car body and running gear to the shock of stop-

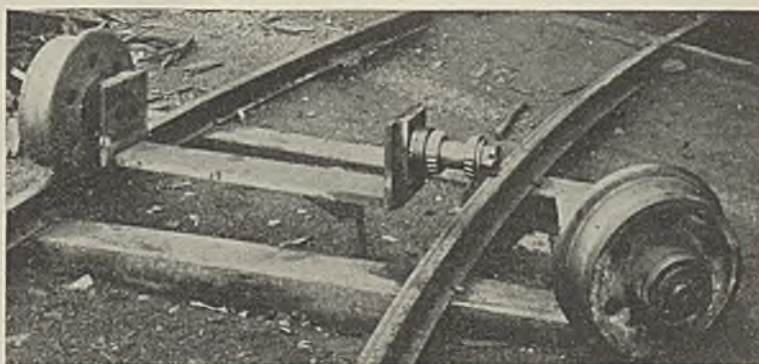
ping the load. Because the coal hoist is used for hoisting men, a safety consideration was involved in the change of cage dogs. These are now situated near the ends of the cage platform instead of near the center, where men are more likely to stand.

The vertical distance from landing to dump is 700 ft. and the hoist is driven by a 750-hp. slip-ring induction motor. With the original conical drums the maximum hoisting capacity was 115

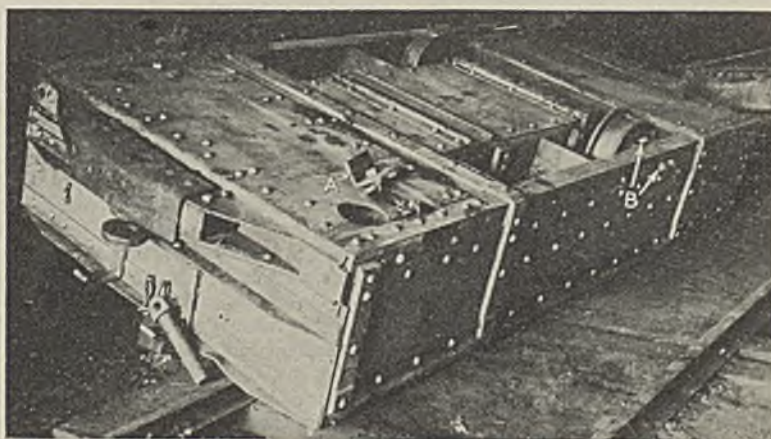
cars per hour. By replacing with cylindrical stepped drums the maximum hoisting capacity was raised to 120 cars per hour. The rapid stepping of the rope from the small-diameter section of the drum to the large-diameter section begins as soon as the motor has come to full speed and when it is capable therefore of making another rapid acceleration of the cage to final speed. After this change of drums was made, on Sept. 1, 1935, the daily production was further increased to 1,710 tons per day, as compared to 1,250 tons during 1934.

In July, 1935, the 550-volt d.c. feeders to each of the four sections of the mine were equipped with Columbus automatic reclosing sectionalizing breakers. Trouble or overload on one section no longer penalizes all sections and, moreover, the breakers afford protection against continuous short-circuit currents which might cause a mine fire.

This increase in production per man and increase in daily production at Summerlee in the face of shorter working hours and thinner coal illustrates what can be done to raise the efficiency of an old mine even though a deep shaft of small dimensions presents a bottle neck to the transportation. A. R. Long, who is superintendent of the mine, is the inventor of the drop-axle design used on the new cars.



A wheel removed to show the bearing and dust collar



One axle and pair of wheels removed to indicate construction. An angle "A" bolted into position "B" after the axle is dropped into place forms the stop that limits the vertical movement of the wheel over rough track

NOTES

... from Across the Sea

IN the anthracite region of South Wales, bags filled with mine refuse have been used in place of roof rock for building cribs with excellent results. They form stronger and more permanent chocks than loose rock, and the bagging is not excessively expensive—about 4c. per unit. Each bag is 33 in. long and 14 in. wide and contains about 65 lb. of material and can therefore be readily handled, declared David Jeffreys in a paper read before the South Wales Institute of Engineers.

Bags are filled with road cleanings which otherwise might be thrown on one side and become a nuisance and a hazard, for when traffic is moving there is no opportunity to load cars. On the other hand, bags can be filled at any time and carried to a place for loading into cars when opportunity favors. Many are filled, however, in points where cars cannot enter, such as sumps, return entries and crosscuts.

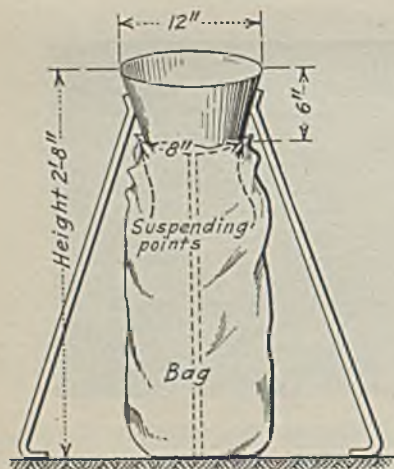


Fig. 1—Tripod stand for filling bags

A tripod (Fig. 1) has been devised, the legs of which are welded or riveted to a metal funnel, the lower end of which enters the sack, which thus is readily filled without help from anyone but the filler. It is said that with the use of bags less dust is raised than in filling cars, the dust in the air being too thick to count after 1½ minutes when cars were being filled into wagons, and being only 125 particles per cubic centimeter after 4 minutes when loaded into bags. Bags are used frequently for facing packwalls, but are often used alone, as shown in Fig. 2.

ON FEB. 7 of last year the Imperial Chemical Industries, Ltd., at Billingham-on-Tees, England, began mak-

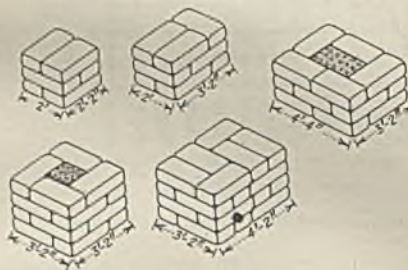


Fig. 2—Square cogs built of bags

ing gasoline by the hydrogenation or, as some more accurately would say, by the hydrogenation-cracking, process. The first material treated was not coal but creosote oil from the Low Temperature Carbonisation, Ltd., plant at Barugh, Yorkshire, England. From this oil, 9,000,000 U. S. gal. of "gasoline" has been made and 7,200,000 gal. sold to the Anglo-American Oil Co. and Shellmex-B. P. Co. The rest was put into storage as basis for a working stock.

Coal is hydrogenated at Bellingham in two main stages: the liquid, or coal, stage, and the vapor, or light-oil, stage. Both of these must be operated simultaneously when coal is being treated. In treating creosote or other oils, there is but one stage, so the Imperial Chemical Industries finished the vapor-stage equipment first. The plant is expected to produce 100,000 tons of gasoline from coal and 50,000 tons from low-temperature and creosote oils—roughly 36,000,000 and 18,000,000 U. S. gal. respectively. When the plant is in full operation it will consume over a half million tons of coal annually and keep about 1,950 miners busy mining the coal needed. About 1,000 men will be employed at the plant, to say nothing of workers in subsidiary industries.

THE NEW experimental plant at Leuna, Germany, of the IG Farbenindustrie uses the Bergius hydrogenation process, but the Ruhrchemie AG's experimental plant, says *Der Wärme*, is based on the Fischer-Tropsch process, which, by blowing steam through incandescent coke, produces a mixture of carbon monoxide and hydrogen, which gases become gasoline, diesel oil, lubricating oil and paraffin on being subjected to suitable thermal treatment in the presence of appropriate catalysts. In this work only atmospheric pressure is necessary. Some of the oils are better than the natural products which they displace; thus synthetic winter oil produced by this process has a cold test of

minus 43 deg. F., whereas good natural winter oil has a cold test of 3 deg. F.

SODIUM CARBONATE activates coke in gas making. By eliminating the effects of alumina and silica in the ash by the use of lime, the quantity of sodium carbonate used, say P. J. Askey and S. M. Dobie in *Fuel*, can be reduced without decreasing the effect, thus avoiding the damage done to carbonizing retorts and producers where a large quantity of the carbonate is used. The cost also is lowered.

BECAUSE of the highly gassy condition of some of their mines and the fact that they have found that discharges of static electricity from air hose will ignite gas, Belgians are taking precautions against such discharges. According to the *Annales des Mines de Belgique*, a hose is being made, known as Exwatt, by the Jenatzy-Leleux factory, at Sclessin-lez-Liège, which has on its interior wall a coarse weave of brass wire forming a square mesh 4 mm. (0.15 in.) per side. This, in the process of manufacture, is embedded in rubber, the rest of the wall being built up on this base. In this way the hose can be grounded readily.

Much has been said as to the large quantity of methane produced per ton of coal mined in gassy seams, and the following figures from the aforementioned source are interesting as showing the capacity of Belgian coal to produce gas. Remembering that 27 cu.ft. goes to a cubic yard, which is the volume roughly of a ton of coal, the figures, especially for Marcinelle Nord No. 11, are startling and impressive.

Cubic Feet of Methane Per Short Ton of Coal Extracted in Belgian Mines

Colliery	Classification	Cubic Feet
<i>Charleroi Basin, Ten Palms Bed</i>		
Grand County.....	Non-gassy.....	none
Centre Jumez.....	Slightly gassy.....	190.0
Amercoeur (north of Center fault).....	Slightly gassy.....	88.7
Amercoeur (south of Center fault).....	Slightly gassy.....	1318.4
Réunis, No. 2.....	Gassy.....	1490.4
Réunis, No. 1.....	Gassy.....	1778.4
Sacré-Madame Blanchisserie.....	Gassy.....	2432.3
Marcinelle-Nord, No. 11.....	Subject to instantaneous outbursts.....	2988.4
Bois-de-Cazier St. Charles.....	Subject to instantaneous outbursts.....	46.8
<i>Liège Basin, Chainez Bed</i>		
Bonnier.....	Slightly gassy.....	101.6
Kessales (north of Marie fault).....	Gassy.....	274.9
Kessales (south of Marie fault).....	Gassy.....	456.8
Maribaye (north of Seraing fault).....	Gassy.....	269.2
Maribaye (south of Seraing fault).....	Gassy.....	195.4

THE PRESENT COST of oxygen is only 10.6c. per 1,000 cu.ft., so it seems now as if oxygen might be used abundantly in the future in place of air. In the blast furnace less gas would have to be heated, for the nitrogen percentage in air greatly exceeds that of oxygen. The heating of the nitrogen in the air to the high temperatures obtaining in a furnace is a cause of much loss. With the nitrogen eliminated in

making water gas, the gas produced has a higher B.t.u. content per cubic foot. At Hirschfelde, says *Die Wärme*, an experimental plant gasifies coal at a pressure of 300 lb. per square inch and needs only about half as much oxygen at atmospheric pressure. The gas has a

high methane and a low carbon-monoxide content and the pressure serves for long-distance transmission without further pressuring.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Orders for all books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

The Ignition of Firedamp by Compression, by the late H. B. Dixon and J. Harwood. *Safety in Mines Research Board, Paper No. 93. British Library of Information, New York, 24 pp. Price, 17c.*

Most of the material of this report appeared in *Coal Age* of July, 1935, pp. 302-303, as taken from an address by R. V. Wheeler detailing Dr. Dixon's experiments. Only details not thus covered require review.

The authors recall that Falk determined the pressures used when methane is exploded by compression by noting the point in the compression at which the pressure induced by the explosion prevented the piston from making any further forward movement. This overlooked the fact that the explosion did not occur immediately after the gas was raised to the ignition point.

Dixon, Bradshaw and Campbell then compressed gas mixtures in glass tubes and photographed on a moving film the flames thus produced, and proved that the piston continued its travel after the ignition temperature had been reached, not only during the period of "lag" but for some time after flame had begun to spread, showing that Falk's calculated ignition temperatures were too high, particularly for mixtures that reacted slowly. Dixon and Crofts then stopped the piston at the moment when any desired compression ratio was attained, but Tizard and Pye declared that this did not suffice, for if the piston were not held in that position, the gases by their compression would force it back and perform work, thereby losing heat. So these investigators not only stopped the piston but held it where it was stopped. They found that with a 2-per-cent mixture of methane in air and with the piston free, the ignition temperature figured 890 deg. C.; with the piston stopped, only 830 deg. C.; and with the piston stopped and held, still less—710 deg. C. When hydrogen and oxygen were the gases exploded in the cylinder, the temperatures, as calculated from the three methods of procedure, were practically the same, because in that case the explosion was almost instantaneous.

Nitrogen peroxide is one of the gases prevalent after shooting; and with 7-per-

cent methane-air mixtures and 0.67-per-cent nitrogen peroxide, a compression ratio of 17.1 will fire the mixture, whereas without the nitrogen peroxide a compression ratio of 23.5 will be needed. In each case the initial pressure is 200 mm. and the initial temperature 50 deg. C.

Mixtures containing 7.0 and 7.5 per cent methane have the lowest ignition temperatures when fired by compression: namely, about 450 deg. C. (under a pressure of about 29 atmospheres). Firedamp containing between 2 and 75 per cent methane can be ignited and will propagate flame under the conditions of experiment—that is, with the whole volume of the mixture under high compression and at the temperature produced by that compression.



Contributions to the Study of Coal—Influence of Structural Irregularities Upon the Chemical Character of No. 6 Coal in Franklin and Williamson Counties, Illinois, by E. T. Benson and G. H. Cady; and *Distribution of Sulphur in Illinois Coals and Its Geological Implications*, by G. H. Cady. *Report of Investigations No. 35, Illinois Geological Survey, Urbana, Ill. 41 pp.*

At its southern end, the State of Illinois comes almost to a point, which point is signalized by the confluence of the Mississippi and Ohio rivers. To this apex in a direction almost due south runs the line of the Duquoin anticline, which, though not exactly located on the western line of Marion, Jefferson, Franklin and Williamson counties, is so near to that line that one might suggest jocularly that the surveyor may have adopted that anticline as his line of division.

This arching fold divides southern Illinois into two equal parts. To the east lie the counties already mentioned, also Saline and Gallatin counties; to the west, Jackson, Perry, Randolph, St. Clair, Washington, Clinton and Macoupin counties. These western counties show little variation in the unit calorific values and moisture contents of their coals, whereas the coals of the eastern

counties have much irregularity in their unit calorific values and less moisture.

This contribution of the State of Illinois to the study of coal explains why this is so. The eastern area has been the scene of much geostuctural unrest; movements of the strata which developed heat, and thus in a degree carbonized the coal and being of unequal intensity, made this carbonization variable. In this bulletin the Illinois Geological Survey shows the striking relation between the disturbance of the strata and the unit heat values. However, it declares that the presence of more vitrain in Franklin and Williamson counties than in Macoupin County explains perhaps some of the difference. The use of unit values, instead of analysis or "pure coal" values, enables the true degree of carbonization to be determined without interference of adventitious mineral matter.

In the second article of this bulletin the total average sulphur—pyritic, organic and sulphatic—in Illinois is declared to be 4.37 per cent on an ash- and moisture-free basis and 3.4 on an as-received basis. Lenses of pyrite or marcasite Dr. Cady regards as being deposited shortly after the bench on which they are found. Concretionary pyrite, he finds, is usually so snugly surrounded by coal as to suggest that the latter had already finished shrinking before the pyritic material was deposited. If this is so, the pyrite is probably, as he states, of secondary origin. No reference is made in the bulletin to the low pyritic content of the coal wherever it is covered by a heavy overburden of shale, which seems to suggest that the pyrite was derived, in part at least, from the sulphates of the sea, and that the sea could not impregnate the coal seam with sulphates because of a thick shale bed.

Throughout Franklin County, in a large part of Williamson County and a small part of eastern Perry County, the average organic sulphur content is less than 1 per cent. In Macoupin County it exceeds 2.5 per cent. The regional distribution of organic sulphur is fairly regular and its variation in some degree systematic. Sulphate sulphur, thought to represent gypsum, is present in small percentage in Illinois—rarely more than 0.5 per cent and usually less than 0.25 per cent.



1935 Year Book on Coal-Mine Mechanization. American Mining Congress, Washington, D. C. 374 pp., 5½x9 in. Price, \$3.

This volume contains all the papers delivered at the annual convention of 1935, in which is included the address on the "Future of Coal," by Howard N. Eavenson. Other contributions are: "Methods and Equipment in Modern Mining," by G. B. Southward, and "Statistical Analysis of Mechanical Loading in Bituminous and Anthracite Mines," by the statisticians of the U. S. Bureau of Mines, and a list of the exhibitors at the exposition, with their exhibits.

OPERATING IDEAS

*From
Production, Electrical and
Mechanical Men*

Wide Variety of Operating Ideas Presented At Indiana Institute Meeting

A KINK session covering a wide range of operating ideas featured the 1935 winter meeting of the Indiana Coal Mining Institute, held Dec. 14 at the Deming Hotel, Terre Haute, Ind. Sixteen ideas were presented in a paper by James Hyslop, chief engineer, Walter Bledsoe & Co., Terre Haute, and his list was supplemented by a number of items from the floor.

The interchangeable trapdoor of the Chicago, Wilmington & Franklin Coal Co., operating in Illinois, was first described by Mr. Hyslop. Instead of depending on brattice men to build the door and frame to fit each place—a job that takes a lot of time, is costly, and often results in an unserviceable door—C.W. & F. uses a standard frame and door (Fig. 1) made in the carpenter shop. The frame is made of 6x8-in. timbers fitted for quick and easy assembly and hinges and hardware are shop assembled. The frame naturally is made of a size that will fit any mine opening, and needs only to be wedged in place. The opening on the sides and top is closed off with ship lap.

C. W. & F. also has adopted the practice of placing safety bulletins in the miners' pay envelopes from time to time, on the theory that a man is likely to give anything found therein a more thorough examination than otherwise.

Returning to the subject of trapdoors, Mr. Hyslop recommended consideration of practice at a northern Indiana mechanical loading mine, where doors are equipped with 8x8-in. plate-glass windows to enable anybody about to take hold of the door handle to observe whether a trip is about to push it open in his face. The glass windows cost about 10c. and originally were mounted in a frame which was then bolted or screwed in a hole cut in the door. This was found unnecessary, however, and now in a two-ply door made of ordinary 8-in. ship lap a 7-in. square is cut. The glass is placed over this hole and fastened in place with strips of wood nailed on the door. The latter are placed on the high-pressure side of slam doors, leaving the other side smooth if anyone should push against it. One or two wraps of friction tape around the

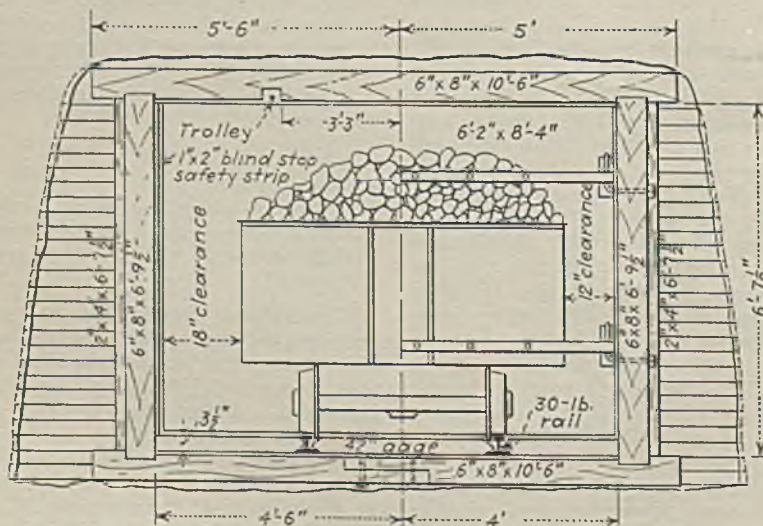


Fig. 1—Details of standard door of the Chicago, Wilmington & Franklin Coal Co.

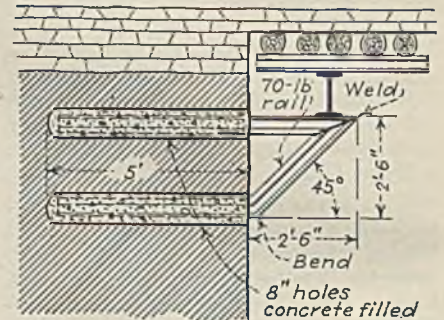


Fig. 2—Shoulder brace used at Snow Hill where roof loads are heavy

edges of the glass facilitate handling without danger of cuts and also cushion the glass when in place. In two years' experience with these windows, only six have been broken. "A similar window installed in a stopping proved very convenient in permitting a parting attendant to watch the position of locomotives for several hundred feet in a room entry."

Use of hitch holes instead of legs to support crossbars (*Coal Age*, June, 1935, p. 237) is becoming a popular practice, Mr. Hyslop stated. Occasionally, the hitch pins are called upon to bear an abnormal weight or the rib may be weak. To take care of these conditions, the idea shown in Fig. 2 was adopted at the Snow Hill Coal Corporation mine. This shoulder brace is used at a point where a post of any kind would have interfered with cars on the track, which was very close to the rib. Supports were called upon to take a very heavy weight transmitted by 15-in. I-beams. Instead of one hitch hole, two were drilled, one over the other. The shoulder was made of 70-lb. rail bent and welded as shown in Fig. 2. To anchor it securely, the holes were filled with concrete. "This method is quite economical."

Where the top has fallen to a considerable height over the crossbars, the idea shown in Fig. 3 has been used. "We make a welded steel-rail section with a series of columns welded to the top bar and so spaced as to rest on the crossbars beneath. This distributes the weight over several bars and makes a cheaper and more permanent arrangement than wood lagging."

On the main bottom at Snow Hill, the

idea shown in Fig. 4 is used. The top was very bad around the shaft and complete protection against anything falling out between the I-beams was considered advisable. I-beam span was 17 ft. 9 in. Centers were 39 in., the ends of the I-beams resting on concrete walls. The spaces between the I-beams were filled with precast concrete arches. After the arches were placed, the ends were grouted where they came in contact with the beams. On test, the arches withstood a load of 10,500 lb. Cost was \$1 each. Forms were made and casting was done at the mine. No. 14 steel wire cloth with a 2-in. mesh was used as reinforcing, primarily to reduce breakage in handling.

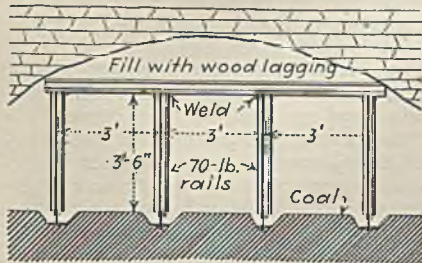


Fig. 3—Details of roof support for use where top has fallen to considerable height

At the mine of the Valier Coal Co., in Illinois, said Mr. Hyslop, the special transformer truck shown in Fig. 5 is used to keep substations close to the machines. This truck carries three 25-kva. transformers and combines safety and portability. The oil switch is mounted inside with the handle outside on one end. An inclosed fused safety switch is mounted on the opposite end for the secondary current. The metal box is large enough to radiate the heat without ventilation inside.

The problem of sectionalizing switches at the Dresser mine, Walter Bledsoe & Co., near Terre Haute, has been solved by the use of inclosed safety switches on d.c. feeders. "These switches are very inexpensive, durable and safe. In order to get the necessary carrying capacity, we use the standard two- or three-pole switch and parallel the blades. Thus a 3-pole 100-amp. switch has a capacity of 300 amp. when so connected. The boxes are painted red. We find this type of switch much better than the single-pole d.c. switch in a wooden box, as the box soon goes to pieces in the mine and many hands have been burned by opening the switch under load, as the wooden door has to be opened to grasp the switch handle. The metal-boxed safety switch is operated from the handle outside, and is much safer. If a fused switch is desirable, the fuses should be of 600-volt rating, as experience shows that the 250-volt fuse is short-lived in 250-volt d.c. service. This statement applies to those fuses wherever used."

The new Snow Hill surface plant, said Mr. Hyslop, is equipped with a 32-volt lighting system, selected to obtain the advantages of the sturdier filament of

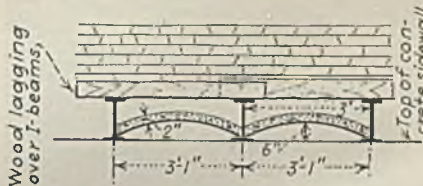


Fig. 4—Auxiliary concrete arches used between I-beams on Snow Hill bottom

the lower-voltage lamp and thus reduce burn-outs resulting from vibration. Also, the problem of theft was sidestepped. However, "the late drastic revision in lamp prices makes the low-voltage system less attractive than when it was designed about a year ago."

Welding offers a wide field for the ingenious coal-mine mechanic. "We find it profitable to make all our switch frogs by cutting and bending our own rail and then welding it on a steel plate. This method has proved to be highly satisfactory and gives the advantages of a one-piece frog. Recently, we made a complete 60-lb. crossover in this way."

At the northern Indiana mechanical loading operation previously mentioned, a novel arrangement has been developed for taking care of keys for underground first-aid kits, said Mr. Hyslop. Several completely furnished portable first-aid kits are kept in the mine, and to avoid pilferage these are kept locked, with keys originally only in the hands of foremen and certain trained first-aid men. Trouble was encountered in a few instances because the material was not readily accessible, due to the absence of the man with a key, particularly on off-shifts. Consequently, small boxes with glass fronts were made and hung close to each kit, with typed instructions to break in in an emergency, but to get the key from one of the men under ordinary circumstances.



New Year

WITH 1935 now a matter of history, operating, electrical, mechanical and safety men face another twelve months in which it is reasonable to assume that there will be no cessation of the pressure for higher efficiency, greater safety and lower costs. As always, alertness and ability to supply an answer on the spot will command a premium. The sources of such answers will vary. Many, of course, will come out of the heads of the men on the job. Others will be based on the experience of others, which this department is designed to pass on. In fulfilling this function, it solicits original items from men charged with the duty of keeping the coal coming. So send yours in, with a sketch or photograph if it will help to make it clearer. Each acceptable item will bring \$5 or more from *Coal Age*.

"Athlete's foot" also has come under consideration at this same operation, and the foremen's washroom has been equipped with a low 5-gal. porcelain tank in which a solution of 1½ lb. of sodium-thiosulphate ("hypo") to a gallon of water is kept. To avoid slipping in stepping into the tank, the men hold onto a rod fastened to the wall. Use was voluntary, but all of the men took to the idea immediately "and most report elimination or reduction in skin irritations on the foot and rawness or tenderness between the toes." The solution offers an excellent and inexpensive method of keeping down outbreaks of "athlete's foot" sometimes resulting when many men use a common washhouse. The

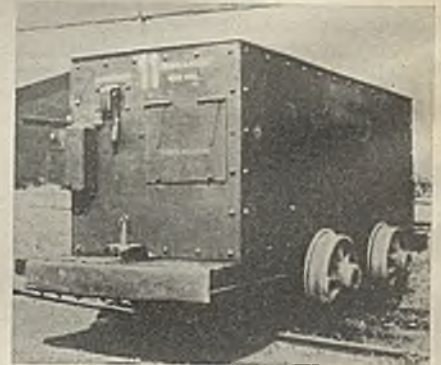


Fig. 5—Valier transformer truck

solution will prevent, but not cure, a bad case, and soon will be used in the general washhouse at the mine.

For a good whitewash for use above or below ground that will stay intensely white and will not flake or wash off, one mine uses the following ingredients in the proportions indicated: 1 sack lime (60 lb.), 5 lb. billposter's paste, three handfuls common salt (about 2 lb.), and ½ pint bluing. Mixing may be done in either cold or hot water, although the latter dissolves the ingredients faster.

Mr. Hyslop also included in his presentation the following Operating Ideas from *Coal Age*: auxiliary cable throw for track switch, November, 1935, p. 466; installation of feeder cable in pump-discharge column, November, 1935, p. 464; auxiliary light signal for pneumatic shaft-signal systems, September, 1935, p. 383; portable electric welder for underground use, October, 1935, p. 426; and oxyacetylene tank truck for underground use, November, 1935, p. 465.

Wesley Harris, president, Bicknell Coal Co., leader of the discussion on Mr. Hyslop's paper, introduced Ed Rogers, deputy Indiana mine inspector, who first described a first-aid truck developed for underground use at the New Hope mine of the Linton-Summit Coal Co. The truck is 3 ft. 2 in. high, 6 ft. wide and 11 ft. long, and is flared over the wheels to make seats of a sort. Under the seats are boxes for first-aid material. Four brackets are mounted in the center of the car, on which a stretcher can

be suspended on springs. Light sockets are installed in the material boxes to keep out moisture pending use.

Citing the anchors used at New Hope for holding track on hills (*Coal Age*, February, 1935, p. 87), Mr. Rogers stated that a modification of this idea also was employed to keep curves in place on heavy grades. Holes are bored in the bottom in which car axles are fixed, the tops of the axles extending slightly above the ties so that they are in contact with the rail. Use of aluminum rail benders for heavy rail at New Hope was commended by Mr. Rogers, who declared that this equipment was safer to use, easier to transport, as it can be carried by one man from place to place, and saves time.

Sprinkling of coal at the face at the mines of the Knox Consolidated Coal Corporation not only increases safety but also results in a noticeable increase in output, due to the absence of dust. This conclusion was corroborated by Thomas James, mine manager, No. 2 mine. Mr. Rogers also singled out for mention equipment for vulcanizing cable splices (*Coal Age*, May, 1935, p. 183) and the portable transformer trucks used by Knox Consolidated (*Coal Age*, January, 1935, p. 3).

The results of cleaning track with a Joy loading machine at the Kings Station mine of the Princeton Mining Co. were outlined by William Hurst, general superintendent, in response to an invitation from Mr. Rogers. To fit the machine for cleaning track it is equipped with a false head, under which are mounted shoes which ride on the rails. So equipped, the loader will clean to within 1 in. of the ties and to 14 in. on either side. Approximately $\frac{1}{3}$ to $\frac{1}{4}$ mile of track can be cleaned per shift, as the machine works as fast as it can move in low gear. A pipe coupling arranged for rapid shifting of the car from one to the other of the two loading positions under the boom is employed to reduce loss of time in this activity.

At the Standard mine of the Standard Coal Co., Mr. Rogers concluded, auxiliary signaling equipment has been installed to facilitate caging. The bottom is of the gravity type, and to knock the empty off the cage the load must be started from about 25 ft. back. Misjudgment of cage landing time in earlier days resulted in trouble in a few instances. Now, the cage actuates a signal bell as it nears the landing, thus enabling the cager to release the dogs at the right moment.

Use of Mirror Saves Time In Changing Levels

At Greenwood No. 10 shaft of the Lehigh Navigation Coal Co., a mirror hanging on the wall in the hoist house saves steps for the hoisting engineer and time for the company. By viewing the reflection in the mirror the operator is able to see when the clutch teeth are adjusted to the correct marks for engagement. In the accompanying illustration, made with the camera set



Not a picture on the wall but a useful mirror

up on the platform at the hoisting engineer's normal position, the central object on the wall in the background is the mirror which shows the reflection of the clutch on the end of the drum. The blurred objects in the foreground are the air gage and ammeter of the operator's platform.

Moving the clutch, which is actuated by compressed air, is necessary several times a day to adjust drum positions for hoisting from different levels. Formerly the hoisting engineer had to use the cut-and-try method of spotting the clutch for re-engagement and had to step down from his platform and walk around to the end of the hoist to see if the position was correct.

Hoist Revisions Eliminate Friction Trouble

"The age-old trouble experienced with the conical-wooden-block frictions employed on many small loose-drum mine hoists was permanently cured at an Alabama mine by discarding the original friction screw, housing, thrust bearings and washers and substituting a home-made

plate and screw," writes Jack Combs, mining engineer, Bessemer, Ala. "The change was hastily made after several days of trouble with hot bearings, an untold waste of oil, many costly interruptions in the operation of the mine and a bit of head scratching on the part of the writer.

"The accompanying sketch shows the plan of installation. A circular steel plate was burned from 2-in. stock to drum-shaft diameter and drilled and tapped for the largest-sized standard bolt which would enter the bore of the drum and shaft. This plate was then attached to the end of the shaft with cap screws. A large-diameter handwheel was taken from a discarded valve and welded to a 1x6-in. bolt. Cost was practically nil, materials used being salvaged from the scrap heap and completion of the job requiring but three hours of labor by two men. When the controller is not located at the end of the drum, it and the brake lever may be moved to this point, or screw-operated by sprockets and chain from any point by hoist runner.

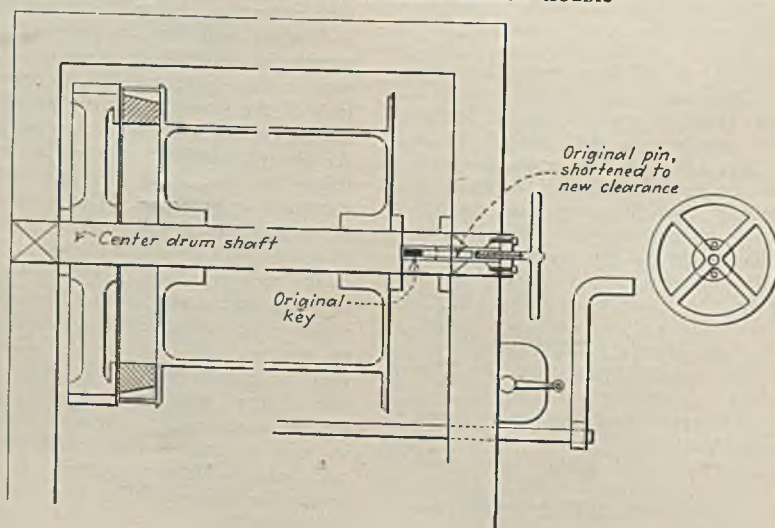
"One distinct advantage over the original arrangement is that the runner is able to gage more accurately the pressure necessary to handle trips and slip is permitted in derailment, thus eliminating undue shock on engine and hoist ropes. Other advantages are obvious."

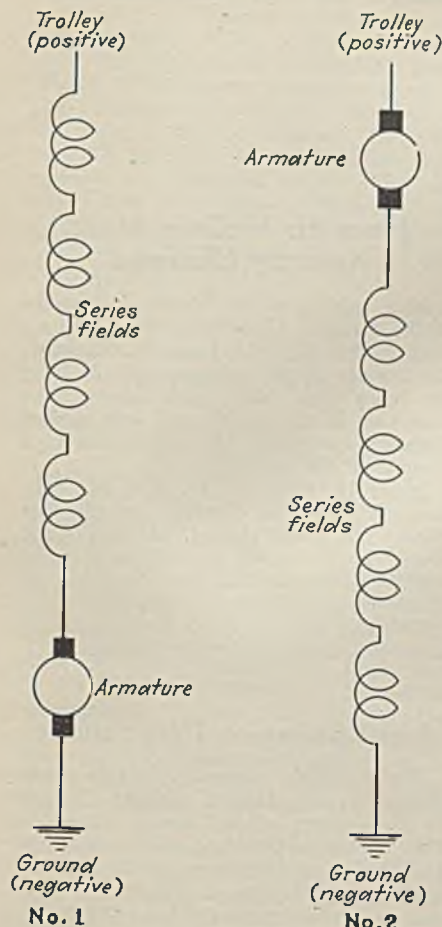
Alternative Series Circuits May Differ in Effect

Connecting the "hot" (ungrounded) line to the armature instead of to the fields has a certain advantage, and reversing the current in the armature instead of in the fields to effect motor reversal also has an advantage. These two questions of advantage often arise on special jobs of wiring or rebuilding equipment powered by series-wound motors.

Advantages in both cases, however, are not of a degree of certainty nor of a magnitude which would condemn for all cases the alternative methods. By reversing the current in the armature instead of in the fields the current-collection performance of

Hoist revised to eliminate friction trouble





Connection No. 2 has an advantage

the brushes will be better and the wear will be more uniform in many cases. This point is illustrated by the unequal wear of brushes and collector rings of a.c. generator rotating fields when they are operated for long periods with a fixed polarity at the rings.

The advantage of connecting the "hot" line to the armature lies in the remote possibility that a ground may occur just ahead of the last field coil or ahead of the last two. In that case the current flowing to this accidental ground connection must travel through the armature; therefore it may be possible to run the damaged locomotive by its own power to the repair pit.

Derailments at Frog Prevented By Auxiliary Guard

Derailment troubles growing of the installation of new switches were checked by use of an auxiliary guard at the frog, writes Walter Iman, Kitzmiller, Md., in detailing experience at one of his operations. The new switches included No. 3 instead of No. 2½ frogs, as well as guard rails trimmed and bolted as close to the rail as would allow the flanges to pass. All in all, the switches were placed in the best possible condition, but derailments still continued because of the longer open space at the point of the frog.



Auxiliary guard in place on frog

The difficulty was found to lie in the cars, which were equipped with small wheels, in most cases in badly worn condition. Replacement of all the wheels at once would have involved considerable expense and time, and as a result the guard shown in the accompanying illustration was developed. This guard, made of wood and faced with strap iron fastened on with countersunk screws where it comes in contact with the wheel, is set about 1 in. higher than the top of the frog. Position of the guard is adjusted so that the tread of the wheel just touches it when the flange just clears the point of the frog. The guard is securely fastened to the ties with ½-in. drift pins.

utes. It involves the use of two back-jack hose connections fastened together with a chain, and the process consists of screwing one end into the damaged hose and the other into the new hose, whereupon the old hose is pulled out. The latter operation at the same time pulls in the new hose.

Obtaining Pulley Radius

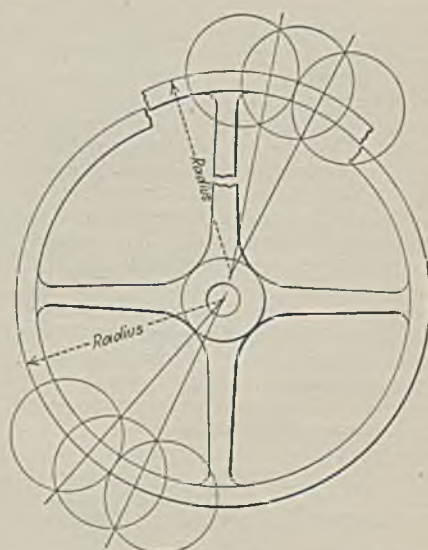
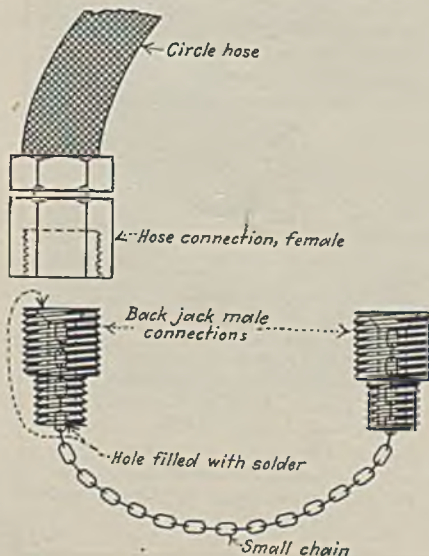
When the radius of a broken wheel or pulley is wanted and there is less than one-half the wheel or pulley left to measure from, H. O. Tenney, Wyano, Pa., calls attention to the following method of obtaining such radius:

Inscribe three circles on the rim of the remaining portion of the wheel so that they

Changing Circle Hose

Any mine electrician who has had to change a circle hose on a Joy loading machine is aware of the grief and loss of time that sometimes are encountered, writes Thomas James, mine manager, American No. 2 mine, Knox Consolidated Coal Corporation, Bicknell, Ind., in offering the changing method shown in the accompanying illustration. With this method, he declares, a hose can be changed in 5 min-

Equipment for Changing Circle Hose



Illustrating circle method of obtaining wheel radius

intersect each other. Then draw two straight lines through these intersections, as indicated in the accompanying sketch. The distance between the intersection of these straight lines and the rim of the wheel is the radius.

WORD FROM THE FIELD



Britain May Buy Mine Control To Cure Coal Ills

Purchase of coal-mining royalties by the British government as the main move toward curing the ills of the industry has again come to the front. This was revealed in the House of Commons on Dec. 9, when Sir Thomas Inskip, Attorney General, explained that the government's proposal to unify mining royalties meant the purchase and control of the royalties by the State.

"It will involve a change in ownership and direction," said Sir Thomas, "for something like 4,000 private persons to a single public ownership and control by the State in the interests of the community. It has been the subject of discussion continually. It was recommended by the Statutory Commission of 1919, by the Royal Commission of 1925 and again by the Coal Mines Reorganization Commission. Members may tell me this is socialism. I could not give a more outstanding example of one of the consequences of a national government."

President Dissolves NRA

Termination of the National Recovery Administration on Jan. 1 was decreed in an executive order issued Dec. 21 by President Roosevelt. The divisions of Review and Business Cooperation and the Advisory Council are transferred to the Department of Commerce, while the Consumers' Division is made a part of the Department of Labor. The existence of NRA as a separate department ceases, however, and the office of Administrator is terminated. The functions and duties in connection with the agencies transferred to the Department of Commerce will continue until April 1, when they will be abolished. NRA was engaged in a study of the actual results of operation under the bituminous coal code having for its objective the development of a factual picture of what happened during the 21 months the code was in effect (*Coal Age*, August, 1935, p. 347).

Labor Act Declared Void

The Wagner-Connelly National Labor Relations Act was declared invalid in its entirety under the commerce clause of the Constitution in a decision by Judge Merrill E. Otis, of the federal district court at Kansas City, Mo., on Dec. 21. The court ruled that "manufacturing is not commerce nor any part of commerce. Nothing is more firmly established in constitutional law than that. Congress, therefore, under the commerce power, cannot regulate man-

ufacturing as commerce. Never can these relations be any part of commerce." The decision was delivered in the case of the Majestic flour mill at Aurora, Mo.

The National Labor Relations Act, signed by President Roosevelt on last July 5, enacted into law a federal authorization for labor to organize for the purpose of collective bargaining, a definition of unfair practices, and the creation of an organization—the National Labor Relations Board—to review disputes between employers and labor (*Coal Age*, August, 1935, p. 352).

Lake Coal Shipments Lower

Though ore shipments on the Great Lakes during the season just closed registered a 27.2 per cent gain over the 1934 season, the movement of coal up the lakes did not show up so well. Final estimate of coal movement on the lakes during the last season, according to the Ore and Coal Exchange, was 35,792,800 tons, including both cargo and fuel coal. This compares with the 1934 figure of 35,971,146 tons, a decline of more than 178,000 tons. The decline was due in part to the shutdown in several fields during the delay in ironing out a new Appalachian wage agreement.

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 *Colliery Engineer*, with which *Mines and Minerals* previously had been consolidated, was absorbed by COAL AGE.

When, in 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During twenty-four years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Leshner, John M. Carmody and Sydney A. Hale. The editorial staff of COAL AGE consists of: Sydney A. Hale, R. Dawson Hall, Louis C. McCarthy, Ivan A. Given and J. H. Edwards.

James H. McGraw Made Honorary Chairman

At a meeting of the board of directors of the McGraw-Hill Publishing Co., Inc., held on Dec. 27, 1935, James H. McGraw, the founder of the company and its head for more than fifty years, resigned as chairman of the board and was elected honorary chairman. He will remain as a member of the board.

James H. McGraw, Jr., who has been connected with the company for the past twenty years, was elected chairman of the board. He has served as treasurer and was executive vice-president and vice-chairman of the board at the time of his election.

Malcolm Muir, president of the company since 1928, continues in that capacity.

Await Ruling on TVA Validity

Arguments for plaintiff minority stockholders of the Alabama Power Co. and by government counsel having closed on Dec. 20 before the Supreme Court of the United States, a decision on the constitutionality of TVA is expected soon after the court reconvenes on Jan. 6. In resting the case with the high court, Solicitor General Stanley Reed insisted that the main point at issue was whether the primary purpose of the TVA act was to aid navigation. He acknowledged that to have power generation a primary purpose was unconstitutional.

Mr. Reed maintained, however, that TVA was started in good faith to assist navigation. The sale of excess power, he asserted, is incidental to navigation improvement. John Lord O'Brian, assisting Mr. Reed in handling the government's defense, also admitted under questioning by Justices Sutherland and Butler that if it was found that the real purpose of TVA was not to aid navigation but the manufacture and sale of electricity, then the whole undertaking was a pretense and the government's case would fall.

Arguing for the plaintiffs, James M. Beck, former U. S. Solicitor General, denied that the government has "title to the waters. They belong to the State in which they are located, subject only to the government's right to use them for purposes of navigation. We deny that the government . . . can make any use of property in which it has only an easement. We admit the right of the government to 'dispose' of its property, but we deny that under such power of disposal it can make a continuing use of its property for non-federal purposes."

In the federal district court at Memphis, Tenn., the constitutionality of TVA was upheld on Dec. 20 by Judge John D. Martin in connection with the trial of two

men in connection with an alleged scheme to sell west Tennessee farmers "units" in TVA for advertising purposes. The ruling came when counsel for one of the men asked for a directed verdict of not guilty, naming as one of his grounds the claim that TVA is unconstitutional. Judge Martin overruled the motion and upheld the constitutionality of the act without delivering a detailed opinion. The court said his decision was based on the same grounds as those cited by the Fifth Circuit Court of Appeals in New Orleans, La., in overruling the late Judge William I. Grubb, of Birmingham, Ala. (*Coal Age*, August, 1935, p. 348).

Personal Notes

GEORGE BENSON, foreman, River Seam Coal Co., was elected president of the Monongahela Valley Coal Mining Institute at its annual meeting on Dec. 10 at Morgantown, W. Va. ALEX BRYCE, superintendent, Maiden mine, Kellys Creek Colliery Co., was named first vice-president; JAMES F. CROCKETT, general manager, National Fuel Co., second vice-president; H. L. GRIFFIN, mining engineer, Koppers Coal & Transportation Co., third vice-president; ROBERT BRADFORD, general superintendent, Guston Run Mining Co., fourth vice-president; and JOSEPH BIERER, mine inspector, fifth vice-president. E. D. GALL, superintendent, Arkwright Coal Co., was reelected secretary-treasurer.

WILLIAM G. CAPERTON, president, Scotia Coal & Coke Co., was reelected president of the Smokeless Coal Operators' Association of West Virginia at the annual meeting held Dec. 12 in New York City. Other officers reelected are: vice-presidents, R. H. KNODE, president, Stonega Coke & Coal Co., and E. C. PAGE, president, Crozer Coal & Coke Co.; treasurer, H. R. HAWTHORNE, vice-president, Pocahontas Fuel Co.; secretary, HOLLY STOVER.

D. J. CARROLL was elected president of the Continental Coal Co. at a special meeting of the board of directors held in Chicago early in December. Other officers elected are: THOMAS D. HEED, chairman of the board; RALPH J. HINES, vice-president; J. G. BADGER, secretary-treasurer. Mr. Hines also was elected a director to succeed L. H. Kelly, resigned.

EDWARD GRAFF, general manager, New River Co., was reelected president of the New River Coal Operators' Association at its annual meeting held Dec. 10 at Mount Hope, W. Va. Other officers reelected are: vice-president, WILLIAM G. CAPERTON, president, Scotia Coal & Coke Co.; treasurer, P. M. SNYDER, president, Castner, Curran & Bullitt; secretary, S. C. HIGGINS.

GRANT HENSON has been appointed assistant foreman of the Wood Coal Co. mine at Ethel, W. Va.

W. J. JENKINS, president, Consolidated Coal Co. of St. Louis, was reelected president of the Illinois Coal Operators' Association at the annual meeting held Dec. 12 at Chicago. Other officers reelected are: O. M. BORDON, treasurer, and F. S. WILKEY, secretary.

THOMAS R. JONES has been promoted from general superintendent to general manager of the anthracite operations of Madeira, Hill & Co. His successor as general superintendent is GEORGE H. LOVELL, formerly chief engineer of these operations.

A. W. LAING, Charleston, W. Va., vice-president, Morrison Coal Co., was reelected president of the Winding Gulf Operators' Association at its annual meeting. Other officers reelected are: vice-president, L. T. PUTMAN, general superintendent, Raleigh-Wyoming Mining Co.; secretary-treasurer, P. C. GRANEY, general manager, C.C.B. Smokeless Coal Co.; assistant secretary, HAL M. SCOTT, Beckley.

TERRY MCGOWAN, formerly mine foreman at King No. 2 mine of the United States Fuel Co., Mohrland, Utah, has been appointed superintendent in charge of operations by the Blue Blaze Coal Co., Consumers, Utah.

FRANK RUTLEDGE has been appointed assistant foreman by the Pond Creek Pocahontas Co. at Bartley, W. Va.

F. W. STOUTT, superintendent, Cornett-Lewis Coal Co., Louellen, Ky., has been elected president of the Harlan Mining Institute. Other officers chosen are: first vice-president, J. Q. ANGEL, general mine foreman, Mahan-Ellison Coal Corporation; second vice-president, ROSCOE PETREY, general mine foreman, Clover Fork Coal Co.; third vice-president, C. P. COLLIER, mining engineer, Harlan Fuel Co.; secretary, J. F. BRYSON, director of safety, Harlan County Coal Operators' Association.

J. P. WILLIAMS, JR., president, Koppers Coal & Transportation Co., has been elected a director of Appalachian Coals, Inc.

Unemployment Insurance Tax Records Required

Records to be kept by employers of eight or more persons for purposes of Title IX of the Social Security Act (unemployment compensation) are the subject of a decision issued Dec. 20 by the Treasury Department. Under the provisions of the act a tax of 1 per cent upon payrolls for this purpose becomes effective as of Jan. 1, though the initial payment of the tax is not due until Jan. 1, 1937.

The regulations prescribed require that every person subject to tax under the act shall, during the calendar year 1936 and each calendar year thereafter, keep such permanent records as are necessary to establish the total remuneration payable to employees; amount of contributions with respect to employment during each calendar year paid into any State unemployment fund, showing separately (a) payments made and not deducted (or deductible) from the remuneration of employees, (b) payments made and deducted (or deductible) from the remuneration of employees, (c) payments made with respect to services excepted by Sec. 907, (c) such other information as will enable the Commissioner of Internal Revenue to determine whether such person is subject to the tax and, if subject to the tax, the amount thereof.

No particular method of accounting or form of record is prescribed. Each person may adopt such records and such method of accounting as may best meet the requirements of his own business, provided that they clearly and accurately show the information required and enable him to make a proper return on the prescribed form.



Shipping Anthracite for Pacific Airway Stations

Three shipments of anthracite, of six tons each, have been dispatched to the Pan-American Airways stations in the Pacific at Midway, Wake and Guam. Louis C. Madeira, 3d, is shown on the pier of the Panama Pacific Steamship Co. in New York City as the coal was about to be loaded on the Steamer *Pennsylvania*. This fuel will be used to cook food and heat water for the ground crews and for the passengers and crews of the "Clippers" between hops across the Pacific.

New Lamps for Old, Timber Kinks, Fans to Fit Presented at Coal Mining Institute

WHY fan performance does not measure up to expectation and why a fan of no greater efficiency in type than another, or one even of lesser efficiency, may give a better result and save power; what progress has been made in a quarter century in mining methods, transportation, ventilation, explosives, inspection, and safety; what constitutes good underground lighting; what mechanical loading demands for successful operation; how to keep the roof from mayhem and murder; a new flame lamp that detects small concentrations of methane and the degree to which mines can be prevented from acidifying surface streams were items in the ambitious program of the Coal Mining Institute of America, which met Dec. 12 and 13 in the Fort Pitt Hotel, Pittsburgh, Pa. About 300 attended. President G. W. Riggs held the gavel at the sessions, and question-box symposiums had M. L. Coulter, engineer, safety and inspection, Clearfield Bituminous Coal Corporation, and M. D. Cooper, division general superintendent, Hillman Coal & Coke Co., as chairmen.

Fans are purchased, said A. L. Lee, consulting engineer, with too exclusive a view to future needs, yet most fans, within a single year after their installation, will not pass the ultimate required volume through the mine workings, because the resistance of these passages already has increased to such a degree as to preclude it.

Takes No Care of Long Split

When a forward-blade fan is used, declared Mr. Lee, the static pressure increases but little as the resistance of the airways is increased, and hence the volume of air passed is decreased. Therefore, if there is a long and resistant split, to close off part of the air to the other splits increases the pressure but little and so supplies little more air to the long split, while depriving the short splits of part of the air they would otherwise receive. The only recourse is to speed the fan, which is a costly expedient, if practical.

With a backward-blade fan, the static pressure rises materially near the point of maximum efficiency whenever resistance increases and air volume decreases; thus the fan pressure automatically is increased so that it will take care of the troublesome split when the other splits are throttled by the partial closing of regulators. Backward-blade fans also—being high-speed units—because of their speed, enable savings to be made in the first cost and efficiency of motor and drive.

Introducing the symposium on progress in mining of the last quarter century, N. G. Alford, Eavenson & Alford, discussing the advance in mining methods, instanced mechanical loading, which in that period has had practically its first exemplification, also the use of track cutting equipment. Design of haulage and hoisting machinery has been little improved in the last 25 years, said W. R. Chedsey, professor of mining, Pennsylvania State College, but the improved designs in that period have had greatly widened application following a decade during which many great developments were made in this department of min-

ing. In 1910, the storage-battery locomotive already had been in use for some time, and the only real troubles encountered in their early use was chargeable to defective battery equipment. The compressed-air locomotive also had been operating for years. Tail-rope and endless-rope haulages still had extensive place in the industry.

Since 1910, electric trolley locomotives have been improved by introduction of the master controller with relays to cut out the various resistance steps automatically either in accord with time or inverse current carried, a feature incorporated mainly in the larger locomotives. Axle mountings of locomotives now provide more flexibility on uneven track, utilizing more effectively the torque impressed on them by the electric motors.

Batteries of storage-battery locomotives have been improved greatly; the life of lead batteries has risen from less than six months to many times that period. Frames have been lightened without loss of strength, so that present-day types have fewer motor burnouts than their predecessors. Battery-charging devices have been improved by the use of vacuum-tube rectifiers and by simpler and more reliable arrangements.

Electric hoists, usually with induction motors, have been superseding steam units, though these also were used in 1910. Their control has been improved in some cases, largely by the development of automatic relays, usually working on an inverse current schedule to control the rate of acceleration of the hoist. Water rheostats have been practically eliminated. In the future, hoists possibly may be operated automatically, not to save man power, for an attendant still will have to be on duty in the hoist room during most of the hoisting shift, but as a means of obtaining maximum capacity and eliminating accidents. One



New Institute Officers

G. S. McCAA, Pennsylvania State mine inspector, Pittsburgh, was elected president of the Coal Mining Institute of America at the Pittsburgh meeting, Dec. 13. Other officers chosen were: first vice-president, W. R. Chedsey, professor of mining, Pennsylvania State College, State College, Pa.; second vice-president, C. W. Pollock, general superintendent, Ford Collieries Co.; third vice-president, N. G. Alford, mining engineer, Eavenson & Alford, Pittsburgh, Pa.

Managing Directors—G. W. Riggs, Mine Safety Appliances Co., Uniontown, Pa.; R. M. Black, professor of mining, Pittsburgh University, Pittsburgh, Pa.; E. A. Siemon, division general superintendent, Hillman Coal & Coke Co., California; C. M. McDowell, personnel director, Pittsburgh Coal Co., Pittsburgh, Pa.; C. F. Keck, safety director, Jamison Coal & Coke Co., Greensburg, Pa.

Western metal mine has found it a worthwhile innovation.

Back in 1911, 260 mines in the bituminous region of Pennsylvania, recalled G. J. Steinhäuser, State mine inspector, were still using furnaces for mine ventilation; 862 fans, however, were in operation; 629 of these relied on steam for power and 233 were electrically driven. A few, also, were driven by compressed air and gas engines; these not being included in the foregoing figure. Today few indeed are the mines having furnaces.

Several companies are using altimeters with good results in solving their ventilation problems. Others are building overcasts and cleaning airways without such aids to guide them and finding that the expenditures are wasted because the work has been done in the wrong place.

In the fifteen years immediately prior to 1928, coal-mine fatalities due to explosives annually exceeded 100; in no year since that latter date has that figure been exceeded, except in 1932, when the total was 101, said S. P. Howell, explosives engineer, safety division, U. S. Bureau of Mines. The maximum was 241 in 1919. In the thirteen years prior to 1924, the fatality rate per million tons exceeded 0.100 annually. Since then it has been substantially less, for though it was a maximum of 0.177 in 1921, in 1931 it was 0.045.

Now They Won't Freeze

Present very low freezing explosives will not congeal at natural temperatures, whereas nitroglycerin explosives and explosives containing nitroglycerin congeal at about 52 deg. F. Progress in obtaining low-temperature freezing characteristics has been especially noticeable in the last ten years because of the rather general use of ethylene-glycol dinitrate as the low-freeze component of all high explosives containing liquid compounds. Low-freeze, but not very low-freeze, explosives were made prior to 1910, but, because of some of the constituents used for this purpose having a high deficiency in oxygen, they yielded on detonation excessive quantities of carbon monoxide.

With explosives that will not freeze at natural temperatures, declared Mr. Howell, accidents arising from thawing have been eliminated. Permissible explosives are either non-freezing or very low-freezing, the first being of that type because they contain no liquid. No longer do any permissibles have nitroglycerin as a characteristic ingredient. Their passing was in the interest of safety, for they produced large quantities of poisonous and flammable gases, likely to affect the health of the men and cause mine fires. Ammonium-nitrate types of permissibles sounded the death knell of nitroglycerin explosives.

In the bituminous regions of Pennsylvania larger inspectional forces have increased tonnage per fatal accident and decreased fatalities per 1,000 employees, declared Richard Maize, State mine inspector, presenting a tabulation in evidence of the latter (see opposite page).

This reduction of accidents Mr. Maize did not claim to be entirely consequent on the efforts of the State inspectors. Credit, he said, must be given also to the Bureau of Mines and to the increased supervision of coal-company officials, either in excess of legal requirements or as provided by new provisions of the mining law, nor may the

work of the compensation rating inspectors and the service inspectors employed by insurance companies be overlooked. But, said Mr. Maize, the figures "bear out the contention that lack of supervision was responsible for the high accident rate in the mines of this country, and the reason we have had such a decided improvement in the accident rate is that, in part, we have had fewer mines to inspect, less employees to supervise and have been able to make more frequent inspections and to give more intensive supervision to each mine inspected." Still more supervision is needed. "Where will you find another industry which has an average of one boss or supervisor to each 75 to 100 men?"

In investigating accidents and injuries, said C. F. Keck, safety director, Jamison Coal & Coke Co., the cause of the accident and the manner in which it could have been prevented nearly always can be determined. "Why not locate the cause and apply the remedy before the accident, instead of waiting for action till after its occurrence? In job analysis and individual education of foremen and workmen lies today's greatest possibility for accident prevention. We need to locate the hazardous condition, the dangerous practice or the ignorance of the individual and to remedy the defect before it appears on the accident record. This is the cheapest and most potent safety activity available to the mining industry. Proper job analysis and 30 minutes of individual education per man per week would reduce the number of accidents 50 per cent in six months."

Better Light at Face

Though Edison invented the electric lamp in 1876, said Graham Bright, Mine Safety Appliances Co., it was many years before electric lights were used in coal mines anywhere but in shaft bottoms and roads, and those were wired lamps. Electric cap lamps came much later. The light shed on industrial work is usually only about 2 foot-candles. The flame safety lamp gives from 1/2 to one candle of illumination, but, as it usually is hung 6 ft. from the face, it gives at that point per square foot 1/36 as much light. A 1/2-cp. lamp therefore will give only 1/72 foot-candle on the working face or about 1/144 of the light which the average industrial worker is afforded.

With the hand electric lamp all the light in the top and bottom zones is lost. Requirements set by the U. S. Bureau of Mines designate that the beam of light shall have an arc of 130 deg. By concentrating the beam to this area the intensity of the light, if the latter be evenly spread, will be about four times that which would be obtained if the light were free to travel in all directions. The light needed for work need have only 20 to 30 deg. of distribution, and most of it is thus concentrated, but, as the eyes wander over a wider angle, it is not well to concentrate all of



George S. McCaa

President, Coal Mining Institute, 1936

it within that zone, for eyestrain would result, the eye facing one second a brightly lighted area and a second later Stygian darkness. The maximum brightness should be five times the average brightness of the entire illuminated area.

With the electric lamp there is no gas or fire hazard—the Anaconda Copper Mining Co. ascribes 80 per cent of its fires to open-flame lamps—there is more illumination, steadier light, no adjustment during the shift, no consumption of oxygen, no generation of heat, safety around explosives and less operating expense.

In reply to Mr. Cooper, Mr. Bright said that the 3-cell battery weighed 87 oz., and the 2-cell, 63 oz. Miners seem to overlook the increased weight, as thereby their places are better lighted so that the 2-cell battery is favored only in Great Britain, where electric lighting has not been so long in operation.

After an address by Erskine Ramsay, chairman of board, Alabama By-Products Corporation, on experiences in Pennsylvania and Alabama, G. E. Bayles, chief engineer, Ohio & Pennsylvania Coal Co., discussed the requisites for mechanical loading, declaring that machines must be made to fit the mine instead of the mine to fit the machines. It is not well to revamp mining methods of long standing in the introduction of the loading machine, because years of experience have determined the best way to meet the perplexing problem of roof control.

A new "low" in mining fatalities had been established in the bituminous mines of Pennsylvania during 1933 with one fatal accident for every 581,569 tons extracted, but in 1934 the output per fatality dropped

to 570,653 tons and in the first ten months of 1935 to 560,366 tons, declared W. H. Filer, State mine inspector, Ebensburg, Pa. Firebosses must be given more time in which to make their inspections. The seven-hour day demands larger supervisory forces.

Whenever an official enters a man's working place, the miner should sound his roof, declared J. V. McKenna, State mine inspector, Waynesburg, Pa. Sometimes, the roof may "sound good," but a slip nevertheless may be detected on close inspection. The foreman should examine the roof facing the end of the room and then facing the other way. Sometimes slips missed in the first examination may be seen easily from the opposite direction.

Foremen must stop to see that all loose rock is taken down immediately, declared Mr. McKenna. If they do not, they are directly responsible if an accident happens, and if the rock cannot be taken down they should see that it is properly secured by timber. They must not only issue orders but stop to see that they are obeyed. Posting of drawslate should be absolutely forbidden. Loose drawslate held on posts or timbers should be taken down immediately. Before removing loose rock, miners should assure themselves that nothing is back of them, whether cars or posts, that will prevent them from keeping out of the way of the rock they are dislodging. They, at least, should have a line of retreat in mind when they start to take down slate. Every miner should have a wedge, slate bar and hammer. Use of a pick for dislodging slate is dangerous. If a bar does not bring down the rock, a wedge should be used to start the movement.

First Cuts Cause Fatalities

First cuts made in the side of a room or entry and last cuts made into open areas or a gob often result in roof-fall accidents. After an entry or room, said Mr. McKenna, has been standing for a time and a side cut is made, the foreman should remember that slips in the roof that cannot be detected may tail out over the coal with a loose end resting immediately on the top of the coal being cut. This roof sometimes will fall even before the coal is shot. No side cut either in development or retreat should be made until the foreman has inspected the place and pronounced it safe. The place to be cut should be "squared up" and all bone coal and slate taken down. The ribs on both sides of the cut should be examined, and all loose coal and slate dislodged and sides squared up. If the ribs are weighted or the roof is bad, one or two posts should be set directly against the rib with cap pieces driven therein. Such posts should not be more than 3 ft. back from the ends of the cut. They will hold the rib if it loosens during, or as the result of, cutting.

After the place has been cut, two roof posts should be set at once between track and face and the place inspected. After the first shot has been fired, only enough coal should be removed to permit placement of two posts about 6 ft. apart directly in the cut. These four posts should prevent the roof from sagging, which otherwise it would be likely to do by reason of the additional width to be supported.

First cuts are exceeded in danger only by cuts which hole into old places. In such holing cuts, the roof may be shattered or

Relation Between Inspectional Forces and Fatalities per Thousand Employees

Year	No. of Inspectors	Production	Employees	Fatalities		Production
				Total	per Thousand Employees	per Inspector
1878.....	3	12,500,741	25,787	48	1.86	4,166,910
1882.....	3	20,694,110	42,393	94	2.22	4,136,428
1902.....	12	98,529,122	135,611	456	3.86	2,210,741
1922.....	30	108,310,046	194,630	424	2.18	3,610,324
1930.....	30	123,417,815	133,703	296	2.21	4,556,478
1932.....	26	74,154,596	106,597	154	1.44	2,852,180
1933.....	26	78,511,864	116,917	135	1.11	3,019,689
1934.....	26	89,592,481	127,868	156	1.23	3,445,865

broken on the other side of the pillar if the place is entering an old room or entry, suggested Mr. McKenna. Also gobbled rock may slide into the cut. Even if the general character of the place is such as not normally to require timber, workmen should carry a line of at least three props not more than 4 ft. apart in any direction to protect them until this coal has been removed.

Roof along haulageways should be inspected regularly, and written reports made. In haulage wrecks "bridge timbers" (horizontal timbers paralleling the tracks) are likely to be brought down by the displacement of one or more of the posts by which they are supported. Sometimes two verticals are used on each side of the track with three or four cross timbers resting on the two bridging timbers. One leg loosened would bring down nine or ten timbers. For this reason, brick corners should be used around switches.

Many men have been injured, asserted Mr. McKenna, in the placing of bridge timbers. Falls usually occur after these timbers have been placed and the workmen are removing the posts under the original cross timbers. Bridge timbers and the posts placed under them cannot be set as tight as are the weighted posts originally placed under the cross timbers; hence, when legs of cross timbers are withdrawn, the roof may sag, perhaps only a fraction of an inch. This twists the bridge timbers, which in turn either twist or push out the legs from under them, and a fall occurs.

Center Post for Safety

For this reason, a center post should be placed under each of the cross timbers under which the bridge timber is to be placed. Condition of these cross timbers should be noted; if new timbers are needed they should be set at this time. The bridge timber should then be placed as firmly as possible and so that the posts under the two cross timbers can be left standing. With these in place the danger of a shift in the weight of the roof is much reduced. At some mines two bridge timbers are used instead of one, as the bridge timber must carry the weight formerly carried by the three or four cross timbers, and if the bridge timber is not strong enough it will soon bend or break. After bridge timber has been placed, if an examination shows everything is in good order, the center posts can be removed. Too often so many are working around the point where bridge timbers are being set that the roof does not sound a sufficient warning to reveal the danger to those employed.

Officials should test roof to their own satisfaction, objected William Lauder, safety director, Pittsburgh Coal Co. They should not rely on miners to perform this essential function; moreover, miners should not be required to leave their work every time officials enter their rooms. Furthermore, loose slate sometimes must be posted. It cannot always be barred down, because enough coal has not been extracted to permit of its removal. Men are not given enough training in the removal of posts. The man who removes them always must station himself on the side of the post away from the point where rock is likely to fall. Sometimes, miners should not be permitted to remove posts near a rib fall.

Sounding the roof is no waste of the miner's time, countered Mr. McKenna.

The miner must quit work or he may sink a pick in the official's ribs when welding it on the face of the coal. Inspectors should participate in the sounding of the roof, said another. The miner strikes the roof and the inspector listens to the sound and holds a stick against the rock to detect vibration.

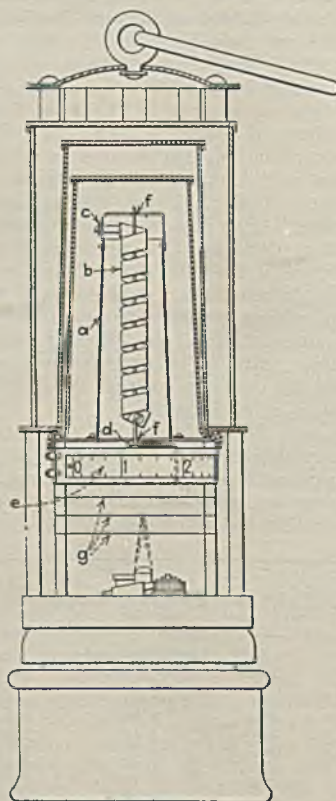
In many States the flame safety lamp still remains the legal device for determining whether a mine is gassy or non-gassy, said L. C. Ilsley, electrical engineer, Pittsburgh Experiment Station, U. S. Bureau of Mines. Moreover, as the electric lamp does not warn the wearer of oxygen deficiency, some device must be used regularly to afford protection. Only an optimistic official would expect the users of the ordinary flame safety lamp to determine methane concentrations as low as one per cent.

Coil Shows Methane Present

In accord with the Bureau's investigations, improved models of round-wick flame safety lamps which involve an entirely new method of registering methane percentages detectable in mine atmospheres have been manufactured. The improvements can be added to either Koehler or Wolf round-wick lamps. No alteration need be made to the construction of the lamp, added Mr. Ilsley. A stainless-steel cone, *a*, is mounted above the glass cylinder, concentric with the gauzes. This supports the thermostatic coil, or helix, *b*, which is built up of a bimetal material like that used in devices for automatically controlling heat. The upper end of the coil is fastened at *c* and the lower end is attached to the pointer, *d*, which is free to turn in the bearings, *f*, these being merely holes in the metal strips at the top and bottom of the cone.

With every change of temperature ex-

Lamp with thermostatic coil detects methane.



plained Mr. Ilsley, the coil expands and contracts, thereby turning the pointer around the scale, *e*, which is loosely attached to the glass and can be moved around it. The usual lamp glass is used, but lines *g* have been added to permit accurate adjustment of flame heights.

To test for gas: (1) let the lamp reach normal temperature while going into the mine workings; (2) before leaving fresh air, set tip of flame exactly on middle line; (3) move scale until pointer aligns with zero mark of scale; (4) proceed to place where test is to be made. If any considerable methane is present, the lamp should give a double warning by increase in height of flame above line of setting and by a decided movement of pointer to right. By setting pointer in normal air to 2 instead of zero, it will indicate by its movement to the left if there is an oxygen deficiency. This also will be shown by a change in the color of the flame, by a decrease in the height of the flame from its setting or by extinguishment. If with oxygen deficiency the pointer should move to the right it does so because heat of combustion of methane is overbalancing loss of heat arising from oxygen deficiency.

Few gasolines are suitable for flame safety lamps, and one should be chosen that will not gum the wick and that has a narrow distillation range. One with a wide range may give off lighter products during the first part of the day, leaving heavier products to be burned at the tag end of the shift, which may result in unsatisfactory burning at both ends of the shift or no light at all. If fed too fast, the lamp may smoke. With a better fuel, a tighter wick may be used. With a better grade of oil, a lamp will burn longer per filling and the wick will not jar up or down and will not gum. Fuel vessels of flame safety lamps should have a positive vent lest a pressure be built up within the vessel when the lamp is burning. With the new device, the wick is not turned down, as in taking observation of a cap, so the light is always available for inspection, and electric lamps can be carried because they do not interfere with the reading of the indication.

Good Vision Unnecessary

By the use of this lamp, men with impaired vision and color-blind men are enabled to test for gas as well as other men. The lamp has the approval of the Bureau. It will show $\frac{1}{2}$ per cent of methane in the laboratory, but it cannot be used on a flat wick or one out of center, declared Mr. Ilsley. Differences in temperature between the point of setting and that of observation, asserted J. T. Ryan, vice-president, Mine Safety Appliances Co., will make a difference in the temperature of the coil and therefore in the action of the pointer.

Excess water in mining must be removed from the mine, and nowhere else can it be placed than in surface streams, said Mr. Cooper. The issue may as well be faced, declared A. E. Holbrook, dean, school of engineering, University of Pittsburgh; the active mines will continue to pour acid water into the streams until the law relating to the sealing of portions of mines is amended. Some improvement can be made in active mines, but not much. In two townships of Westmoreland County, these mines produced 22,000 lb. of acid per day, and abandoned mines, 23,000 lb. daily. Human sewage, if it were not for mine

water, would make the streams too foul for the near-by population to endure. The subject is fraught with danger; only one vote prevented the passage of a law which would have laid on the coal industry the impossible burden of ridding its waters of their acid content.

No rational person, declared E. W. Lyon, regional consultant, Public Health Service, desired to hamper the coal industry, but, in his belief, the coal operator should realize that his interest is identical with that of the population of the mining region and should cooperate in some solution of the problem. Thus, he could make provision to keep water from entering the mines, thus easing his pumping load while lessening the volume of acid water delivered to the streams. Though the law now prohibits the placing of stoppings in worked-out sections, he hoped it could be revised. Panels could be isolated inexpensively if the work were laid out with that end in view, and their closing would reduce the cost of ventilation. Advancing places do not provide much acid, so with old workings rendered non-acid by the exclusion of air, little acid would be delivered to the streams.

Safety must be the first consideration, urged J. F. Bell, State mine inspector, Dravosburg, Pa.; it cannot be assured if worked-out areas are to be closed to ventilation, for they will fill with methane, which is now carried away from the gobs by passages opening into the return.

Westinghouse to Open Jubilee With Employee Mass Meeting

Signalizing its start on its second half century of service, the Westinghouse Electric & Mfg. Co. will celebrate the fiftieth anniversary of its incorporation with a family party of 12,000 employees in the Pittsburgh district on Jan. 8. Members of the Westinghouse organization in every important branch office and factory in the country will hold simultaneous meetings and will participate in ceremonies in the Pittsburgh district through a short-wave broadcast from Westinghouse transmitter W8XK (25.26 and 48.83 meters) starting at 8 p.m. Eastern standard time. The broadcast will be picked up by international representatives and friends in foreign countries.

The Pittsburgh meeting will feature addresses by Chairman A. W. Robertson, President F. A. Merrick and other national figures from outside the company, who will review the contributions of Westinghouse to industry and present a forecast of the future. "The New Frontiers," Westinghouse's new institutional sound picture for its golden jubilee, will be shown to employees for the first time as a part of the celebration, which will open the golden jubilee year of the company.

Ninth Mining Institute Set

The annual mining institute of the College of Mines, University of Washington, will be held for the ninth successive year Jan. 20-25 at Seattle. Lectures and laboratory demonstrations will be given each day except Saturday by members of the mining, metallurgy and ceramics staff and

MISSISSIPPI POWER PROJECT PLANNED BY NORRIS

A BILL proposing a Mississippi Valley Authority—along the lines of TVA—is in contemplation by Senator Norris. The Nebraska statesman, father of the Muscle Shoals project, announced on Dec. 27 that he would introduce a measure in the coming session of Congress to set up the new authority, which would embrace more than half of the continental United States. It would reach from the sources of the Mississippi River near the Canadian border to the river's mouth at the Gulf of Mexico and from the Allegheny foothills to the western continental divide, omitting the TVA area.

The plan, according to Senator Norris, is an expansion of his former project for a Missouri Valley Authority. Flood control, he stated, would be its chief purpose, but it also would direct the development of navigation, irrigation, hydro-electric power, soil conservation and reforestation. Like TVA, said the Senator, the new authority would be managed by a three-man directorate.



faculty of the college, as well as talks on related subjects by special lecturers from industry. A special field trip is planned for the concluding day. Other features will be a display and demonstration of new machinery and equipment and a joint meeting with the North Pacific Section, A.I.M.E. Sessions are open to all persons interested in the mineral industries, and no fees or registration formalities are required.

Takes Back Airdox

Development and marketing of Airdox, compressed-air agent for the dislodgment of coal, was taken over by the Safety Mining Co., Chicago, on Jan. 1. This is the result of a mutual agreement modifying the arrangement with the Sullivan Machinery Co. whereby the latter was licensed to develop Airdox.

Obituary Notes

FRANK M. HOUSE, 62, superintendent of the New Acton mine of the Alabama Fuel & Iron Co., died in Birmingham, Ala., Dec. 4. He had been identified with the coal mining industry in Alabama more than 30 years, serving at various times as superintendent of operations for the Alabama By-Products Corporation, Sloss-Sheffield Steel & Iron Co. and the Markeeta Coal Co.

W. D. MCGINNIS, 62, superintendent of the Summit mine of the Alta Coal Co., died Dec. 9 at Summiton, Ala. He had been in charge of the Summit operation for a number of years.

Sales of Mechanical Stokers Exceed Last Year's

Sales of mechanical stokers in November, 1935, totaled 5,004, of which 4,287 were small residential-size units, according to statistics furnished the U. S. Bureau of the Census by 108 manufacturers. This compares with sales of 10,038 units in the preceding month and 3,373 in November, 1934. Figures for the first eleven months of 1935 show that 44,266 units of all types and sizes were sold, compared with 26,110 in the corresponding period of 1934. Sales by classes in the first eleven months of 1935 were as follows: residential (under 100 lb. of coal per hour), 38,048; apartment house and small commercial heating jobs (100 to 200 lb. per hour), 2,881; general heating and small high-pressure steam plants (200 to 300 lb. per hour), 1,220; large commercial and high-pressure steam plants (over 300 lb. per hour), 2,117.

Willow Grove Enters List Of Mechanical Mines

With work on a new tippie and washing plant under way, the Willow Grove No. 10 mine of the Hanna Coal Co., Neffs, Ohio, will join the list of completely mechanized mines next April. At that time it will move into the position held by Hanna's famous Fairpoint No. 9 mine, where exhaustion of coal will bring to an end a five-year record of mechanized operation both underground and on the surface.

Serving both as a regular contributor to the output of the Hanna group and a laboratory for experimental work in mechanization, Fairpoint No. 9, from its earlier start as a single-shift operation, graduated to a triple-shift schedule in 1934. Preparation facilities at Willow Grove, which will substantially duplicate those at Fairpoint, will consist of a four-track all-steel tippie and washing plant with loading booms, sizing screens, conveyors and auxiliary equipment. Emulating Fairpoint, the mine also will operate on the triple-shift basis.

Coal Research Summarized

Recent advances in coal research and utilization are summarized in a booklet entitled "Résumé of Research in Coal and Coal Utilization," issued by Bituminous Coal Research, Inc. The brochure gives a synopsis of coal studies by private industry, universities and technical schools throughout the country, with a bibliography of recent publications on the subject.

Foremost in fundamental coal research, according to B.C.R., is Carnegie Institute of Technology, Pittsburgh, Pa., and the leader in applied research is Battelle Memorial Institute, Columbus, Ohio. The importance of these studies by private industry and educational institutions is emphasized because of the curtailment of such work by the U. S. Bureau of Mines experiment station at Pittsburgh, made necessary by cuts in its budget, and lack of information concerning proposed work along this line by TVA.

Mine Operation and Supervision Are Features Of Indiana Institute Meeting

PROBLEMS involved in both mine operation and supervision featured the 1933 winter meeting of the Indiana Coal Mining Institute, held Dec. 14 at the Lisming Hotel, Terre Haute, Ind. With F. L. Dome, vice-president, Little Berry Mining Corporation, and retiring institute president, in the chair, papers and discussion were devoted to economic and safety factors in the use of treated timber, practical operating rules, supervision problems in the coal industry and new developments in mining. John A. Garcia, president, Allen & Garcia Co., was toastmaster at the banquet following the technical sessions, with John S. Taylor, of Hays & Hays, attorneys-at-law, Sullivan, Ind., as speaker at the evening.

"WOODEN wood preservation," said Beatty Joyce, district sales manager, the Wood Preserving Corporation, "is impregnation of wood under pressure with preservatives that have proved their value over long periods of time." Wood preservation goes back to the time of Queen Elizabeth, when the necessity for protecting the English fleet stimulated study of the question. "We know today that decay is caused by low forms of plant life called fungi," which start from spores or seeds and require for their growth heat, air and a certain quantity of moisture and heat. Under ordinary conditions of service, it is impossible to control air, moisture or temperature, so that the most effective way to prevent the growth of fungi is to poison the wood.

Mine Conditions Favor Fungous Growth

"The uniform temperature, air and moisture conditions in many coal mines are extremely favorable for the growth of these wood-destroying organisms. The practice of leaving in place rotten timber sets and placing new timber sets in place, frequently in decayed sets, is the quickest method that could be used to insure the speedy infection and decay of the new timber. The further practice of using old, infected or decayed timber as lagging or of disposing of it by using it back in the old workings, then the old fungus continues to produce fungi and millions of spores, or seeds, which are continuously sent out into the main workings to be carried by the air currents to other parts of the mine. For this reason, mine timber placed in service in rotten air quality has a shorter life than if in service in fresh air.

"Copper oil and certain toxic salts are highly poisonous to fungi and are harmless to humans when the treated timber is handled under normal conditions. To be really effective, wood preservatives must be impregnated deeply into the wood under pressure and a sufficient amount even in the wood to continue to prevent decay for long periods of time."

The first railroad ties were treated in 1868. Mr. Joyce pointed out, however, that until the second 1900 to 1910, that economic possibilities were substantially

attractive for use on a relatively large scale. The Baltimore & Ohio, New York Central and Pennsylvania railroads use an average of 2,919 cross-ties per mile of track, and the maintained mileage of the three roads is 55,850, making the total number of ties in service 163,000,000. Renewals of treated ties in the period 1930-34 averaged 74.61 per mile, against 245.82 untreated ties in the period 1907-11. Cost of renewals was \$344.15 per mile in 1907-11 and \$149.22 in 1930-34.

Even greater savings are possible in mines, because timber life is much shorter and labor cost relatively higher. A study by C. A. Herbert, supervising engineer, Vincennes station, U. S. Bureau of Mines, showed an estimated saving of \$1,500 per mile of main-line track, based on a treated-tie life of fifteen years, which is conservative. Railroad saving is something under \$200 per mile. "A simple rule is that when a treated mine tie is installed or a treated mine timber is put in place, the cost in place will be returned with a profit at the time when the first renewal would have been made had an untreated mine tie or mine timber set been used."

Discussing the use of treated material at a northern Indiana mechanical loading operation, S. M. Cassidy, Terre Haute, stated that zinc chloride was



Indiana Officers

H. H. SCHILL, general manager, Binkley Mining Co., Clinton, Ind., was elected president of the Indiana Coal Mining Institute at the Terre Haute meeting, Dec. 14. Mr. Schill succeeds H. A. Davis, vice-president, Little Berry Mining Corporation, Lisming, Ind. Other officers were chosen as follows:

First vice-president—H. R. Smith, president, Shelburne Mining Co.

Second vice-president—C. A. Farber, supervising engineer, Vincennes station, U. S. Bureau of Mines.

Third vice-president—H. C. Conrad, general manager, Knox Consolidated Coal Corporation.

Secretary-treasurer—Harvey Carver, commission, Indiana Coal Operators' Association (retirees).

Members of the executive board are: Thomas W. Baileys, Binkley Mining Co.; Paul Carey, Hercules Powder Co.; H. A. Thompson, vice-president, Thompson Coal Co.; H. A. Gross, general superintendent, Walter Hirsche & Co.; S. M. Cassidy, superintendent, Seneca Coal Mining Co.; E. J. Weimer, general manager, Snow Hill Coal Corporation; and F. L. Dome, vice-president, Little Berry Mining Corporation.

preferred under conditions at that mine because it is fire-resistant, somewhat less costly and can be handled with the bare hands. The mine is very wet, with a humidity of over 95 per cent and a temperature of 58 to 60 deg. F. the year around. Timbers decay rapidly under such conditions, and experience indicates that with untreated timbers decay is well started in nine months. Few untreated props or ties will last more than eighteen months. Somewhat greater life probably could be obtained from good white-oak ties, but these are scarce and consequently the plentiful mixed hardwoods, treated, are employed.

The 25-lb. rail in room entries is now laid with 3x5-in. x 5-ft. ties; 60-lb. main-line rail with 5x7-in. x 6-ft. ties. Steel ties are installed every 6 ft. in both types of track, and are used exclusively in rooms and development entries. No zinc-chloride room ties have failed from decay, although there have been some replacements resulting from mechanical injury, especially some years ago when main lines were laid with 35-lb. rail on 4x6-in. ties. In the latter case, the rails cut into the ties. No such trouble has been encountered with the 60-lb. rail, even though no tie plates are used except on switches and curves, where pounding is severe.

Three Uses Expected From Tie

As each room panel (48 rooms) produces 800 to 900 tons per day, sections last only three to four months and wood ties under room tracks usually are not in place more than six months. "It would seem that each tie could be used over again two or three times, but such is not the case, as untreated room-entry ties average only one and one-half uses."

With treated 3x5-in. ties, we expect to be able to get three uses—two splittings on one side and one on the other—before mechanical injury prevents further use for tracklaying. When injury prevents further use, the old ties can be pressed into service as lagging or cribbing in permanent entries or as cap pieces in aircourses or break-throughs. Both are used where untreated timber would result in failure, with consequent expensive clean-up and rebuilding.

Junk light rail had been used at the mine to lag over crossbars, but is now so scarce and expensive, Mr. Cassidy pointed out, that it is cheaper to use treated wood, even if new wood was, rather than used ones, are employed. Lags have been practically eliminated on haulways, as they cannot be kept re-cessed, due to sloughing of the rib, thus presenting a dangerous condition and adding to cost. Now, a hitch drill is used for making holes for 60- to 90-lb. rail crossbars. In aircourses and other permanent places where there is no haulage, "we find it more economical if treated lags are used to support the bars. This is especially true in old aircourses and where the hitch drill is employed full time on haulways. If aircourses were crossbarred as driven it might be best to use the 'hitch-drill' method."

Roughly, treatment adds about one-half to the original cost of the timber. But this is offset many times by less

consumption of ties, lagging and legs and, particularly, by the great reduction in labor cost of replacing and maintaining when not treated." As a result of an investigation carried out with Emile Cramps, mine foreman, Mr. Cassidy offered the following figures to show the advantages of treated main-line ties at the mine in question. Two trackmen receiving a total of \$30.15 can replace an average of ten ties per shift, making the labor cost per tie replaced \$1.01. The cost is 45c., making the total cost of replacing an untreated tie \$1.46. Extra cost of treating the original tie with zinc chloride would have been 26c.

"It can thus be seen that the cost of the second tie alone would more than offset the original extra cost of treating. Then on top of that is the high labor cost, which offsets many times the cost of treating. Savings by using treated wood for timbering are even greater, as there is not only the high material and labor cost of replacement but also the much higher cost of cleaning up slate, interference with haulage and mine operation, delay and danger to men. In one case a main-line bottom replacement cost \$5 per lineal foot of entry, all of which could have been avoided if treated timber had been used originally."

A selected list of operating ideas, or hints, was the subject of a paper by James Hyslop, chief engineer, Walter Blodsoe & Co. His presentation was supplemented by a number of ideas offered from the floor, all of which are abstracted on p. 24 of this issue.

Supervisor Has Many Responsibilities

"The essence of supervision," declared G. F. Buxton, professor of industrial training, Purdue University, "is the observation and control of workers by the foreman or boss of the gang." This involves the assumption of a number of responsibilities by the supervisor, of which sixteen were singled out by Professor Buxton for consideration, as follows: keeping watch over the activities of the various employees in the group of which he is in charge; laying out each man's job, which presupposes accurate knowledge of what constitutes a satisfactory day's work; maintaining the quality and speed of the men's efforts; instructing employees where necessary so that each will know how to work efficiently; recognizing bad methods and mistakes immediately; correcting bad working practices; controlling mining hazards; keeping abreast of methods of preventing accidents; insisting upon safe working methods; planning his work so that all men may be observed at intervals and also so that those who need more than the usual attention will get it; finding ways of working agreeably with men; selling to employees the idea that the management intends to deal fairly with them, as well as the idea that the company must make a profit or go out of business; getting the worker's point of view, as the supervisor is, to some degree, their representative; clearing up misunderstandings; reporting to the management matters that both have and have not been settled satisfactorily; and, finally, keeping abreast with what is going on, a test of supervising ability which must

ANTHRACITE WEEK OBSERVANCE TO BE ANNUAL EVENT

ANTHRACITE WEEK, which was observed in the hard-coal region of Pennsylvania Oct. 7-12, is to be an annual event. Plans for last year's celebration originated in Scranton, and the interest aroused to the importance of the industry in that community was such that it was decided to make the observance a permanent annual affair. To that end there has been organized the Anthracite Conference, including representatives of the tripartite interests behind the movement, which will work for permanent results from the recent celebration and plan programs for the future. A conference of business and professional interests representing the entire anthracite region, held at Wilkes-Barre on Dec. 10, endorsed the proposal to make the celebration a yearly event.



be matched by sufficient executive ability to keep control of the situation.

A working knowledge of human nature and a cooperative spirit are the principal qualifications of a good supervisor, declared E. J. Weimer, general manager, Snow Hill Coal Corporation, in a discussion of Professor Buxton's paper. To gain a knowledge of human nature, it is necessary to study the principles of getting along with men. Many supervisors are proficient in the handling of men, said Mr. Weimer, and in each case they possess the following traits; honesty and sincerity; an innate interest in and an affection for people; strength, or power, or personality, which is power under control; and analytical ability. The tools of a good supervisor, he concluded, are cheerfulness, sincerity, calmness and consistency.

Timbering, drainage, face preparation, loading and tippie preparation now rank in importance with air and haulage, once considered the most important departments around the mine, declared Dewey Loudermilk, mining engineer, Binkley Mining Co., in a summary of new developments in coal mining. Manufacturers now supply smaller and faster fans, which can be operated for about one-half the cost of the fans used ten years ago, and the operator has co-operated by building better brattices in aircourses. In haulage, the locomotive is fast eliminating the mule; heavy steel is replacing light steel; and in many cases chemically treated ties are going in on permanent haulage roads.

Hitch Drill Improves Timbering Art

The art of timbering has made rapid strides with the introduction of the hitch drill, which cuts the cost of installing crossbars and increases safety by eliminating legs which may be knocked down by derailed trips. Chemically treated legs are being used in many mines to obviate the necessity of replacing them every few years. In some mechanical mines, the management is using larger straight props and recovering them—a much safer and more economical procedure. The drainage prob-

lem has been met satisfactorily by the development of a wide variety of pumping units from small gathering pumps to large centrifugal units or turbine pumps placed on the surface. "In my opinion," said Mr. Loudermilk, "the use of the turbine pump in dewatering mines is an outstanding development. These pumps are adapted to pumping out old works, abandoned shafts or, in case the mine is sealed or shut down indefinitely, to installation in the quarter shaft, enabling the sump to be pumped."

In face preparation, continued Mr. Loudermilk, the shortwall machine, track-mounted cutting and shearing machines and electric drills have played major parts in economical face-preparation methods, while permissible explosives and air-shooting give added safety along with a better quality of product. Mechanical loading either by face conveyor, pit-car loader or mobile loader has made great strides since 1927, and "it is interesting to note the success of some mines with small pit cars that have changed over." Concentration has been one of the outstanding results of the growth of mechanical coal loading. "For example, I know of a hand-loading mine that was producing 1,500 tons of coal nine years ago from five partings. Today, that same mine is producing 3,000 tons of coal from two partings. They are hauling the coal two or three times farther than they were nine years ago."

Rapid Progress Made in Stripping

Rapid progress also has characterized strip mining. Ten years ago, with the 6- to 8-cu-yd. dippers in use, an 8 to 1 ratio was about the limit in stripping. Since then, the adoption of horizontal drills and liquid oxygen has resulted in material savings, and the cost of maintaining stripping units has been reduced substantially. Furthermore, changes in dipper design and the use of various alloys have resulted in a material weight reduction, with the result that capacity has been increased to 32 cu-yd. These changes make possible much higher ratios of overburden to coal and, generally speaking, "permit consideration to be given to operations where the ratio is as high as 20 to 1."

Progress in the design of coal-loading shovels, asserted Mr. Loudermilk, has paralleled that of stripping shovels, with the result that several machines capable of loading 3,000 to 3,500 tons in seven hours are now in service. Trailer haulage, while subject to some distance limitations and requiring consideration of potential daily mine output, has proved in many cases a cheaper method of handling coal from pit to preparation plant. Also, trailers permit the stripping of small isolated areas that otherwise could not be worked and are particularly adapted to loading coal in the ends of pits or in the last cut in abandoned pits. Reclamation of stripped areas is receiving widespread attention from strip operators, "and unquestionably within a short time the various experiments in this direction will become crystallized so that what is now looked upon as waste and barren land will become even more productive than it was before the coal had been removed."

Salvati Heads Program Group For A.M.C. Convention

The thirteenth annual convention of Practical Coal Operating Men and National Exposition of Coal Mining Equipment, under the auspices of the Manufacturers' Section of the American Mining Congress, will be held May 11-15 in Cincinnati, Ohio. R. E. Salvati, general manager, Island Creek Coal Co., has accepted the chairmanship of the national program committee. Though no details of the program have been announced, the technical sessions and exposition will be held, as in past years, in the Music Hall.

Urges Support for Coal On Public Projects

The use of "materials produced with coal" on PWA and WPA projects is urged in a bulletin issued Dec. 13 by the Southern Illinois Reciprocal Trade Association. The bulletin, which is addressed to mine labor organizations, the coal industry of the State and members of the association, calls attention to the fact that contracts for public improvements have been awarded to companies using natural gas. This action is characterized by the association as a short-sighted policy, since the Federal Public Works program was designed to relieve unemployment and "the use of natural gas deprives many workers of employment," whereas "the use of coal contributes to permanent employment in the coal and railroad industries of the State." Therefore the association solicits cooperation in preventing the use on public projects of materials produced with natural gas.

To Discuss Industrial Fuels

A symposium on industrial fuels will feature the meeting on Jan. 21 of the American Society for Testing Materials to be held at the Philadelphia Engineers' Club, which will jointly sponsor the meeting. The program is as follows: "Manufactured Gas," W. H. Fulweiler, chemical engineer, United Gas Improvement Co., and associates; "Liquefied Gases," W. H. Bateman, president, Solgas, Inc.; "Fuel Oil," H. V. Hume, combustion engineer, Atlantic Refining Co.; "Coal and Coke," A. C. Fieldner (vice-president, A.S.T.M.), chief engineer, experiment stations division, and W. A. Selvig, chemist, U. S. Bureau of Mines.

The papers have been prepared with particular regard to their comparative value, the speakers having conferred with one another in drafting an outline applicable to each paper. Details to be covered in the papers include historical background, magnitude of the industry, future availability of raw materials, possibility of new processes, tests that are applied to the materials, significance of the tests, utilization of the materials, general economic aspects of the product, and utilization. Discussion will be both written and from the floor, the prepared discussion to be presented by speakers interested in the materials primarily from the standpoint of consumption.



R. E. Salvati
Accepts chairmanship of program committee
of Mining Congress convention

To Make Air-Sand Cleaners

Air-sand dry cleaners for use in coal-preparation plants are to be manufactured and distributed by the Stephens-Adamson Manufacturing Co., Aurora, Ill., according to an announcement by the Hydrotator Co., Cleveland, Ohio. Thomas Fraser, who developed the air-sand process, has been transferred to the Stephens-Adamson organization to supervise engineering and construction work on the cleaners.

Industrial Notes

CUTLER-HAMMER, INC., Milwaukee, Wis., announces the promotion of C. S. Crane, sales manager, and W. C. Stevens, chief engineer, to vice-presidencies in charge of sales and engineering respectively.

O. R. LANE, 455 Paul Brown Building, St. Louis, Mo., has been appointed representative of the KENNEDY VALVE MFG. Co. in Oklahoma, Arkansas, eastern Missouri and Indiana. WILLIAM GODBEY will represent the company in Kansas, Nebraska, western Missouri and southwestern Iowa, making his headquarters in Kansas City, Mo.

FRANK F. CHILES, formerly manager of sales of the bar division of Corrigan-McKinney Steel Co., has been appointed assistant manager of sales of the bar division of the REPUBLIC STEEL CORPORATION, with headquarters at Youngstown, Ohio. The Pittsburgh (Pa.) district sales office of Republic has been removed from Fourth and Bingham Sts., South Side, to 1832 Oliver Building. UNION DRAWN STEEL Co., a subsidiary, has moved into an adjoining suite.

J. E. N. HUME, assistant manager of the General Electric Co.'s industrial department, has been appointed manager of the department, vice W. W. Miller, deceased. GEORGE H. REID has been named industrial department manager in the New York district, succeeding Fred S. Hartman, who retired as of Dec. 31.

World Power Conference Plans Taking Shape

Organization of the World Power Conference, third plenary session, to be held in the United States in September, 1936, is well under way, officers and a number of committeemen having been named. The executive committee will be in active charge of planning and carrying out the conference, subject to the general direction and approval of the American National Committee, which will be composed of the executive committee and approximately 80 additional representatives of the utilities, including coal, oil and gas producers, the professional societies and others.

At a meeting of the executive committee held in Washington, D. C., late in November an agenda and general plan of operation were adopted. Seven principal topics of discussion were approved, subdivided into eighteen specific questions. Each participating nation will submit one paper on each question which will present its views, except that on questions of a controversial nature each nation may submit two papers presenting opposite sides. About fifty nations are expected to participate, sending approximately 1,000 delegates, and nearly 3,000 Americans are expected to take part. Various phases of national power economy will be discussed, as follows: Physical and statistical basis—technical, economic and social trends; organization of the fuel industries; organization and regulation of electric and gas utilities; national planning for the most efficient utilization of natural resources; problems in regional planning; rationalization of distribution; national power and resources policies.

The National Coal Association has accepted membership in the American national committee, which will cooperate with the executive committee. President J. P. Williams, Jr., will be the association's official representative.

The following officers have been chosen:

Honorary president: Franklin D. Roosevelt.

Honorary vice-president and chairman of the American national committee: Harold L. Ickes, Secretary of the Interior.

Chairman of the conference and vice chairman of the American national committee: William F. Durand, professor emeritus, mechanical engineering, Leland Stanford University.

Director: O. C. Merrill, consulting engineer, Washington, D. C.

Executive secretary: Joel D. Wolfsohn, National Power Policy Committee, Washington, D. C.

Executive committee: Morris L. Cooke, Rural Electrification Administrator (chairman); C. W. Appleton, vice-president, General Electric Co.; Floyd L. Carlisle, chairman of board, Niagara Hudson Power Co.; Frank D. Comerford, president, Edison Electric Illuminating Co., Boston, Mass.; Gano Dunn, president, J. G. White Engineering Corporation; Robert H. Fernald, dean, Towne Scientific School, University of Pennsylvania; A. C. Fieldner, chief engineer, Experiment Station Division, U. S. Bureau of Mines; Daniel C. Green, trustee, Middle West Utilities Co.; David E. Lillenthal, director, Tennessee Valley Authority; William McClellan, president, Potomac Electric Power Co.; Frank R. McNinch, chairman, Federal Power Commission; Gen. Edward M. Markham, Chief of Engineers, War Department; O. C. Merrill; I. E. Moulthrop, consulting engineer, Boston, Mass.; T. W. Norcross, chief engineer, Forest Service, Department of Agriculture; Richard Southgate, Chief of Protocol, State Department; C. E. Stephens, vice-president, Westinghouse Electric & Manufacturing Co.; Joel D. Wolfsohn; James C. Bonbright, trustee, New York State Power Authority.

Supreme Court to Expedite Guffey Act Decision; Minimum Prices Ordered Within 30 Days

WASHINGTON, D. C., Dec. 31.—Although legal attacks on the validity of the Bituminous Coal Conservation Act of 1935 have steadily mounted in number until more than one hundred companies are now aligned against it, the machinery of the new law continues to move. As the result of a two-day hearing ending Dec. 28, Chairman Hosiord of the National Bituminous Coal Commission announced that schedules of minimum prices in Minimum Price Area No. 1 would be promulgated within 30 days. Some of the operators asked that minima be established immediately, while others urged delay pending Supreme Court action on the constitutionality of the law. The hearing was held in accordance with General Order No. 10, issued by the commission on Dec. 19. Minimum prices have already been approved for Districts 14, 16, 17 and 18 (Arkansas, Oklahoma, northern Colorado, southern Colorado, and New Mexico). Two other general orders were released, No. 9 designating the district boards as agents of the commission for distributing data to code members and providing that orders of the district boards shall be orders of the commission when approved by the commission. General Order No. 11, issued Dec. 20, provides that assessments hereafter made by district boards shall become effective as and when approved by the commission; initial assessments authorized in Order No. 3 are payable by code members of respective districts irrespective of commission approval. To date, 3,685 companies with an annual production in 1934 of 252,000,000 tons have signified to the commission their acceptance of the code.

Supreme Court Agrees to Quick Test

Following district court actions attacking the Guffey law, restraining orders affecting more than seventy companies have been issued against imposition of the 1½ per cent penalty tax for non-compliance with the code. In most instances the courts have held that the tax was not imposed in good faith, but as a coercive measure, though the jurists declined to rule on the constitutionality of the law. In order to clarify the situation as soon as possible, however, the Supreme Court of the United States agreed on Dec. 23 to grant a quick test of the validity of the law in response to a joint request by the government, counsel for James W. Carter, president, Carter Coal Co., and attorneys for the R. C. Tway Coal Co. and nineteen other operators in the Harlan field of Kentucky. This action by the high court obviated the necessity of recourse to the circuit courts of appeals in these cases, in which the government had emerged victorious in the lower courts (*Coal Age*, December, 1935, p. 547).

Judge Albert P. Reeves, in the federal district court at Kansas City, Mo., today declared the Guffey act unconstitutional in a case brought by the Hume-Sinclair Coal Mining Co., Huntsville-Sinclair Mining

Co., Minden Coal Co., Tebo Coal Co., Reliance Coal Corporation and Windsor Coal Co. The court held that Congress has no specially assigned power under the Constitution to make provision for the general welfare. "The tax imposed in this case, according to the evidence," Judge Reeves' decision read, "is so burdensome and onerous as to destroy the business of the plaintiffs. While it is undoubtedly within the congressional power to destroy by imposing a destructive tax, yet, in this instance, the act provides for a 'drawback' of 90 per cent of the tax if the producer will accept and subject himself to the regulatory provisions of a code. This code is not designed to facilitate the collection of the tax, but the regulatory provisions of the code are separate and apart and independent of the tax." Thus the tax, said the court, "clearly stands as a penalty to compel submission to a national regulatory code."

The hearing on minimum price fixing was held in the Carlton Hotel beginning at 10 a.m. Dec. 27. Charles O'Neill, president, Eastern Bituminous Coal Association, and chairman of District Board No. 1 (eastern Pennsylvania), representing 82 per cent of the production in the district, said his board was unanimously opposed to filing minimum prices until the Supreme Court passes on the constitutionality of the Guffey act. Though conceding that the price structure is in a precarious condition, with the general level lower than it was under NRA, he feared that fixing prices now would further upset the price situation. With many producers granted injunctions against the taxing provisions of the law, he declared it would not be practicable to file prices until the legal situation had been cleared up.

H. S. Clark, District Board No. 1 and president, Rochester & Pittsburgh Coal Co., was in substantial agreement with the views of Mr. O'Neill and added that to publish prices in the face of non-

complying producers' free price lists would precipitate price cutting by code members. Similar views were expressed by R. E. Jamison, sales manager, Jamison Coal & Coke Co., and chairman of District Board No. 2 (western Pennsylvania), who said that non-code members apparently were proceeding on the assumption that they were entirely relieved of all taxes provided in the code. Supplementing Mr. Jamison's statement, H. L. Findlay, District Board No. 2 and vice-president, Youghioghney & Ohio Coal Co., said he felt that an attempt to fix prices without complying with every provision of the act probably would cause more lawsuits and a price structure that could not be enforced. In advising that action be deferred he said he did not believe that the industry was in a position to regulate itself. He conceded, however, that strict enforcement of Sec. 14 of the act (requiring contractors on government work to purchase bituminous coal from code members) might make establishment of a price structure possible, as suggested by Messrs. O'Neill and Clark.

Urges Tax Levy Be Placed in Escrow

Indorsement of Mr. O'Neill's stand was voiced also by W. L. Robison, of District Board No. 4 (Ohio) and president, Youghioghney & Ohio Coal Co., who spoke for that company, the United States Coal Co., Ohio & Pennsylvania Coal Co. and Powhatan Mining Co. Admitting that prices were needed, he said he did not see how a district board could formulate them without the weighted average for the area. Code members, he asserted, should not be left at the mercy of non-code members who have no price restrictions; he did not know how code members could bid against members and non-members. Also urging delay pending action by the Supreme Court, John L. Steinbugler, vice-chairman of District Board No. 7 (Southern No. 1), speaking for William C. Atwater & Co., the American Coal Co. of Allegany County, Mill Creek Coal Co., of all three of which he is an officer, and for several others, suggested that the commission take steps to have the 1½ per cent tax of code members placed in escrow, to be refunded promptly if the act be found unconstitutional.

Speaking for District 6 (West Virginia Panhandle), E. G. Mathiott, vice-president, Valley Camp Coal Co., said the board in that district favored fixing minimum prices for local distribution, but thought that schedules in competition with other districts and producers protected by injunctions could not be worked out now. With complete data for all of Minimum Price Area 1 and with strict enforcement of Sec. 14, he thought it might be possible to promulgate prices properly correlated with other districts. W. A. Richards, president, Pemberton Coal & Coke Co., speaking for District 7, declared that board unanimous in the belief that no schedule for Minimum Price Area No. 1 could be filed now, but that Districts 5 (Michigan) and 12 (Iowa) be permitted to do so. The other districts, it was thought, should first work out a correlated formula; his committee, he added, was making progress in correlation. In



FEDERAL ANTHRACITE CONTROL PROMISED BY GUFFEY

A BILL providing for federal regulation of the anthracite industry has been promised by Senator Guffey if the U. S. Supreme Court upholds the constitutionality of the Bituminous Coal Conservation Act of 1935. The Pennsylvania Senator, who was a caller at the White House on Dec. 19, to discuss "routine matters," predicted that the high court would sustain the Guffey-Snyder act and said that he intended to introduce a hard-coal bill along similar lines if and when the bituminous control law is upheld. "The anthracite men want a regulation just like the bituminous operators are getting," he said, "and that goes for the operators as well as the miners."

behalf of District 8 (Southern No. 2), W. J. Magee, vice-president, Carbon Fuel Co., said the sentiment of that district was substantially the same as that of District 7.

R. Meuter, vice-president, Brown Coal Co., spokesman for District 9 (western Kentucky), stressed the wide difference of opinion and the large volume of tonnage in that district not in the code or protected by injunctions as obstacles to the promulgation of prices. A statement that this board had voted not to submit prices elicited the comment from Chairman Hosford that the commission was not enlightened by a refusal to comply with its order and he showed disappointment with Mr. Meuter's announcement.

Expressing readiness to file schedules, H. W. Bean, general sales manager, Robert Gage Coal Co., and vice-chairman of District Board No. 5 (Michigan), which he represented, said that district favored setting minimum prices at once. D. T. Buckley, Koppers Coal & Transportation Co., representing District Board No. 3 (northern West Virginia), also strongly indorsed immediate filing of schedules. Pointing out that some slack was selling as low as 50c. per ton, he said that if prices were not established now it was hardly likely that they ever could be set up. He filed a price schedule. Ezra Van Horn, executive vice-president, Ohio Coal Control Association, speaking for District Board No. 4 (Ohio), of which he is chairman, urged that prices be set up as quickly as possible, in spite of injunction suits. His board had prepared a basic price list and was ready to meet with other boards for correlation. George W. Reed, vice-president, Peabody Coal Co., and chairman of District Board No. 10 (Illinois), said that group held the same views. F. E. Dies, Globe Coal Co., operating in Indiana County, Pennsylvania, said that unless prices could be established assuring better realization there would be nothing for his company to do but cut wages.

Asks Protection for Code Members

H. B. Lee, vice-president, Maumee Collieries Co., speaking for District Board No. 11 (Indiana), of which he is chairman, also favored immediate establishment of minimum prices and said he was ready to cooperate in correlation. The commission, however, should afford protection to code members against non-members. H. E. Howard, president, Binkley Mining Co., representing the Belleville (Ill.) Group Coal Association; R. H. May, sales manager, Northern Illinois Coal Corporation, representing the Northern Illinois Coal Association, and W. M. Soule, representing three mines in Fulton County, Illinois, joined in a protest, presented by Mr. Howard, against what he termed a formula for fixing prices which changed established differentials. Mr. Howard also said he thought the commission should establish some yardstick to be used by the coordinating committee.

Speaking for District Board No. 12 (Iowa), M. G. Youngquist, secretary, Iowa Coal Trade Association, pointed out that his district had petitioned to be withdrawn from Minimum Price Area No. 1 because its production cost is so

Coming Meetings

- American Mining Congress: annual meeting, Jan. 14, Waldorf-Astoria Hotel, New York City.

- Southern Tennessee Coal Producers' Association: annual meeting, Jan. 16, Chattanooga, Tenn.

- Fourth International Heating and Ventilating Exposition: Jan. 27-31, International Amphitheater, Chicago.

- American Institute of Mining and Metallurgical Engineers: annual meeting, Feb. 17-20, 29 West 39th St., New York City.

high that undue prejudice would be created against Iowa if its prices were fixed on the basis of the weighted average for Minimum Price Area No. 1, especially since 98 per cent of Iowa coal moved intrastate. The board, he stated, announced it was ready to fix its own prices and correlate with other districts where necessary.

Appearing as a consumer, H. D. Coates, representing the National Association of Purchasing Agents, took no definite stand on the establishment of minimum prices except to say that the consumer has an advantage in the present market. Questioned by the commissioners and Thomas Woodward, consumers' counsel, Mr. Coates said there should be no distinction between domestic and industrial consumers in mine prices. Howard W. Veazey, attorney for the American Bituminous Retail Coal Merchants' Association, Chicago, asked that a member of his association be placed on the advisory committee to the commission and suggested that cash discounts should be 2 per cent instead of the proposed 0.5 per cent.

Mark W. Potter, president, Pennsylvania Coal & Coke Corporation, counseled that the commission officially postpone its order to file prices by Dec. 27, making the record clear, whereupon Chairman Hosford announced that the commission would enter a formal order extending the time for filing until Jan. 2, but expected all schedules in Minimum Price Area No. 1 to be submitted by that date. Any price list filed, said Mr. Hosford, would be kept in strict confidence pending final action.

Assuring the conferees that the commission fully appreciated the gravity of the situation and the difficult problems confronting the coal industry, Chairman Hosford pointed out that it was the unanimous opinion of the commission that it was not in its discretionary power to delay indefinitely the establishment of minimum prices. He said the rules and regulations of the marketing committees would be sent to the district boards at an early date so that they could study them and report back to the commission. Coordination, he added, must be speeded up and directed the coordinating committee to remain in Washington and complete its work within 15 to 30 days.

Following the chairman's announcement, Commissioner Percy Tetlow strongly urged the prompt establishment of minimum prices. He declared that

the bituminous operators owe it to their industry and the country to bring an end to present conditions, which he described as a menace that would bring about demoralization. "We are not going to dilly-dally with a problem that may mean destruction of this industry," he said. "The industry will not survive the winter if forces now playing continue to exist. There can be no survival of the fittest because even the strongest interests will be destroyed. We are going to act to prevent this, whether the industry wants it or not."

Opinion No. 1, issued by the commission on Dec. 21, ruled on the status of code and non-code member coal companies when the latter acquire ownership of producing mines that have accepted the code. The transfer of such properties, it was pointed out, does not carry with it membership in the code. Therefore, the transferrer is not relieved of his liabilities and the transferee must formally accept the code to avail himself of the benefits of code membership. If a sale or transfer is made in good faith, the transferrer's code membership is terminated, but it is not relieved of liability for assessments levied by the district board prior to the transfer. Until such obligations are discharged, the transferrer remains liable therefor. Where a sale or transfer is made without valid consideration or not in good faith, the rights and liabilities of the parties must be determined upon the facts of the individual transaction.

Hearings to Be Given in Turn

The commission announced in Opinion No. 2, issued Dec. 23, that rules of procedure of the commission must be strictly adhered to in regard to requests for hearings on prices, regardless of emergencies. Granting immediate hearings, the commission points out, would be unfair to applicants waiting their turn for hearing on the regular calendar; in addition, the commission has no authority to approve or determine minimum prices on particular sizes of coal, or for particular producers, or for particular consumers.

The commission also has announced that Sec. 12 of the Guffey act, which prohibits the delivery of coal under contracts made prior to Aug. 30, 1935, at prices below the minima in effect at the time of delivery, applies with equal force to both code and non-code members. In a formal statement of policy, the commission said that it would use such facilities as are available to enforce compliance with Sec. 12, particularly with respect to producers who have not accepted the bituminous coal code.

Statistical boards have been set up by all but 6 of the 23 district boards, the commission announces. The districts that have not provided separate statistical bureaus are Nos. 3 (northern West Virginia), 9 (western Kentucky), 15 (Southwestern), 18 (New Mexico), 21 (North and South Dakota), where no board has been organized, and 22 (Montana).

Extra space has been granted to the commission in the Investment Building in Washington to accommodate its increased personnel. The main office remains in the Carry Building.

WHAT'S NEW

In Coal-Mining Equipment

OXYGEN APPARATUS

Mine Safety Appliances Co., Pittsburgh, Pa., offers the new M-S-A light-weight half-hour oxygen breathing apparatus in mouthpiece and facepiece types. The mouthpiece type bears the U. S. Bureau of Mines Approval. Advantages listed by the company are: over-all weight of 13½ lb., including 1-lb. Cardoxide charge; reduced over-all dimensions with less interference with working freedom; better distribution of weight and improved balance; reduced resistance to breathing; more comfortable mouthpiece because of reduced weight and closer fit; fewer parts and con-



A major feature is a blower with a double outlet for two-man use, and greater air capacity.

A hand-operated instrument for quick, accurate detection and measurement of low but dangerous concentrations of hydrogen sulphide in air, known as the M-S-A hydrogen sulphide detector, is another new product of the company. The detector permits readings of the toxic gas in concentrations of from zero to 0.04 per cent, and can be operated by the ordinary workman.

SLUSHING HOISTS

Sullivan Machinery Co., Chicago, offers the new ABC series of slushing hoists for scrap service, for which exceptional endurance and pull and minimum size and weight are claimed. Features outlined by the company include: adaptability to mounting on timber skid, loading slide or ramp and to any operating position; right or left motor; side-operating or behind-the-drum controls; ample safety devices; adaptability to inspection of all internal parts in a short time with labor on the spot; and sizes from 7½ to 50 hp.

GOGGLE LENS

As optional equipment on goggles of the American Optical Co., Southbridge, Mass., the company offers the new "6-Curve Super Armorplate" lens with a high curvature said to give far greater impact resistance than any lens previously used in standard eye-protection equipment. The illustration shows a 1-in. solid-steel ball dropped from a height of 10 ft. at the instant of impact on the lens. The photo was taken with an exposure of 1/100,000 second by Prof. H. H. Edgerton, Massachusetts Institute of Technology. The standard test for goggle lenses is based on the use of a ¾-in. steel ball dropped from a height of 39 in. Besides resistance to impact, the 6-Curve lens is said to be more effective in deflecting glancing blows be-



cause of its higher curvature. Also, the curvature allows closer fitting of the face without interference with eyelashes. Furthermore, tests are said to indicate that in case of shattering by an irresistible blow, the curvature tends to push the fragments out away from the eye.

EXCAVATOR

Bucyrus-Erie Co., South Milwaukee, Wis., offers the new 85-B digging unit, for which it claims greater power, speed and strength than any previous shovel of this size. Use of special heat-treated alloy steels, modern electrically welded construction and Ward Leonard control, it is stated, assure big output with economical operation. The unit is fully convertible, and a change from shovel to dragline, or vice versa, can readily be made in the field with minimum loss of time, as

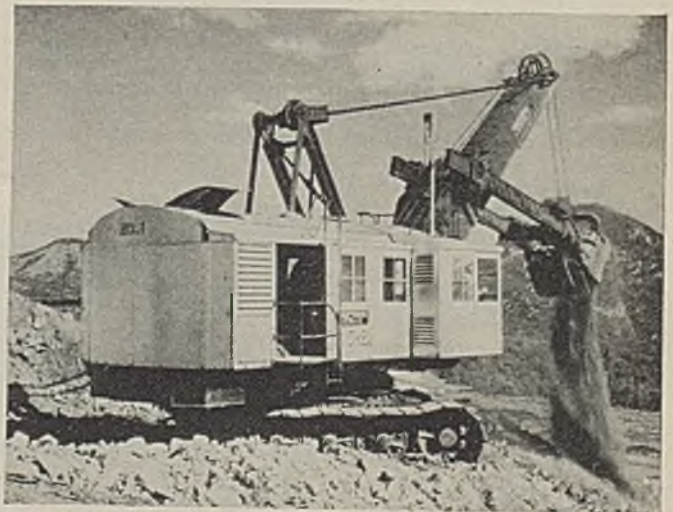
only a few simple changes to the main machinery and to the front-end equipment are necessary.

For shipment, the entire 85-B machine is loaded on four flat cars with a minimum of dismantling, it is stated. All machinery comes within a 10-ft. clearance, so that only the side wings need be removed from the revolving frame. Working as a shovel, the 85-B machine weighs 224,000 lb. As a dragline, it will handle a 3-cu.yd. heavy-duty bucket on a 65-ft. boom.

BALL BEARING

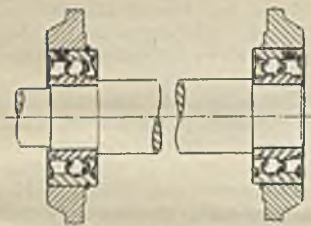
Norma-Hoffman Bearings Corporation, Stamford, Conn., offers the new "3000 Series" in-closed cartridge-type single-roll "Precision" ball bearing made chiefly in the medium series starting at 25 m/m bore. Although having but one row of balls, the company points out, the new bearing has inner and outer rings of standard double-row width. It is completely in-closed and protected on both sides by special metal seals held firmly in place by snap rings on the outer race. These metal seals have a long inwardly projecting flange with a close-running fit over the grooved and redressed inner ring which, while free from rubbing friction and wear, effectively prevents the escape of lubricant. Sealing plates, it is stated, are easily removable, and the bearing is handled as a complete self-protected cartridge unit at all times.

Wide inner and outer rings, it is said, afford exceptionally large grease capacity and eliminate looseness or "peening" of either shaft or housing. Lock-nuts are not required on the shaft in most cases. The "3000 Series" bearings can be furnished either with or without a grease filling plug. Where the filling plug is not employed,



nections, lessening chances of leakage; improved cylinder-cradle design to keep cylinder in line with high-pressure connections; improved harness; light-weight cylinder, cutting weight one-third; and new double-seat valve—a more positive guard against oxygen loss. The mouthpiece type also is furnished with a skull cap that will fit any size head and a pair of gas-tight non-fogging goggles.

Mine Safety Appliances Co. also offers an improved combination hose mask approved for use by two men with as much as 150 ft. of hose to each mask.



greasing is done by removing one seal. The bearing also can be furnished with or without the snap ring on the outer race. In many cases, the company points out, elimination of sealing features otherwise employed makes it possible to reduce the over-all length of the unit in which the bearing is employed; also, supplementary protective parts usually are eliminated, with consequent simplification of assembly.

BATTERY

Gould Storage Battery Corporation, Depew, N. Y., offers the new Kathanode "Glassklad" Type KMD motive-power-battery cell, which it states has been developed especially for longer life in mine-locomotive service. Type KMD cells, the company points out, are a further development and improvement of the Type RVPX Armored Kathanode and allied rubber jar cells, which were assembled with positive unit structures so designed that the active material was continuously locked in the pressure-cast base structures by means of laminated spun-glass mats of high porosity placed in intimate contact with both faces of the active material. This construction allowed sediment space to be reduced to 1½ in., instead of the usual high bridge.

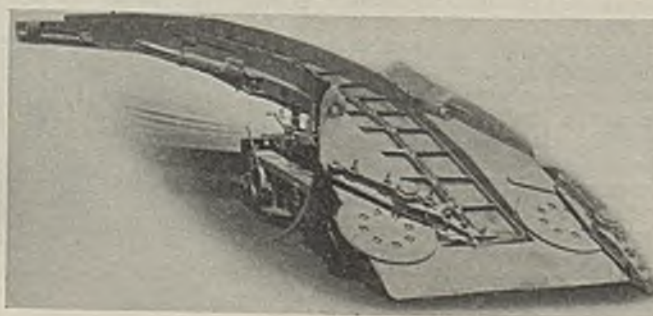
In the KMD cells, the company states, sediment space has been reduced still further to 1¼ in. as a result of construction improvements, thus cutting rib height. The element has been dropped in the jar to provide a larger electrolyte chamber at the top of the cell and to materially increase insulating space by increasing the distance between the top edges of the plates and the underside of the crossbar. No change has been made in element height, oversize design having been retained with a base structural height of 9½ in. Positive base castings have been made thicker and heavier, it is stated, volume of active material has been proportionately increased, processing methods have been improved, and a special black-oxide active material has been developed for exceptional response to high current demands in starting, etc. Porosity of the armored envelope of hard rubber has been increased by a special ar-

range of the perforations.

"Durapor" separators are a new feature announced by the company for the KMD line. These separators are a combination of silica gel and finely divided particles of rubber heat-treated under pressure to form grooved sheets. These separators are solid sheets, thus preventing any possibility of bridging from negative to positive. The silica gel functions as a means of electrolyte transfer, and the absence of pores, it is declared, eliminates clogging. Large vent plugs with baffles vented to prevent electrolyte from spraying over the top of the cell, completely cushioned element with triple seal to posts and cover, high-tensile-strength relatively flexible hard-rubber jars and refinements in tray structure are other features noted by the company. The improvements included in the new KMD cell, with consequent increase in capacity, "make possible an unqualified guarantee on a direct pro rata basis of 54 months," the manufacturer states.

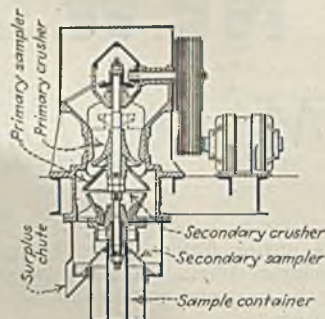
LOADER

As a companion unit to the Joy 10-BU heavy-duty machine, Joy Mfg. Co., Franklin, Pa., offers the new Joy 11-BU loader with a guaranteed loading capacity of 4 tons per minute. Strength, mobility and high capacity are stressed by the manufacturer. The loader consists of a self-propelling chassis with caterpillar-type traction; the Joy loading head, hinged to the main chassis and supported by hydraulic jacks to permit vertical adjustment to compensate for irregularities in the bottom; and a rear conveyor designed for both vertical and horizontal adjustment. As in the 7-BU, 8-BU and Joy, Jr., machines the rear conveyor is a continuous flexible single-strand chain extending from the gathering head to the discharge point. This conveyor swings through an arc of 45 deg. to each side of the center line of the machine. Operating controls for the 11-BU loader are centralized on the right side for one-man operation.



SAMPLE CRUSHER

Thorsten Sampler Co., Pittsburgh, Pa., offers the sampling crusher shown in the accompanying illustration



for both size reduction and automatic recovery of an accurate sample sufficiently small in quantity and particle size for laboratory use without manual quartering. The unit provides for crushing and sampling in two stages, the sample from the primary stage being crushed still further and sampled the second time in the secondary stage. The rotating sampling cones, the company points out, have adjustable openings and cut samples out of the cylindrical curtain around the entire periphery of the crusher surfaces, thus insuring accurate sampling.

BELT

The new U. S. "Royal Cord" belt is now offered by the Mechanical Goods Division of U. S. Rubber Products, Inc., New York City. The new belt, the company states, is a result of improvements and refinements in the U. S. Cord belt with incasing duck envelope, and is characterized by a square-cut edge. Because the cords are embedded in rubber, this cut edge, experience has shown, results in superior operation against shifters, particularly, it is asserted, over cord belts with the duck envelope folded over the edges. The laminated and cut-edge construction permits, it is stated, the use of a single ply of duck on each side, instead of several plies, as in the envelope type, with resultant

greater strength at no increase in expense growing out of the fact that efficiency of a ply of cord fabric in the carcass is greater than that of a duck ply in the cover. Another feature stressed by the company is the development of a special duck cover to eliminate the many seams in the bias-cut duck type. The new belt is available in widths up to 24 in. and in plies from five up.

CONCRETE PLACER

Pneucrete Equipment Co., Alhambra, Calif., offers the new Pneucrete pneumatic concrete placer for mining and construction work. Compactness and adaptability to operation in low and inaccessible places are fea-



tures stressed by the manufacturer, who points out that overall height is only about 2 ft., against 6 ft. for the older style.

BRAKE LINING

Thermoid Rubber Co., Trenton, N. J., offers the new Thermoid BX Woven brake lining for use on heavy industrial machinery and equipment. This brake lining has as its base asbestos tape woven in a single thickness and therefore, it is pointed out, without plies to separate in severe service. This tape is woven of heavy yarn containing brass wire and is impregnated with a highly heat-resistant Bakelite resin. The resultant product is described as a dense, flexible material consisting of 70 per cent asbestos and 30 per cent resin. It is ground on the wearing surface ready for application. Other features pointed out by the company are: offers very high coefficient of friction under all service conditions; gives quick deceleration and "high holding"; withstands temperatures above 900 deg. F without deterioration; shows no material decrease of efficiency or deterioration in the presence of oil, grease or water; and flexes quickly to the drum flanges without scoring. The company recommends the lining for services involving fast deceleration and moderately high temperatures, such as mine hoists, shovels, draglines and cranes.