COAL AGE

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

SYDNEY A. HALE, *Editor*

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ALTHOUGH proponents of the Guffey-Snyder bill to establish an independent system of federal regulation for the bituminous-coal industry have sought administration indorsement, no such indorsement has yet reached the public eye. On the contrary, press dispatches from Washington represent the President as feeling that the progress toward rehabilitation already made under the code has been such that there is no reason to set up other and new controls as long as the present system continues to work. In other words, when the patient is convalescing, why upset his internal organization by changing medicines?

This seems an eminently practical viewpoint. But the persistence with which measures of this character are proposed and the increasing number of coal producers who would exchange the rough-and-tumble battle of the competitive markets for the shelter of the quota system suggest that no campaign for an expansion of government control should be taken too lightly even when the proposals made lack the magic stamp of definite White House approval and support. There is so much that is appealing in this present revision of the David Lewis allocation scheme now presented with the garnishment of a code inspired by NRA and government purchase of surplus coal lands inspired by the recent report of the Natural Resources Board that it is tempting to forget the price demanded for these concessions.

The code system has not been without its defects—structural and administrative. Despite these, however, the code has effected such a beneficial revolution in the bituminous coal industry that it does not appear the part of wisdom to abandon the system without further experimentation and trial—especially when the alternative offered is based in large part upon an importation from Great Britain which seems to have been no more successful in the country of its origin than our own code system and one which, after four years of operation, is still under attack and in a process of further revision.

Cappy Coal

THEORIES of washing are still in their infancy, with specific gravity as the basis of our ordinary washing methods. In rising water currents, streamlining of particles has some influence, making selective action depend not only on gravity but on shape and smoothness. Where a particle is not round or cubical but flaky, it may turn sidewise and fall more readily in still or descending water, because it exposes less effective surface to the suspending medium. Similarly, it will rise less readily in an upward current.

Because cappy coal, with a thin flake of refuse on one or two faces, is laminar, it will act differently from coal that is cubical. Again, flotation reagents may help. They may make the coal less wettable and, therefore, more easily floated, and they may make the cappy coal, refuse and pyrite more wettable and, therefore, less readily carried upward. Then, again, the presence of air or its absence will have an effect, and certainly the acidity or alkalinity of the washing medium will be a factor.

It may be found that washing may be conducted so as measurably to drop cappy coal and

to float coal not cappy, and thus reject what in the northern anthracite region sometimes has been separated later by passage over a spiral or a jump-the-gap mechanical picker. The method would put cappy coal in the refuse, from which it would be rescued for crushing or attrition by a system of washing more truly gravimetric. Many experts say that cleaning efficiency varies with the coal washed. To every coal accordingly its appropriate washer, and also to every coal and size of coal a suitable washer according as heating value, appearance, coking value, non-clinkering ash, low pyrite or low ash of product, or combinations of these characteristics are desired.

Severity Rather Than Frequency

SUGGESTION has been made that accident frequency embody some reference to the severity of the accident; that half a point be charged for an accident involving no loss of time; that two points be allotted for a lost-time accident, with one-fifth of a point for every day which the accident causes a man to be laid off. This, it would seem, would make a severity record unnecessary and enable adequate comparisons to be made on the new frequency-severity basis alone.

Some suggest that, in order to make supervisors more careful, a responsibility factor be established making an accident count for more against the records where the supervisor is responsible for its occurrence. This, however, introduces an opportunity for juggling the record, for in a contest few companies would be disposed to jeopardize their chance for leadership by acknowledging defects in supervision that would multiply their accidents. Responsibility of a supervisor is difficult to assess, especially in a mine where the supervisor may often be held for the negligence of a mine worker. Whether he is really at fault is difficult to determine.

The other suggested change seems to have merit, but, to make the record comparable, the calculations of earlier years would have to be rectified; and the number of no-lost-time accidents raises the question as to what degree of accident it envisions—a mere abrasion, a small cut or something that actually injures the patient and demands more than a precautionary sterilization of the part affected.

Bettering Mine Effluents

IN EVALUATING the effect of closing mine openings to reduce the acidity of their effluents, some caution is needed. In a recent tabulation showing the quantity of daily mine drainage and acid discharge from forty-two selected mines in Pennsylvania, Ohio and West Virginia, before and after sealing, the quantity of water was reduced 59 per cent and the quantity of acid 71 per cent. Acidity of the effluent was reduced 30 per cent.

From this it is by no means to be inferred that a reduction of 30 per cent is the limit of what may be expected from sealing. Assuming on the one hand that the loss of acidity was not caused by some reaction that decreases the acidity of the water by creating compounds that, though not acid in themselves, will become acid on reaching the air, and assuming on the other hand that the water is not neutralized by impounding, this result is quite favorable, for the old acid water in the mine is being gradually decreased by neutralization with alkaline ground water, by dilution and overflow, and the new water coming in apparently is becoming acid only by its mixture with the acid water already present. In time, then, all the old acid water will be diluted and removed, and nothing but new water will flow from the mine. As this will not be acidified by new acid, the effluent will become alkaline in almost all cases.

One condition may modify that assurance. That is the presence in the mine of acid crystals that have not been dissolved by the mine water. A big inflow of water might raise the water level in the mine to a point where it might dissolve such crystals. Thus a freshet that would contribute much alkaline or neutral water to the effluent might actually add to its acidity by dissolving this hitherto undissolved acid, which all mines contain, but, once this is removed, no more would form and, eventually, the effluent would become acid-free. The only acid then would come from operating mines, and these waters could be greatly bettered if the means used in sealing abandoned mines were adopted in the parts of the mines abandoned and other means provided for preventing acidification. Such improvements in operating conditions would, by eliminating pump and pipe corrosion, measurably reduce cost of operation.

VOLTAGE INCREASED

+ And Power Saved

By Moving Generator Sets Forward

By A. L. LEE
Consulting Engineer
Pittsburgh, Pa.

MINING officials quite generally recognize that, in most underground distributing systems, comparatively low electrical efficiencies prevail, but in the majority of cases their efforts to improve them are dictated and influenced to a far greater degree by the operating disadvantages of so-called "poor power" than by a desire for greater electrical efficiency. It is a fact, no doubt, that in no other industry are satisfactory power conditions so difficult to maintain as in underground coal mining, and that in none must so large a sacrifice of the ideal be made to practical considerations with attendant complications of the electrical problem.

For reasons affecting safety and electrical maintenance, 275 volts d. c. is now the more commonly accepted standard of potential for general underground use. It is interesting to note the effect of voltage on circuit, as given in Table I. Consider the case of a two-conductor cable of a permissible-type cutting machine. The cable usually is No. 2 B&S gage 300 ft. long, the conductor length being 600 ft., for which the resistance figures 0.155 ohm. Average cutting load is 35 kw. with 230 volts at motor terminals. As 152 amp. is needed for a 35-kw. load at that voltage, the potential drop is 152x0.155, or 23.6 volts. Of course, from the standpoint of an electrical engineer, such a drop is undersirable, and the solution would be a conductor of larger size, but practical experience dictates that No. 2 cable must be used, because it is as large as can be handled and reeled conveniently.

Many cases of such sacrifices to the needs of mining practice might be cited and, considered as a whole, they make necessary the progressive planning of electrical distribution in underground operations. Increasing the size, capacity and current requirements of mining machines without increasing the size of feed lines and trailing cables involves additional drops in voltage proportional to the increase in current and an energy loss which increases as the square in the increase in current.

Too often, the machine operator's idea of what constitutes a satisfactory degree of mechanical performance becomes the criterion by which power condition is judged. In other words, when the motor overheats to such an extent that his lunch sandwich is burned in an attempt to toast it on the motor case, he will report that the power is inadequate, and as a consequence the track bonding will be checked and other steps will be taken to bring his motor temperature down to the right toasting point, and nothing further will be done until he makes further complaints.

As "poor power" grows quite rapidly under the influence of such factors as increasing transmission distance, greater length and severity of haulage and depreciation of track and feeder circuits, it is well to consider some of the costly effects of excessive voltage drop, and thus determine the most practical and economical corrective measures. These effects may be classified as follows:

Operation—
- Reduced output of equipment due to slower operating speeds.
- Loss of time due to excessive electrical repairs.
- Destruction of morale.

Repair costs—
- Increase of repair labor and material.
- Excessive replacement of armatures, field coils, cables, etc.

Power costs—
- Excessive kilowatt-hour consumption.
- Reduction of individual unit efficiencies when operated at reduced voltage.
- Increase of billing demand per ton of daily output, as underground losses usually are at a maximum during the demand peak.
- Increase of demand peaks and kilowatt-hour losses due to the low diversity factor of machines operating at reduced speeds.

Recognizing these conditions, management of the Renton mine of the Union Collieries Co. approached the problem of determining the most effective and practical plan for improving its underground electrical distribution through a survey of power conditions. This mine, near Pittsburgh, Pa., operates in the double Freeport seam. The seam at Renton has an average thickness of about 6½ ft. and the coal at the main hoisting shaft lies 520 ft. below the surface. Underground equipment includes track-mounted and shortwall mining machines, track-mounted drills, gathering and main-line locomotives and pumps. Average length of haul approximates 0.6 mile in gathering service and 1.8 miles in main-line transportation; there are a few severe grades.

At the time the survey of underground power conditions was made

Table I—Relative Quantity of Copper Required for a Given Circuit Efficiency

Voltage and Circuit	Per Cent of Copper
275 volts, d.c., single-phase	100
550 volts, d.c., single-phase	25
220 volts, a.c. three-phase, 60-cycle, impedance-resistance ratio 1.12 (wires in conduit)	131
440 volts, a.c. three-phase, 60-cycle, impedance-resistance ratio 1.12 (wires in conduit)	28.2
2,300 volts, a.c. three-phase, 60-cycle, impedance-resistance ratio 1.68 (pole line with 18-in. symmetrical conductor spacing)	1.8
2,300 volts, a.c. three-phase, 60-cycle, impedance-resistance ratio 1.08 (underground cable with 3,000-volt insulation)	1.16
6,600 volts, a.c. three-phase, 60-cycle, impedance-ratio 1.09 (underground cable with 7,500-volt insulation)	0.14

As the impedance-resistance ratio will vary for different size and spacing of conductors, the values for No. 2/0 B & S gage were selected as being sufficiently representative.

(May, 1933), the mine had been so far extended that it had somewhat outgrown its existing underground distribution system. Additional heavy feed lines had at various times been installed for a considerable distance in the mine to improve the voltage at point of use. The average distance from hoisting shaft to working face had increased to about 2.4 miles, and it was apparent that any reasonable investment in copper for the low-voltage d.c. system would afford only temporary and partial relief. Need for a relocation of the conversion equipment was evident.

The available rotating equipment then serving the mine consisted of one 300-kw., one 200-kw., and one 150-kw. synchronous motor-generator set, all of which were used to convert the current from 2,300 volts, 3 phase, 60-cycle, a.c. to 275 volts d.c. for general use in the mine. These sets were connected to the mine feeders by means of manually operated air circuit breakers and to the a.c. line by manual starting and synchronizing equipment. They were operated in parallel, using an equalizing bus connection, and were located in the same building as the hoisting machinery.

After a study of the various mining areas and their potential output, separate locations were selected for the 300-kw. and 200-kw. units from which it was thought they would serve the mine for a time at such efficiency as would more than justify the necessary investment. It was decided that the 150-kw. set would be left at the original location to serve the haulage units and to operate in the network formed by a triangular spacing of the three units. The 300-kw. substation (Fig. 1) is about 2 miles from the original outside substation, the 200-kw. unit being approximately 1.7 miles from the same point.

The most practical method of serving the new substations with high-tension a.c. power was the next problem

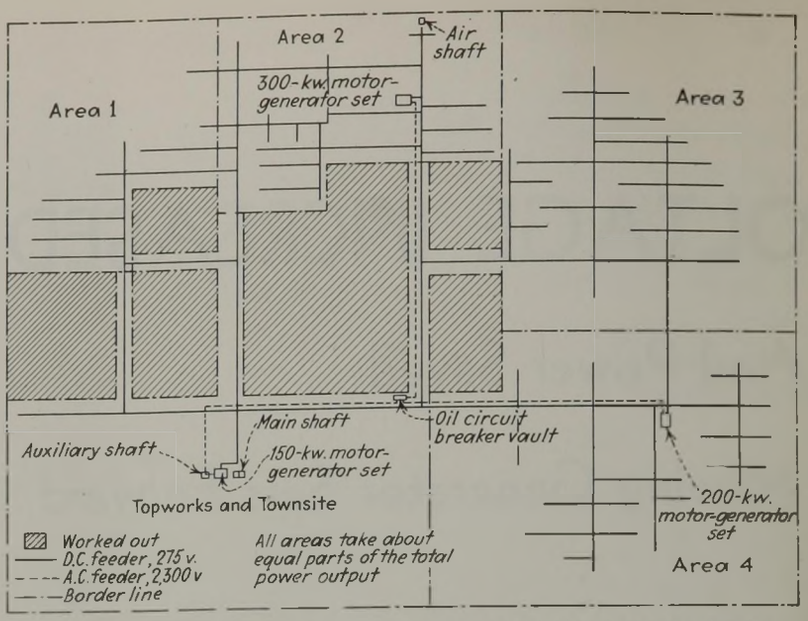


Fig. 1—Underground Feeder System, Mine No. 3, Union Collieries Co.

to be solved, the alternatives considered being:

1. Construction of a 2,300-volt, 3-phase, 60-cycle overhead pole line to a point immediately above the underground location of one of the substations and a branch line to the location of the other, each line to terminate at a borehole approximately 600 ft. deep and to be connected to a three-conductor cable suspended therein feeding to a concrete and steel underground substation room housing the conversion equipment.

2. Construction of an underground high-tension system, using three-conductor lead-covered and steel-taped armored cable, to be installed from the main shaft bottom to the junction point, as shown in Fig. 1, and there connected by means of oil circuit breakers, housed in a concrete vault, to separate cables of smaller size but like construction, which would continue on as separate feed lines to the two substations, these cables to be buried 14 to 18 in. in a kerf cut in the fireclay bottom of the mine heading by means of a track-mounted universal type mining machine. A suspension-type cable would be suspended in the auxiliary shaft to serve the aforementioned underground cable system.

After a careful study of the economics and operating characteristics of the two systems, the latter was adopted as being better suited to the conditions prevailing. Some of the more important factors influencing the decision were:

1. That, due to the much greater circuit reactance of a pole line of normal spacing over that of a three-conductor cable, a very heavy line would be required to serve the 500-kw. substation capacity, the copper ratio being about 1.55 to 1 in favor of the underground cable for a given per cent of line regulation and 18-in. symmetrical line-conductor spacing on the poles.

2. That a pole line would require right of way over private property, would be subject to lightning and other storm hazards and would have to be

Fig. 2—Exterior View, Underground Automatic Substation, Renton Mine.

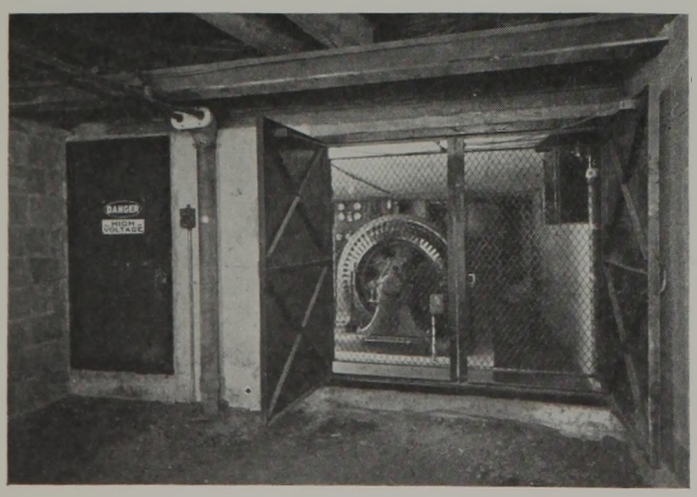
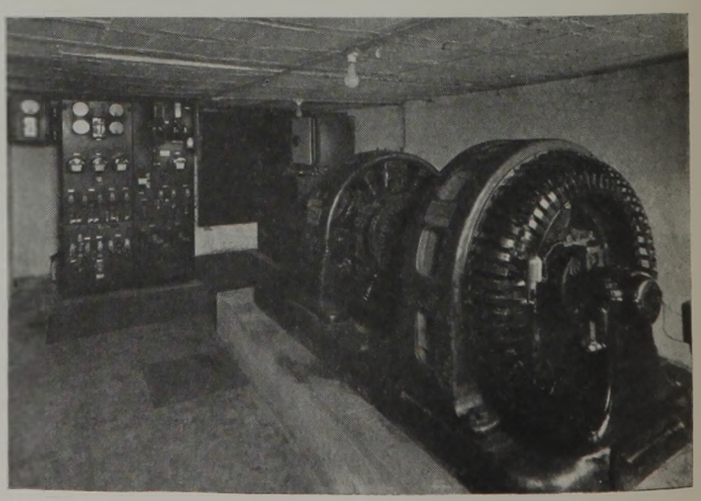


Fig. 3—Interior View, Underground Automatic Substation, Renton Mine.



especially well constructed to provide for a probable life equal to that of an underground cable. Separate disconnection of the branch circuits would not be as easily attained as with the underground cable system.

3. Finally, it was found that the cable system would cost less than an overhead line of equal efficiency, life and utility.

A decision having been made with respect to the high-tension circuits, recommendations were submitted to the mine management covering a general plan for underground power improvement. In August, 1933, it was decided to proceed, as previously outlined, with the installation of two full-automatic underground motor-generator substations utilizing the available rotating equipment, the stations to be served by the previously discussed high-tension cable system. The 150-kw. set, it was agreed, would be left at the original location but with automatic reclosing features provided on the d.c. side.

The installation called for the purchase of some 13,000 ft. of underground cable and 700 ft. of steel-wire-armored suspension-type cable. The steel-taped armored cables are provided with 30 per cent Hevea performance-test rubber insulation with jute fillers, $\frac{1}{8}$-in. lead sheath, jute over lead, double steel-tape armor and jute over all.

This cable was laid in a trench cut by a universal arcwall cutting machine with the bar in the shearing position. Because of limited roof clearance, only cable reels of a diameter not exceeding 60 in. could be handled underground and, as dragging the cables to location would be too destructive, it was found necessary to provide for the splicing of cable lengths at distances governed by the length of cable that could be wound on a reel of that size. It was not thought practical to make and bury the splices, as is usual in outdoor construction methods. Specially designed plug connections were provided, housed in steel inclosures concreted in a rib of the mine heading, one advantage of this method being that sections of the cable might be readily segregated for testing, or isolated should it be so desired. A special reel car was constructed which allowed the cable reels full advantage of the minimum roof height under which they would be transported, thus decreasing as much as possible the number of cable joints to be used.

Construction work on the concrete substations was completed, automatic switching equipment installed and wiring connections made ready. The rotating units were then transported, without dismantling, on special trucks which provided roof clearance. They were installed on the new foundations and grouted in place. The changes being accomplished over week-ends, they caused no delay to mining operations other than the short time consumed in properly paralleling the units under the changed conditions of load.

It will be seen from Fig. 1 that with the new location of the conversion equipment the d.c. system is a network, the various mining areas being served by a nearly centralized unit or a multiple feed. Main haulage units operate mostly in parts of the system where the load they impose will not affect the working-face voltage. The result has been an average increase in voltage for coal cutting and for gathering haulage of more than 80 volts. The increase in the main-haulage area averages about 55 volts.

Under the old system, total circuit resistance from source of power to working face was sufficiently high that a solid short-circuit at that point could not cause an ampere flow high enough to insure operation of the main circuit breaker which carried the combined current of the three conversion units, provided, however, that such a fault occurred at a time when other load did not exist. Such a condition, of course, is a distinct hazard. The circuit conditions of the new system are such that in connection with the automatic features now provided such a possibility can exist only when the d.c. feeder system is extended and the feeders are repaired without due regard to proper standards of operation.

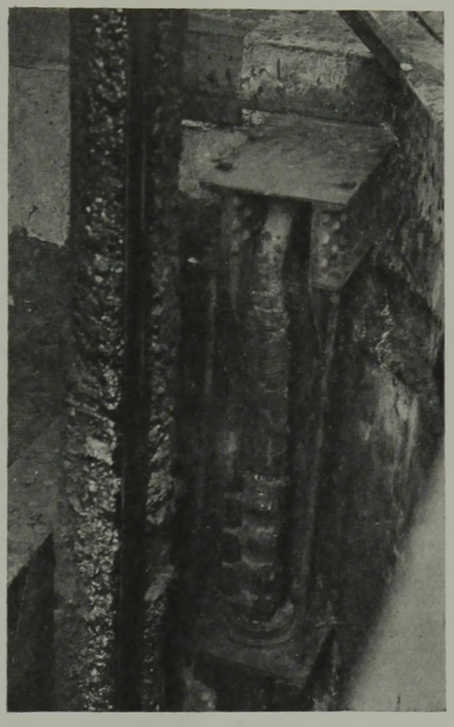


Fig. 4—Suspension Cable Support; Shaft Depth, 520 Ft.

Conditions vary quite radically with the physical characteristics of the mining system, so it is well to consider some of the complications which may affect individual underground substation units of moderate or small capacity more acutely than they will those where, as in most cases, total capacity is concentrated and a considerable length of circuit is available to cushion severe instantaneous peak-loads. The author's observation has been that where total capacity is relocated and distributed in units of comparatively moderate size, each of which is immediately adjacent to its load area, some of the effects that may be expected are as follows:

The instantaneous demand on each unit will be radically increased and even though full field current be carried by the synchronous motor, the conventional d.c. automatic circuit breaker will not act with sufficient speed to prevent the pull-out torque of the motor from being exceeded occasionally. The result is that the unit is pulled out of step, and unless special features are provided for immediate resynchronization, protective relays will act to shut it down. Though such cases may not be frequent, they usually are held to result from some other cause and, being preventable, they should be anticipated in the selection of switching equipment.

When power-demand billing is based on integrated peak-load periods of 15 minutes or over, the demand charge (when reflected to tons produced) may be expected to decrease because of the elimination of losses which are undoubtedly at a maximum during the peak period. In other words, mine tonnage may be somewhat increased without increase in demand. This, of course, is dependent on a reasonable degree of voltage improvement at the point of use.

If underground synchronous motors are to provide power-factor correction for the inductive load of the surface plant, the cost of transmission of the necessary reactive kilovolt-ampere-hours should be considered in the determination of the high-tension circuit efficiency, and a new, economically correct plant power factor determined.

As some of the older types of synchronous motors require very rigid line voltage and reactance characteristics when applied to severely fluctuating load conditions, serious consideration should be given to the age and design of the motor in the determination of supply circuit constants.

The tendency of a synchronous motor to hunt or periodically lag and lead the natural rotating field set up in the stator, and thus cause line surging, is influenced by a number of factors, some of which are: (1) the design of the squirrel-cage winging embedded in the field poles; (2) the air gap; (3) the field current setting; (4) the inertia of the rotating mass, and (5) the reactance and resistance of the supply circuit.

With certain resonant conditions present between line and motor constants, a synchronous motor, if of rather unstable design, will not uncommonly hunt. In such cases the pull-out torque is no longer stable, and the operation of the motor is unsatisfactory. Hence, care should be taken when the older types of conversion units on long lines are located and a proper reactance-resistance ratio for circuit conductors should be selected to

(Turn to page 106)

CLINTON CONVEYOR PLAN

+ Designed to Provide Maximum Flexibility

In Operation of Four-Room Units

By IVAN A. GIVEN

Associate Editor, Coal Age

MAXIMUM flexibility in the operation of four-room units is the chief characteristic of conveyor mining at the Submarine No. 2 mine of the Clinton Coal Co., Clinton, Ind. Present operations are in the Indiana Fourth Vein 90 ft. below the Fifth Vein originally mined on this property and completely extracted. Thickness of the Fourth Vein averages 3 ft. 9 in. Horsebacks ranging from 6 in. to 5 ft. in thickness are numerous and completely cut out the coal where they occur. Immediately over the seam is an average of 17 ft. of gray slate which, while normally strong, cuts badly in fresh air. Systematic timbering of entries therefore is a necessity, and concrete retaining walls have been built along the loaded and empty tracks and adjacent openings on the shaft bottom for protection. Average depth of cover is 276 ft.

Extraction of the Fourth Vein was started in 1930, and Fairfield pit-car loaders are employed in entry driving—three on the day shift and two at night. Each pit-car loader is part of a unit also including a Sullivan CE 7 cutting machine, a Hardsocg or Dooley Bros. post-mounted electric drill and a 6-ton Goodman locomotive, which hauls to the shaft bottom.

An entry crew consists of two loaders, each receiving $6.75 per shift of seven hours; two machine men, $6.75; one driller and shooter, $6.15; one chunker, who trims the cars and oversees loading, $4.57½; and one motorman, $5.14. One boss at $7 is employed to oversee the three units on the day shift, and a second one for the two units on the night shift. Average performance per pit-car unit is six cuts 10 ft. wide and approximately 5½ ft. deep per shift, yielding 42 tons of coal delivered on the shaft bottom.

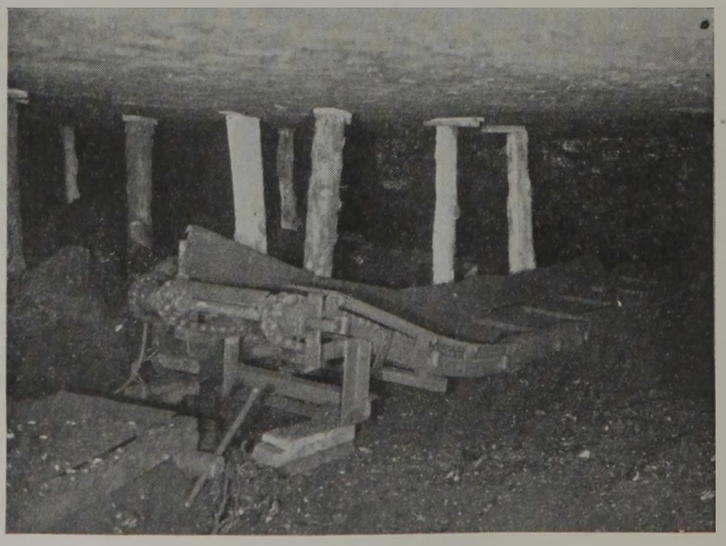
Two conveyor units (Tracy and Fairfield) were in operation and a third Jeffrey unit was being installed at the time this article was prepared. Additional units are contemplated in the future. Each conveyor unit is assigned to a separate entry from which a total of 32 rooms—sixteen on each side—is turned. Three headings driven as in Fig. 1 (left) make up a room entry. As the entry is advanced, the room necks are turned and driven in two cuts. A third cut is then made and left in place pending installations of the conveyors. This system provides sufficient room for the initial conveyor set-up.

Sight lines for rooms are estabished every 38 ft., with the exception of Nos. 8 and 9 on each side of the entry, where the distance between sight lines is increased to 50 ft. to allow for an anti-squeeze pillar. As the sight lines are carried 6 ft. from the right rib in every case, rooms on the opposite sides of the entry are offset slightly. Loading stations are established on the middle heading, the roof being shot down to gain sufficient height. To facilitate trip changing and avoid interference in bringing in supplies, track is laid in all three headings and crossovers are cut opposite each group of four rooms, as indicated.

While only four loading stations are used per entry, eight are prepared as the entry is driven (Fig. 1, left) to secure maximum flexibility in operation. Access to these loading stations

Loading Stations Are Made by Blasting Down Top to Accommodate the Loading Head.

View at the Face of a Room, Showing Tail End of Main Conveyor, Face Conveyor and Timbering.



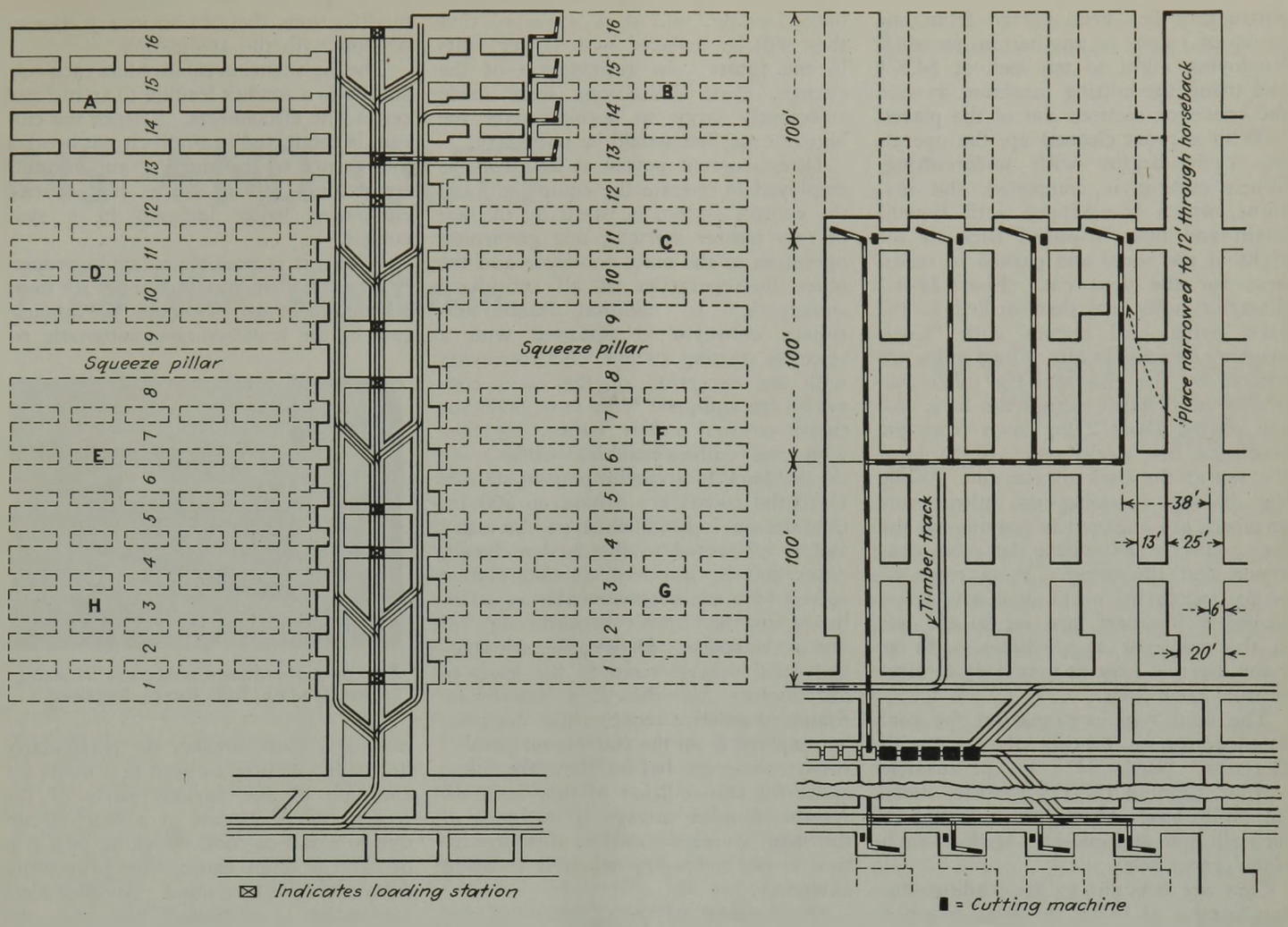


Fig. 1—Left, General Plan of Mining Adopted at Submarine No. 2 Mine; Right, Above, Details of Conveyor Set-Up in Four Room Panel; Right, Below, Showing Placement of Equipment in Starting a Group of Four Rooms.

is through breakthroughs 8 to 10 ft. wide cut on the sight lines of the rooms. Two breakthroughs are cut at each station, allowing it to be used in loading from two groups of four rooms, one at each side of the entry.

Conveyor operation starts in one of the two groups of four rooms at the inside end of the entry (Group A in Fig. 1, as an example). Normally, the loading station opposite Room 13 is employed, and when Group A is completed the conveyor unit is moved to the other side of the entry, using the same loading station. If conditions make use of this station impracticable, the station at Room 16 could be pressed into service. Ordinarily, however, No. 16 would not be used, as it would entail loading by the car instead of by the trip. When Group B is worked out, the conveyor unit normally is moved to Group C, using the loading station at Room 12. However, the station at Room 9 is available and may be used if conditions are more favorable for handling trips under the conveyor discharge or for other reasons. Similar considerations govern the work in the remaining groups on the entry.

Equipment comprising a conveyor unit is as follows: one 300-ft. main, or mother, conveyor with 15-hp. motor; one 114-ft. cross conveyor with 5-hp. motor; three 100-ft. parallel room conveyors, each with 5-hp. motor; four 14-ft. face conveyors, each with 1½-hp. motor; four 35-hp. Sullivan CE7 cutting machines with 6-ft. cutter bars; one Hardsocg or Dooley Bros. post-mounted portable electric drill; and one 6-ton Goodman locomotive hauling to the shaft bottom. The conveyors are installed as shown at the right in Fig. 1, one view showing the start of work in a group of rooms and the other the position of the cross conveyor after the first move-up.

In starting a group of rooms, the four face conveyors and cutters are set in the room necks; the drive end and necessary intermediate sections of the main conveyor are placed; the cross conveyor, which discharges into the main conveyor, is set over the track in the outside entry; and the drive sections of the three parallel room conveyors are placed in their respective room necks. The standing cuts in the 20-ft. room necks are then shot down and loaded, after which the rooms are widened to 25 ft., leaving a 13-ft pillar. The four rooms are then advanced simultaneously until they are two or three cuts beyond the second breakthrough 100 ft. from the center of the entry, whereupon the cross conveyor is moved up in preparation for the second 100 ft. of advance. Maximum room depth is 300 ft., which requires two moves of the cross conveyor for complete extraction. The 13-ft. pillar between rooms is left in place. A timber track extending up to the cross conveyor is laid in one of the rooms after the first move-up, to facilitate delivery of timber and other supplies, and this track is extended after the second move. When horsebacks are encountered, the rooms are narrowed to 12 ft. until they are passed.

The standard conveyor unit crew comprises thirteen men, as follows: one boss, $7 per shift of seven hours; five loaders, $6.75 each; two machine men, $6.75 each; one timber and panman, $4.57½; one driller and shooter, $6.15; one chunker, $4.57½; one motorman, $5.15; and one triprider, $5.14. These men normally clean up approximately eight 25-ft. cuts per shift, yielding 150 tons of coal delivered on the shaft bottom. Maximum production from a unit in any one shift has been 177 tons. Cross-conveyor move-ups usually are accomplished in less than half a shift, and an

entire unit has been moved from one group of rooms to another in one shift employing eight to ten men at $4.57½ and using the cutting machines to skid the conveyor sections out of the places.

With a room cleaned up, the operating cycle begins with undercutting. When cutting is completed, the machine, which is equipped with Bowdil chain and bits, is pulled back to the right of the room and parked in readiness for the next cut. Four 2⅜-in.-diameter holes are then drilled in the face, using coal augers with "Coalmaster" detachable bits. Two holes are located on the ribs and the other two divide the distance across the face. All are started about 2 in. down from the roof and are angled upward to meet the top at the back of the cut. While the drilling is going on, other crew members are engaged in moving up the face conveyor, extending the room conveyor and timbering. Four rows of props, successive props in a row being spaced 4 ft. apart, are set to the left of the conveyor at all times, with as many more as may be necessary to meet unusual conditions.

The final step in preparing the coal for loading is blasting the cut with Hercules "Red H" F permissible powder, running 117-118 1¾x6-in. sticks per 50-lb. box. One stick is loaded in each rib hole and one-half stick in each of the center holes.

Cars are brought to the loading station in trips of 14-15, the usual practice being to have one trip loading and another waiting. Approximately 140 cars with a nominal capacity of 2,400 lb. are in use. These cars originally were designed for operation in rooms with hand loading, and it is expected that they will be replaced with larger units in the future. In anticipation of the change, shaft dimensions were made sufficiently large to accommodate the bigger cage that would be necessary.

Direct-current power at 250 volts is employed to operate the equipment, and the control system is based on the use of two master starters, one governing operation of the main conveyor and the other the operation of all subsidiary conveyors. In addition, each subsidiary conveyor is equipped with a separate starting switch. All conveyors with the exception of the main conveyor are equipped with two-conductor rubber-covered cables which, together with the cutting-machine cables, are carried back to a special plug-in station. Until the rooms are driven up 200 ft., this station is established on the entry and is connected to the feeder circuit. After 200 ft., however, another station served by a main power cable is established in the fourth breakthrough of one of the rooms. Drill cables are plugged into sockets wired to the leads to the motors on the face conveyors. Standard practice requires that the fuses be removed from the starters on parallel room conveyors before they are taken apart for the addition of new sections. As the chunker always is stationed at the main conveyor starter, this precaution is not necessary when it is being extended.

Development of the system employed at Submarine No. 2 mine was largely the responsibility of D. W. Hayes, superintendent, and C. H. Harrison, mining engineer, Clinton Coal Co., which is headed by H. M. Ferguson.

Voltage Increased and Power Saved By Moving Generator Sets Forward

(Concluded from page 103)

serve such equipment regardless of electrical economics.

The improvement which has been made in synchronous motor design may be better appreciated from the following experience with which the writer is familiar. A 300-hp. 80 per cent power-factor motor was applied to a job requiring its full rating. It was supplied by a line which was designed to allow 10 per cent voltage drop at full load and 100 per cent power factor. The motor hunted severely with field set for 100 per cent power factor and not so badly at 80 per cent. As the load was of fluctuating nature, the application was not satisfactory, as there was much voltage disturbance and the motor was frequently pulled out of step. This motor was replaced with a 400-hp. 80-per-cent power-factor motor of more recent design. With no changes to the existing supply line, the load was increased by some 30 per cent with very little line disturbance.

Automatic switching equipment selected for the new substations at Renton mine combine all of the conventional features usually provided for mining service with provision for automatic resynchronization and a few other special modifications thought necessary in connection with the application.

The high-tension cable enters each substation in a conduit leading to an inclosed set of line disconnects. Thence the current is conducted to an oil circuit breaker and thence to the starting and running contactors, all of such high-tension equipment being inclosed in a steel cubicle.

Where it is possible to apply properly network distribution methods for more advantageous use of copper, the application of the sectionalizing automatic re-

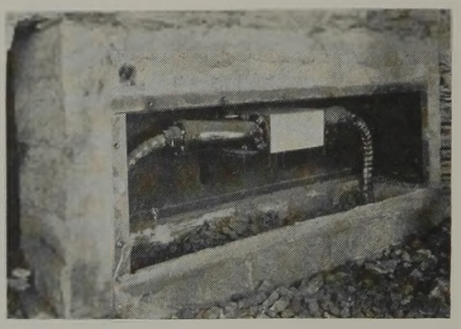


Fig. 5—Cable-Plug-Connection Housing in Heading Rib, Cover Removed

closing circuit breaker is particularly desirable. It may be used to provide for isolation of the various parts of the feeder system in case of a short-circuit due to a fall of roof, wrecking of a trip of cars or other cause, thus preventing delays to the entire mine. Another ideal application is to protect feed lines, the total circuit resistance of which has increased to such an extent that, with a short-circuit existent at the extreme end of the circuit, and all other mine load removed, sufficient current cannot flow to insure operation of the main circuit breakers.

Tonnage, kilowatt hours and kilovolt-amperes at the Renton mine are shown in Table II. Kilowatt-hour figures cover power consumed at 275 volts, d. c., and conversion losses. The kilovolt-ampere demand figures are for the total plant load.

The large kilowatt-hour saving compared to face voltage improvement is explained by the high efficiency of locomotive haulage operating on a feeder network and a general increase in the efficiency of all mining operations.

At the present rate of production, the investment required for the installation will be retired by power-billing reduction alone in less than four years. The capital value from an increase of production standpoint would be hard to estimate accurately. Though it is difficult to approximate the money saved in other ways than by a reduction of the bills for power, it may be safely stated that the electrical energy savings resulting from underground power improvement are usually much less than the economic benefits which accrue from reduced loss of time, decreased electrical repair, freedom from annoyance and improvement in morale.

Table II—Current Demands, Renton Mine

Period	Kw.-Hr. Per Ton	Kva. Billing Demand Per Ton of Daily Output
12 months prior to installation	3.41	0.520
10 months' operation with new system	2.08	0.411
Decrease	1.33	0.109

INS AND OUTS

+ Of Mine Ventilation

By W. J. MONTGOMERY
Manager, Ventilation Division
Jeffrey Manufacturing Co.
Columbus, Ohio

MILLIONS of dollars each year are found going needlessly from the ventilation purse of the coal mining industry. This loss is incurred by the costs of power waste, of property and life loss from gas explosions and of worker inefficiency in atmospheres deficient in oxygen. Relatively few companies have escaped carrying some share of the burden. That there is much room for improvement may be drawn from the writer's contention that, under the best of conditions, 80 per cent of the mines with ample airway capacity could be adequately ventilated with a fan motor input of 25 h.p. or less.

Recognition, of course, is given to the fact that there is a limit to profitable refinement of the ventilating system. If, however, practicability were allowed to hold full sway, it would fix the profitable balance at a point much closer to the ideal than to the mark set by prevailing practice. Good practice specifies a volume delivery efficiency of 70 per cent. This efficiency is computed as the ratio of the total of volumes delivered to the intake of final splits and the volume measured at the foot of the shaft. Few mines show much better than half this efficiency.

It is not difficult to understand why improvement of ventilation practice proceeds so slowly through the years. Unquestionably, fear of the theory has been the chief factor retarding progress. Awed by involved formulas, many practical mining men have allowed their confusion to interfere with a sharp understanding of the fundamental laws of ventilation. There should be few mistakes in the use of these laws, since they are simply stated, interrelated and easily applied. In addition to the laws, certain principles can be placed under the heading of fundamentals. For the most part, these have been originated empirically, and their soundness is backed by long experience.

Some ventilation equations are carried forth in terms of calculus and even differential equations. That these have merit and application cannot be denied. However, they are largely extraneous to the laws in the sense that they take up where the laws leave off. In other words, they make for refinement. And in some instances they are used to evolve principles which, once developed and proved, can be applied by easy arithmetical computation, perhaps not with an exactness equal to that of the original derivation, but yet with fair accuracy. Consequently, having a firm grasp of the simple fundamental laws and principles, it is possible to achieve high merit in ventilation without resorting to the use of involved formulas.

An analogy may be drawn between an electric generator and a fan, showing the operating characteristics of each with respect to the circuit or system through which output is distributed. Clearly and logically, the comparisons demonstrate the simplicity of the theory of ventilation. The analogy as a whole may be likened to a framework structure, plainly marked to indicate where each fundamental fits. Having a clear mental print of this framework, the individual is ready to complete the building of good ventilation practice.

An electric generator driven at a given speed develops a given pressure called voltage; a mine fan driven at a given speed develops a given pressure called water gage. If there are no wires connected to the generator, no current can flow; and if the airways are blocked so that there is no opening through the mine, no air can flow. If a wire is connected across the terminals of the generator, the current that flows will depend upon the resistance of the wire, which in turn depends upon its length, cross-section and the material of which it is made. The longer the wire, the smaller its cross-section and the higher its specific resistance, the less is the current that will flow; conversely, the shorter the wire, the greater its cross-sectional area and the lower its specific resistance, the greater is the current that will flow.

The quantity of air that a fan will pass through a mine at a certain pressure, or water gage, depends upon the resistance of the mine, just as the quantity of current an electric generator at a given pressure or voltage will put through a wire depends upon the resistance of the wire. As in the case of the wire, the resistance of the mine depends upon the length of the airways, their cross-sectional area and upon the character of the sidewalls, floor and roof. If the sidewalls are rough and the floor is covered with scattered rock, the resistance is higher than when these surfaces are smooth.

The resistance of a wire to the flow of an electric current is measured in terms of ohms. The resistance of a mine to the flow of air, though measured in terms of water gage, may be indicated by the equivalent orifice of the mine. (The equivalent orifice of a mine is the area of a circular opening in a thin plate which offers a resistance equal to the mine resistance, when passing a volume of air equal to the mine volume.) Though the capacity of a generator may be 364 amp. at 275 volts (100 kw.), if a resistance of 1.50 ohms is connected across the terminals, only 182 amp. will flow—50 per cent of the capacity of the generator—which by no means indicates that the generator will not deliver its full capacity. Likewise, if a fan rated to deliver 100,000 cu.ft. per minute at 3-in. water gage (equiva-

Feeling that presentations of mine-ventilation theory and practice have been made too technical, Mr. Montgomery has guided his pen toward simplification of the essentials. Since there is much difference of opinion as to what constitutes good practice and how air moves underground, these articles should also stimulate the thinking of that group which is intimate with the problem. The recommendations and conclusions herein contained are prompted by an experience of 32 years in the design and application of mine fans. They are backed by findings from inspections of mines in every section of the United States and many mines in foreign countries.

lent orifice, 23.0 sq.ft.) is connected to a mine having the resistance of an equivalent orifice of 11.5 sq.ft., only 50,000 cu.ft. will flow. Just as in the case of the generator, acceptance of only 50,000 cu.ft. of air by the mine is no indication of the capacity of the fan. To get rated capacity from the fan, the resistance of the mine must be reduced to that indicated by an equivalent orifice of 23.0 sq.ft., even as it would be necessary to reduce the resistance of the wire to 0.75 ohm to get rated capacity from the generator. The resistance of the wire is reduced by making the conductor shorter, of larger cross-section and of material of less resistance. The resistance of the mine is lowered by making the airways shorter and of larger cross-section and by smoothing the surfaces.

The above analogy is based on Ohm's Law, a law which is universal in its application. In lay words it means that of the energy which can be developed by one agent no more will be accepted by a second agent than resistance to acceptance or acceptance capacity will allow. Both the generator and the fan are sources of energy, since they produce potential energy. The wire in the electric circuit and the airways in the mine ventilating circuit are receivers of energy; in them is a resistance which opposes the flow of energy and fixes their capacity for accepting the flow offered them by the energy sources.

Coal-operating men gradually have learned the futility of attempting to put more current through a wire at a given voltage than the resistance of that wire will permit. They do not say that a 200-kw. generator has failed to deliver its rated capacity when nothing but a 100-watt lamp is connected across the terminals. Similarly, it is futile to attempt to put more volume through a mine at a given pressure than the resistance of that mine will permit. By the same token it is eminently unfair to blame a mine fan when it fails to furnish more air than the mine will take.

It is well, of course, to get the most out of the mine fan, as judged by measurement of its mechanical efficiency. But since ventilation does not end with the fan, additional criteria of achievement must be resorted to as a means of gaging results from the fan to working faces. Therefore a new efficiency is introduced for the purpose: namely, the *relative ventilation efficiency* of a mine.

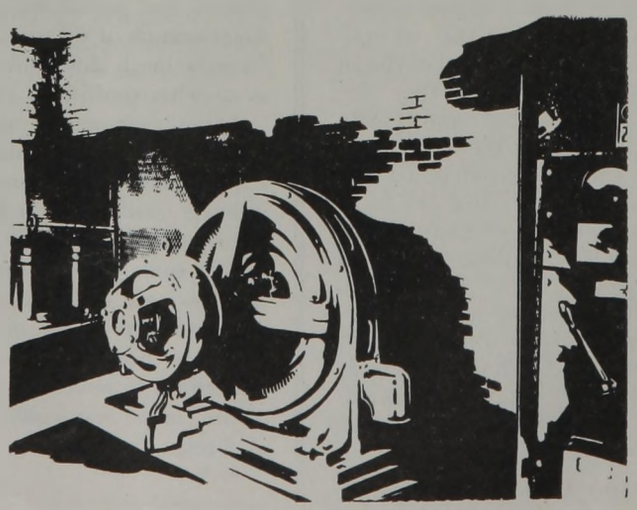
It is conceded that an exact determination of such an efficiency is practically impossible because of the entrance of so many indeterminate variables into the calculation. However, these unknowns do not preclude the calculation of a relative ventilation efficiency which will serve all the purposes of a practical yardstick. Fortunately, there is a fixable base any deviation from which can be gaged relatively. This base happens to be the (volume-resistance) mine characteristics with best practice prevailing.

Immediately it will be asked what are the characteristics of a mine with best practice prevailing. This can best be explained by illustration; for example: When plans are laid for the opening of a new mine, sound engineering prescribes that a calculated assumption be made of the maximum air volume requirement and acceptable resistance with relation to the underground layout and projection. If the mine is to be in a seam where experience has been established, a close approximation of ventilation requirements with relation to conditions can generally be drawn. Thickness of seam, roof conditions, timbering requirements, the nature of the coal and bottom, shaft-opening or drift-portal possibilities, together with the rate of gas emission, are more or less determinable factors which would guide the prediction of volume and resistance. As a matter of fact, no mine design can be much more than halfway accurate which has not been benefited by such reconnoitering. How else can the dimensions and numbers of airways be fixed and safe air volume be guaranteed? Also how else can fan specifications be intelligently drawn? By this process resistance for maximum volume can be pegged by the judging of air velocities, distance of air travel and other basing factors. A differentiation, for example, can be made between the allowable resistance of a thick-seam mine with good roof and the acceptable resistance of a thin-seam mine with bad roof.

Getting back to the focus of the discussion—having these basic factors, the relative ventilation efficiency of the mine can be ascertained. Thus if the groundwork is so well laid that, in the middle year of the period of capacity tonnage, the volume-resistance characteristics of the mine match the predicted values, then the relative ventilation efficiency would be considered 100 per cent. But should the airways at this stage have become so cluttered that a pressure of 6 in. is required for passing 150,000 cu.ft., whereas the predicted resistance for this volume is 3 in., then the relative ventilation efficiency would be considered 50 per cent. Where the volume remains constant, the efficiency naturally will vary inversely as the water gage, for the efficiency is based on air horsepower.

This system, which, incidentally, is original and here published for the first time, can be used effectively at various stages of development leading to capacity production. Thus at a certain stage in the development, a volume of only 75,000 cu.ft. may be required, the pressure necessary to obtain this volume being 1.5 in. gage. The condition appears harmless enough; yet analysis will show it is high time to provide more airway capacity. The resistance varies as the square of the volume passing; and on this basis, a pressure of 6 in. would be required to obtain the ultimate volume. The pressure must be held to $\frac{3}{4}$ in. gage for 75,000 cu.ft. if later 150,000 cu.ft. is to be obtained at the predetermined pressure of 3 in. It is vastly important that the resistance be carefully watched throughout the development period. If at any time the mine resistance is found to be greater than the predetermined pressure for a corresponding volume, then correction of airway capacity should be made. As a whole, the adoption of this system would help end the confusion which blames the mine fan for all trouble, by putting ventilation thinking right.

It may be argued that the actual resistance characteristic of the mine may develop to be considerably less than the value predicted for it, in which case the relative ventilation efficiency would greatly exceed 100 per cent. That possibility, which would seldom transpire, should be no reflection on this method of arriving at a relative efficiency. The fault in that case would be in inaccuracies of reconnoitering. That fault, patently, would be a happy one except as it would reduce the mechanical efficiency of the fan specified for the higher resistance.



PUMPING PROJECT

+ Reduces Mine Drainage Cost; Improves Water Supply for Three Towns

By J. H. EDWARDS

Associate Editor, Coal Age

BY INSTALLATION of two deep-well turbine pumps for draining its Scarbro mine, in Fayette County, West Virginia, the New River Co. reduced the wet-season daily pumping labor from four man-shifts to one man-shift. Locating a new water-treatment plant close to the mine pumps and utilizing their discharge for raw water supply also has made it possible for one man to look after both the mine drainage and the purification of water along with pumping to high storage tanks. Each deepwell turbine unit has a rated capacity of 1,000 g.p.m., and the vertical depth from the base of the pump head to the lowest impeller is 395 ft.

Arrangements now existent date back three years, at which time Scarbro mine was temporarily closed down, with pumping being taken care of by several large motor-driven reciprocating pumps at the bottom of the 390-ft. hoisting shaft. Other conditions relating to pillars and safety dams which protect the mine from an adjoining abandoned property, formerly operated by another company and now filled with water, require that the mine be ventilated to the extent that it can be entered for inspections.

During times of normal water influx it was necessary, under conditions existing following the shutdown, to employ one pumper and to keep a hoist engineer on duty at all times that the pumper was below ground. Two extra men were required during the wet seasons, when the old pumping units could not handle the water by operating one shift per day. A study of the possibilities for future routine developed the fact that by replacing the underground pumps with deepwell units having the pumping heads at the top of the shaft and by providing a slightly larger combined capacity than that of the old pumps, one man could do all necessary pumping in one shift. The possible saving in labor and the expectation of a much lower maintenance cost were the incentives for purchasing the new pumps.

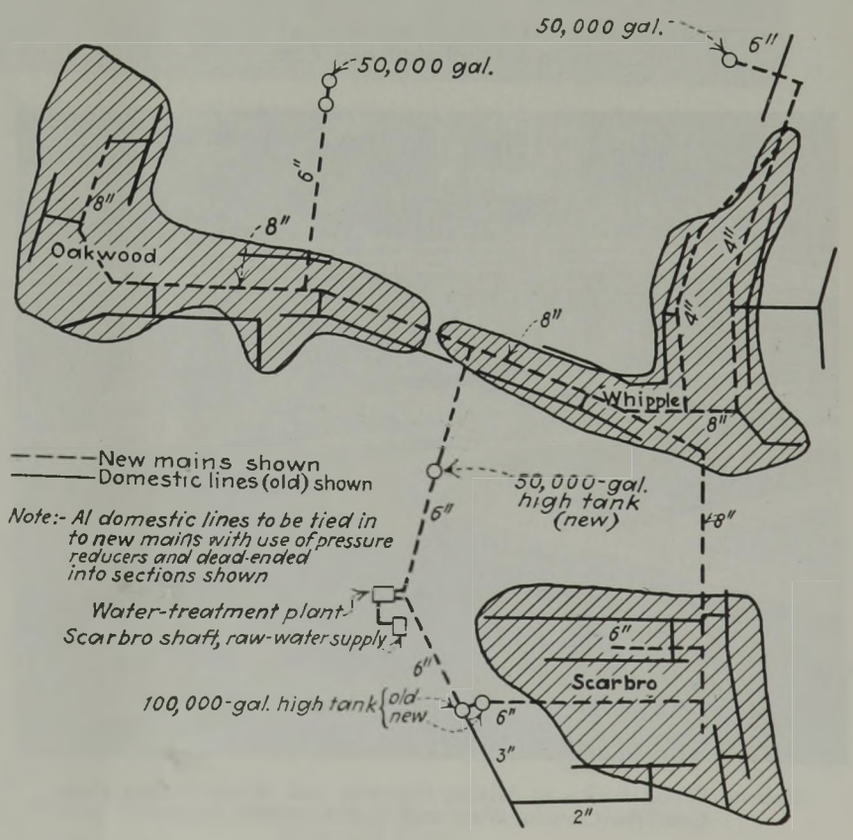
Pomona water-lubricated pumps were selected and these were installed with

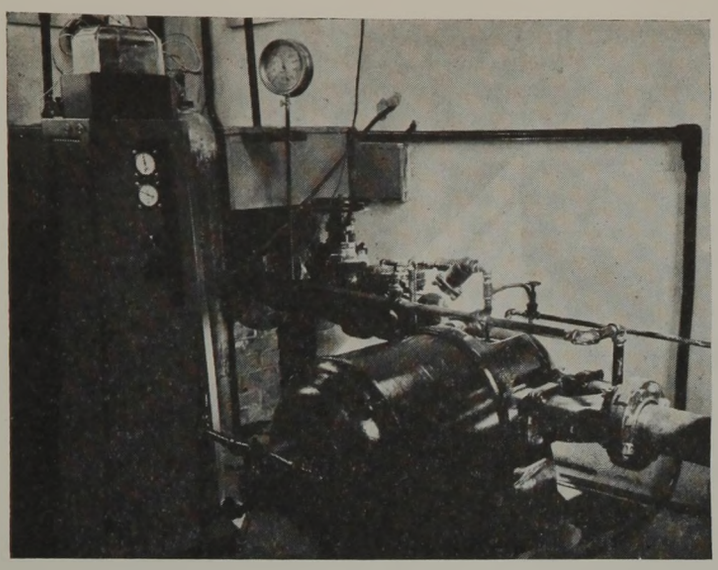
Table I—Analysis of the Mine Water as Delivered to the Treating Plant

	Parts Per Million	Grains per U. S. Gallon
Temporary hardness (as $CaCO_3$)	0.0	0.0
Permanent hardness (as $CaCO_3$)	306.0	17.9
Total hardness (as $CaCO_3$)	306.0	17.9
Calcium hardness (as $CaCO_3$)	....	....
Magnesium hardness (as $CaCO_3$)	....	....
Free Carbon Dioxide (as CO_2)	....	....
Iron (total) (as Fe)	75.0	....
Iron (dissolved) (as Fe)	75.0	....
Manganese (as Mn)	....	....
pH concentration	below 4.0	....
Turbidity	35	....
Color	10.0	....
Odor	none	....
Chlorides (as Cl)	slight	....
Free chlorine	0.0	....
M.O. alkalinity ($CaCO_3$)	0.0	....
Phen. alkalinity	0.0	....
Reaction to methyl orange	Acid	....
Reaction to phenolphthalein	Acid	....
Suspended matter	Iron oxide	....

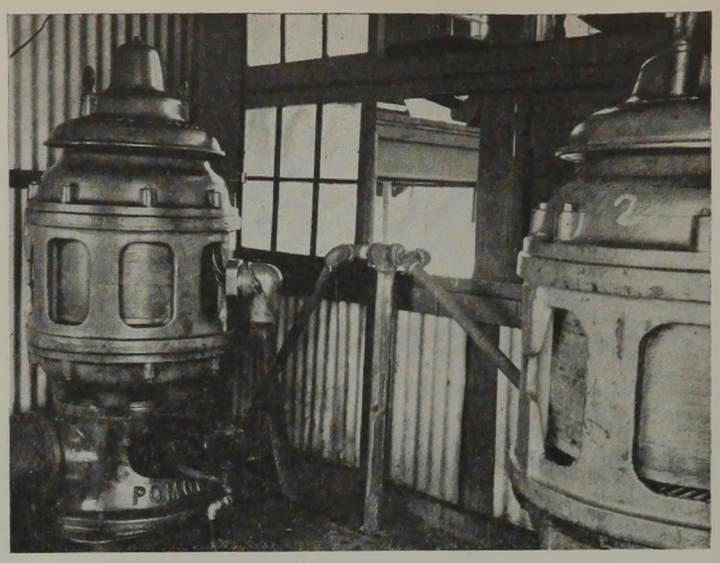
17.1 parts per million equals 1 grain per U. S. gallon.

Layout of New Water System Serving Three Towns.



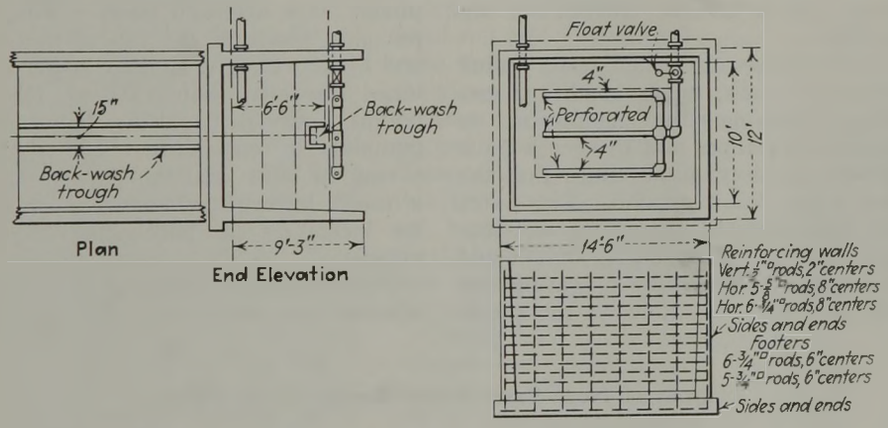


Left to Right: Chlorinator and Treated-Water Pump.

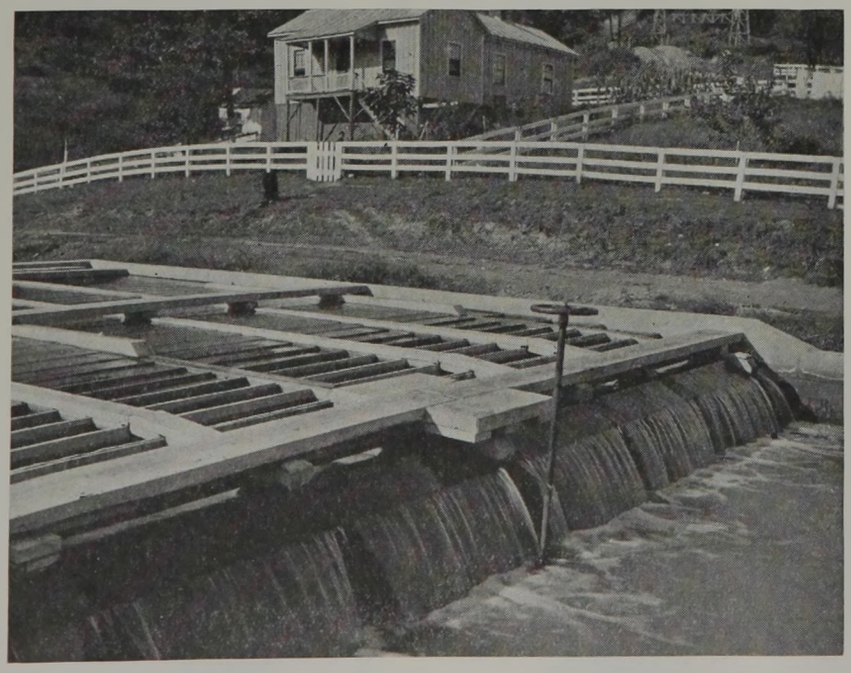


Two 150-Hp. Pumping Heads at Shaft Top.

casings hanging in the pipeway compartment at one end of the hoisting shaft. The units are duplicates and are powered by Westinghouse vertical Type CS line-start 2,300-volt 1,770-r.p.m. 3-phase 60-cycle constant-speed induction motors rated at 150 hp. A small sheet-metal building with floor dimensions of 7x10 ft. houses both of the pump heads. The control panels (Westinghouse magnetic oil - switch type) are located in the hoist house.



Design Details of the Filter Which Receives the Water From the Sedimentation Tank.



Showing Wood Baffles in Mixing Chamber and Water Passing Over Concrete Curtain Wall Into Sedimentation Basin.

The pumps have casings of 9-in. standard steel pipe. These are in 10-ft. lengths and water-lubricated guide bearings of rubber are located at the joints. Casings are anchored to buntons at 100-ft. intervals, but the entire weight is supported from the top. Pump discharge connections are 10-in. size. Bowls and impellers are of acid-resisting bronze and the impellers are assembled on shafts of Monel metal. The main drive shaft, however, is of ordinary steel. The pump heads are fitted with inclosed ratchets which prevent reversal and overspeed upon back flow of the water column at shutdown. Town water from a high tank is turned into the pump casings through a 2-in. line to lubricate the bearings at start. It is turned into both by opening one valve, even though but one pump is to be started. This is done to avoid the mistake of turning the water on a certain one of the two pumps but starting the one not thus supplied. Experience to date with the pumps indicates that their maintenance cost will be very low compared to the pumps replaced.

The Pomona units were put into operation in October, 1933, and since that time one man working one shaft beginning at 3 p. m., when the mine load peak is over, has handled the pumping. The man employed is experienced at operating the hoist and is available to run it when inspectors may

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wish to go below, which is but occasionally. In July, 1934, the water-purification system was constructed and put into use and the same one man now has its operation added to his duties, with no demands upon him except attention to his plant above ground and in the open air.

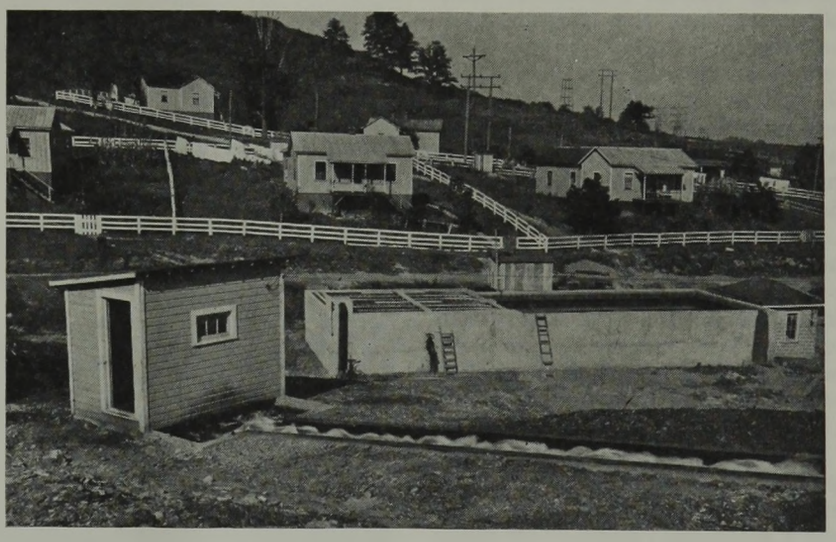
The mine water as it comes from the Pomona pumps for treatment for domestic purposes is acid to the degree that analysis of a sample taken in November, 1933, showed the pH concentration as "below 4." In this scale of measurement, based on hydrogen ion concentration, pH 7 is neutral. A lower figure indicates acidity and a higher one alkalinity. A study of the analysis indicated that the steps necessary to prepare a pleasant and safe water for drinking and one suitable to other home uses must include aeration for removal of iron, introduction of soda ash for precipitation of permanent hardness, mixing, sedimentation and filtration. Chlorination also is included as a safety feature only, frequent bacterial analysis having shown the supply free of all contamination. The fill-and-flow system was adopted as the type of plant best suited to all the conditions, and 1,000 g.p.m. was fixed as the optimum rate of flow through the treating equipment into the sedimentation basin. Design proceeded on this basis and the finished plans called for an aeration flume, a housing for the chemical machine, a reinforced-concrete structure combining baffle-flow mixing chamber and sedimentation basin, a filter, clear-water sump and pumproom.

Normal pumping from the mine is 750,000 gal. per day, this being done in the 7-hour shift. Use of the new system began with a daily flow of 50,000 gal. of water through the purification plant to supply one town only, Scarbro. More than twice this quantity will be used when pipe lines now being laid are extended to include Oakwood and Whipple, with resultant abandonment of their individual pumping from rings cut into the sides of the shafts.

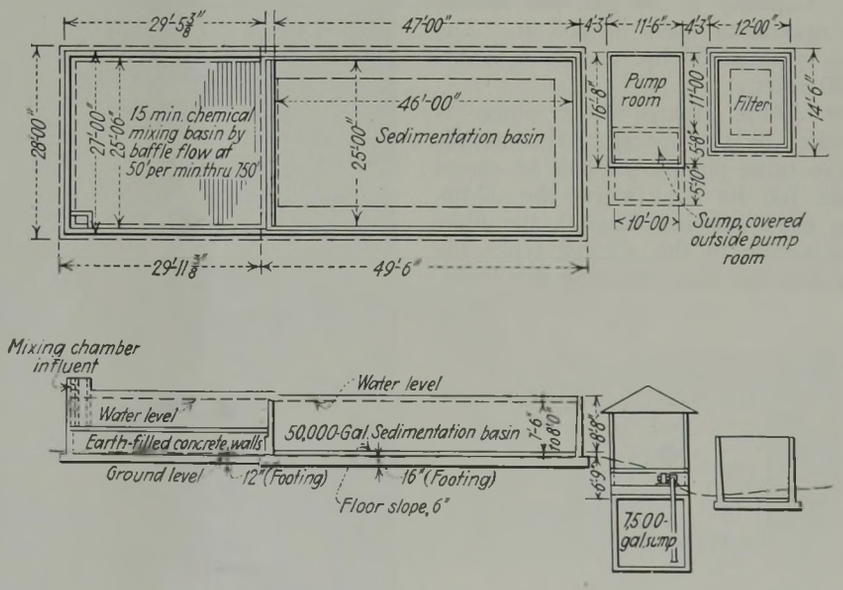
The treatment begins with water diverted by valve control from the mine-pump discharge line into the aerating flume, 5 ft. wide, 50 ft. long and 12 in. deep, built on a pitch of 1.32 in. per foot. The bottom is constructed of rough masonry which causes the water to be churned to a white foam or spray. Then after percolating through a charcoal filter laid in the flow section of a 3x10x10-ft. sump the water passes through an end wall into a 2-ft. rectangular flume located under a small building housing a Wallace & Tiernan chemical feeder. This equipment feeds in soda ash by dropping it directly into the water at the point of its entrance into a discharge pipe, and consists of a hopper and motor-driven reciprocating feeding mechanism which can be adjusted to any desired rate of feed within its capacity.

From the sump under the chemical feeder the flow continues downward to the baffle mixing chamber, from which it passes into the reinforced 50,000-gal. sedimentation basin. The various features from the mine-pump discharge to the clear-water sump are arranged at descending elevations, made possible by local conditions, which provide gravity flow throughout.

The mixing chamber, elevated so that water may flow directly to the sedimentation section, is 25 ft. 6 in. wide by 29 ft. 5⅜ in. long and the water depth is 3½ ft. In this basin the water is forced to travel a labyrinth path 750 ft. long. Intake at 1,000 gal. per minute creates a rate of flow through the baffles of 50 ft. per minute and assures the desired time of 15 minutes in the mixing basin. The water is confined to its path (whose cross-section is 9 in. wide by 3 ft. 6 in. deep) by baffles made of cross-laid pine flooring treated with linseed oil for protection during hot weather and assembled with nails having lead-coated heads. The water flows over a concrete partition wall in passing from the mixing chamber to the sedimentation basin. The latter basin is 25 ft. wide by 46 ft. long and the normal depth of water when full is 8 ft., the top of the effluent line being placed at 18 in. off the bottom. A shallow weir at one corner of the basin acts as a skimmer when the water level is permitted to rise to its height and also acts as an overflow in case of unintentional



In the Foreground Is the Aerating Flume Leading to the Chemical House. In the Background Is Mixing Chamber, Sedimentation Tank, and Treated-Water Pumphouse.



Design Layout of Mixing and Sedimentation Unit, and Pump Room and Filter.

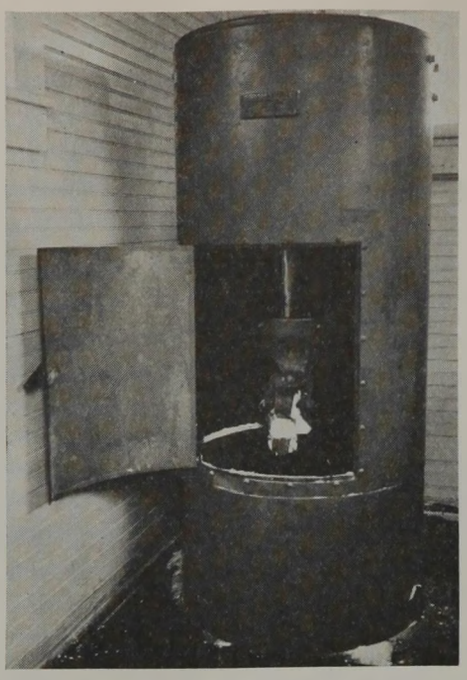
overfilling. Sediment is flushed from the bottom of this basin by opening a valve in the pumproom which controls the drainage line.

Through the perforated effluent pipe, located at the 18-in. elevation above the floor of the sedimentation basin, the treated water flows by gravity, under a head which begins at 7 ft. and diminishes to 1 ft. as the surface is lowered, through a float-controlled valve into a concrete filter by means of submerged distributor pipe. The filter is 10 ft. x 12 ft. 6 in. and 9 ft. 3 in. deep. Manual control of this flow is by a gate valve in the pumproom.

The layers of materials in the filter from top to bottom, which is the direction of flow, are quartzite sand, 28 in.; gravel, passing $\frac{3}{8}$-in. screen, 3 in.; gravel screened $\frac{3}{4}$ to $\frac{3}{8}$ in., 5 in.; gravel screened 2 in. to $\frac{3}{4}$ in., 10 in.; native sandstone, 2 to 4 in.; and an 8-in. false bottom of two layers of hard burned hollow building tile. A perforated copper-pipe underdrain collects the water for discharge into the clear-water sump. On alternate days the filter is backwashed for three to five minutes with treated water flowing at approximately 2,000 gal. per minute from the main storage tank under a 200-ft. head. The backwash control valve is located in the pumproom and the water passes through a 15x14-in. wash trough and sluice gate.

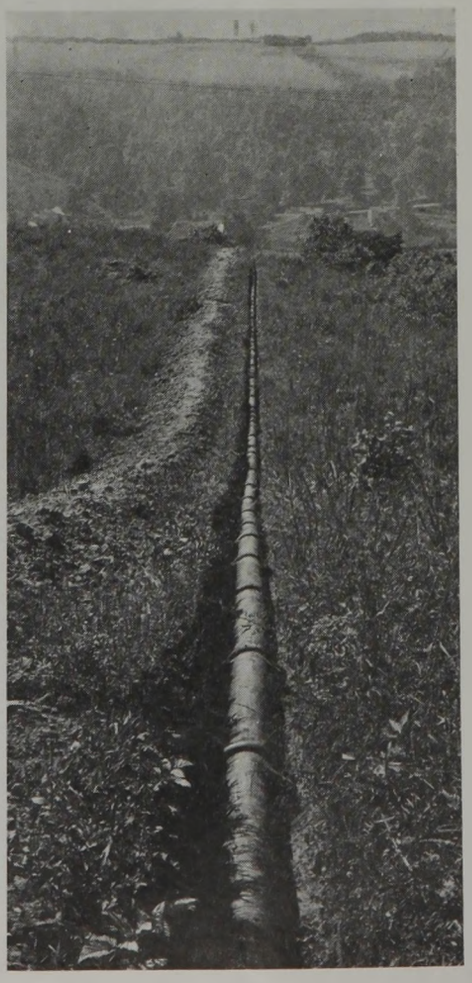
The last step in the gravity flow is from the filter to a 7,500-gal. treated-water sump under the floor of the pumphouse, which is situated between the sedimentation tank and filter. This flow also is controlled automatically by a float valve with a secondary hand valve, both being in the pumproom. This pumphouse contains a Wallace & Tiernan chlorinator, also a "Jennings Suction Centrifugal" pump. This pump, its 3,500-r.p.m. motor, and a "Nash-Hytor" vacuum pump are built as a direct-connected unit with three bearings. Capacity is 250 gal. per minute at a maximum head of 285 ft. The motor is rated 50 hp. and is operated on 440 volts.

The 30-hp. treated-water pump is controlled by the operator who attends the two mine pumps. When he comes on the job he first starts the 30-hp. pump, thus drawing through the filter and elevating to the storage tanks the water that has been standing for settlement in the sedimentation tank. When the high storage tank has been supplied he diverts the waste water from one mine pump—that is, 1,000 gal. per minute—through the treating units and refills the sedimentation tank. The soda-ash feeder, which can be controlled from either the waste gate or the chemical room, is of course started as the filling is begun.



Door Opened to Show Feeder Dropping Soda Ash Into Sump.

Six-Inch Cast-Iron Pipe From Filter Plant to Storage Tanks.



When the construction now in progress has been extended to include the two additional mine towns, Oakwood and Whipple, there will have been laid for the three towns 10,166 ft. of 8-in., 1,693 ft. of 6-in., and 4,111 ft. of 4-in. "Universal" cast-iron distribution mains. The class of pipe installed has a rated working pressure of 150 lb. per square inch and has been found specially applicable to local topography because of the type of joint which permits the making of bends or turns up to $4\frac{1}{2}$ deg. per joint. These water mains are buried to a depth of about 30 in. and will include a complete set of fire hydrants, all installed in compliance with the Underwriters' Code for fire protection as well as domestic supply.

To the water-storage facilities previously used at the three towns there have been added two new storage tanks. These are both of wood construction and are built at or near ground level on near-by hills. The two new 50,000-gal. tanks increase the total storage capacity to 250,000 gal. for domestic and fire-protection purposes.

The treatment and distribution systems were designed by J. E. Howard, chief engineer of the New River Co., and all units were constructed under his supervision by company labor. The Scarbro unit has been in operation since July and the extensions now being made will provide an abundant water supply for the other two towns at an early date. The combined projects of mine pumps, water treatment and storage, with distribution and fire protection system, will, when finished, represent an investment of approximately $40,000.

The plant has been designed for long life and for operation by such practical attendants as may be in charge of it from time to time. The supply of raw water, far in excess of all need, should never fall below requirements. The apprehension regarding possible cessation of flow of water into rings in shafts surrounded by advancing mining operations has been eliminated, and the management of the New River Co. feels that a forward step has been taken in the modernization of its plant and in the improvement of living conditions for its employees.

CAR TRANSPORTER

+ Allows Stripping Two Seams Simultaneously

At Huntsville-Sinclair Mine

THE car transporter—a machine for stacking spoil on the top of existing banks—has been adopted at the Mark Twain mine of the Huntsville-Sinclair Mining Co., Huntsville, Mo., to solve the problem of stripping two seams separated by a small interval. The additional seam now being recovered with the transporter is the Mulky, varying from 12 to 14 in. in thickness. Thirteen feet below is the Bevier, averaging 46 in. in thickness and separated into two benches by a stratum of fireclay 4 in. thick, 10 in. above the bottom. From the surface down to the Mulky, the overburden consists of a varying thickness of clay and surface soil, 62 in. of limestone and 36 in. of black slate. Between the Mulky and the Bevier is a very hard blue shale.

Operations at Mark Twain began in March, 1932, and the original stripping plan was based on stripping to the Bevier and discarding the Mulky. The good quality of the latter, however, made its recovery desirable. Consequently, stripping procedure was changed in 1933 to provide for uncovering and loading the Mulky, then turning the 10-cu.yd. stripping unit and digging down to the Bevier, returning along the course of the original cut. This step was taken in anticipation of the installation of the transporter, built by the Bucyrus-Erie Co. in accordance with specifications laid down by coal-company operating officials and put in service in October, 1934.

The Mark Twain transporter consists essentially of a car running on tracks laid on a structural steel bridge, one end of which rests on a 20-ft. square platform mounted on three caterpillars. This platform also carries an A-frame structure from which the outer end of the bridge is suspended over the spoil bank by wire cables, as well as the necessary transformers, hoist drums, motor and controls for operating the car. A counterweight suspended on

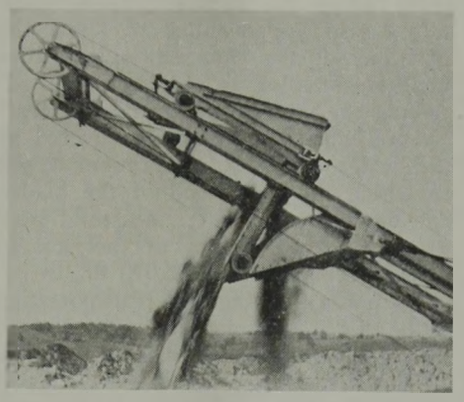


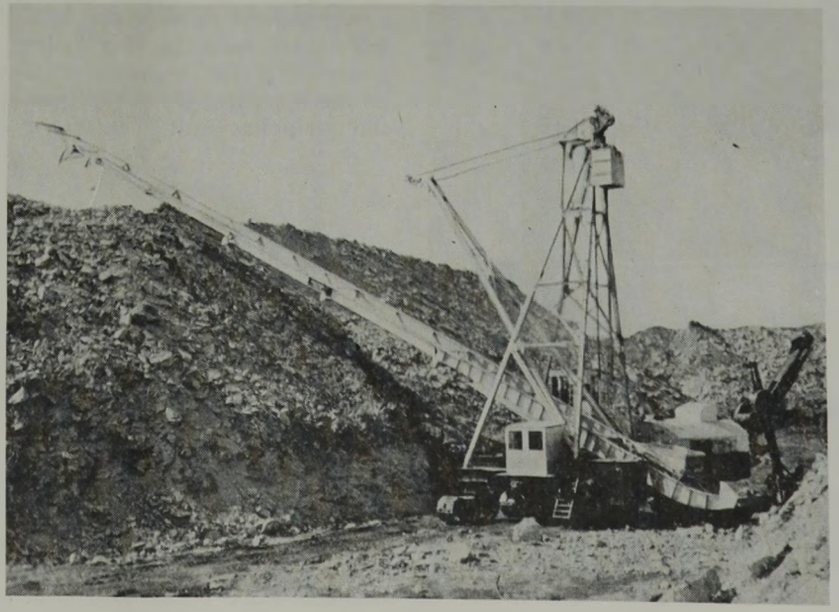
Fig. 1—Car With Bottom Dropped Down to Dumping Position on the Curving Inner Track.

guides on the A-frame is adjusted so that it will just pull the empty car up the bridge when inclined to the maximum of 45 deg. Two of the caterpillars are mounted on one side of the platform next to the spoil bank, and the third, completing the three-point suspension, is mounted in the center of the side next to the wall. All three are equipped with 5-hp. steering motors, each individually controlled, and are operated by 15-hp. propelling motors. One control is provided for the two propelling motors on the bank side and another for the third motor on the wall side.

The car which carries the spoil is designed with a drop bottom, as shown in Fig. 1. This bottom is hinged at the rear and when closed is supported at the front on wheels running on the inner of the two bridge tracks. In dumping, the body of the car is held in position on another set of wheels running on the outside track, while the front wheels on the bottom follow the down-curving dumping portion of the inner track, thus allowing the bottom to drop down and dump the spoil.

Capacity of the car is 4 cu.yd., identical with the dipper capacity of the shale-loading shovel. Time required to complete the full cycle from loading to

Fig. 2—Huntsville-Sinclair Car Transporter in Service. The Room on This Side of the Platform Houses the Transformers. Control and Motor Rooms Are on the Opposite Side.



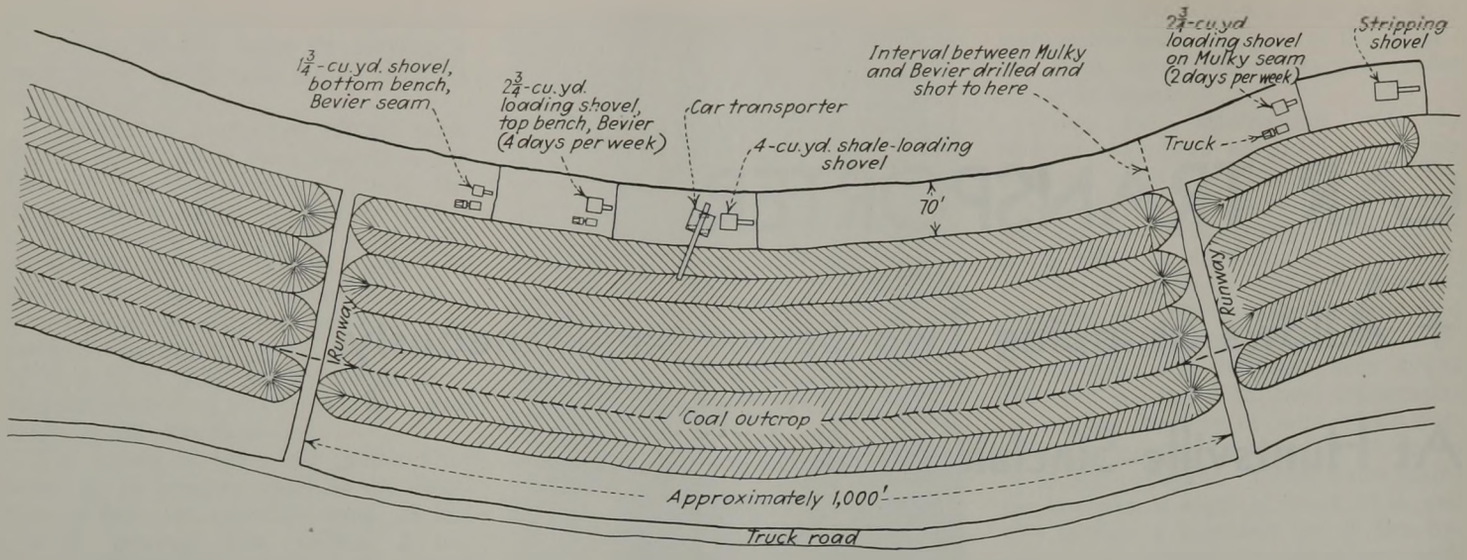


Fig. 3—Stripping, Loading and Hauling With the Car Transporter.

dumping position and return is 4 seconds and the car is operated from two hoisting drums on a comon shaft. Four $\frac{5}{8}$-in. wire cables are attached to the car—two at the front for pulling it to the dumping station and two at the rear for returning it to the loading position. Front and rear cables on one side of the car are led onto opposite sides of one of the drums, and the same procedure is followed with the cables on the opposite side. The drums are driven by a 250-hp. Westinghouse motor with Cutler-Hammer variable-speed controller. Motor, control panels and resistances are installed in a room on the opposite side of the bridge from the transformers. Over the motor room is the control room in which the car, caterpillar and steering controls are centralized. Operation of the car is governed by an indicator in the control room (Fig. 4) which automatically shows the position of the car at any point along the bridge. Three indicators also are installed to show the positions of the caterpillars, and thus facilitate steering in moving up or adjusting the position of the transporter.

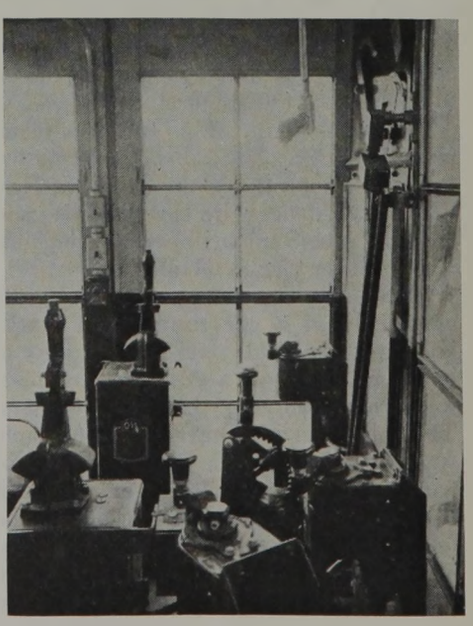
Total horizontal distance covered by the bridge is 178 ft. Maximum height to which the outer end of the bridge can be raised is 125 ft., measured from ground level. Weight of the unit in working condition is 250,000 lb.

Stripping, loading and transportation with the car transporter in use are shown diagramatically in Fig. 3. The 10-cu.yd. stripping shovel takes off all the overburden down to the Mulky coal, which is then loaded by a 2¾-cu.yd. loading unit. Trucks and trailers (*Coal Age,* October, 1934, pp. 373-376) are employed to haul the coal to the preparation plant. These units go into the pit through runways left in the spoil area, as indicated in Fig. 3. Installation of these runways has been facilitated by the fact that the coal area has been cut up into "islands" by small streams, along which the roads are built.

To preserve a road in the pit back to the nearest runway, the blue shale is left intact back to this point, which means that the transporter always is on the opposite side of the runway from the stripping unit. In front of the transporter and up to the runway, the blue shale is drilled by the same horizontal drill used in drilling the overburden above the Mulky, the drill being turned to put down vertical holes. Holes are spaced 18 ft. apart, one row following along the foot of the high wall. After shooting, the blue shale is picked up by a loading shovel with a 4-cu.yd. dipper, which dumps into the transporter car, which in turn deposits the shale on top of the spoil row left by the stripping shovel. The top bench of the Bevier seam is then loaded by the 2¾-cu.yd. shovel previously mentioned, this machine spending about two days a week on the Mulky and four days on the top bench of the Bevier. The fireclay over the lower bench is then stripped by a 1¾-cu.yd. shovel, which later loads the bottom coal. Generally, the fireclay is removed at night and the coal loaded the next day.

Fig. 4 — Above, Caterpillar Position Indicators; Below, Indicator Showing Position of Car on Bridge.

Fig. 5 — Separate Controls Are Provided for Each Caterpillar Steering Motor, the Two Caterpillar Propelling Motors and the Car Hoist.



OPERATING SAVINGS

+ Will Return Power-Plant Investment Of Ohio Mine in Three Years

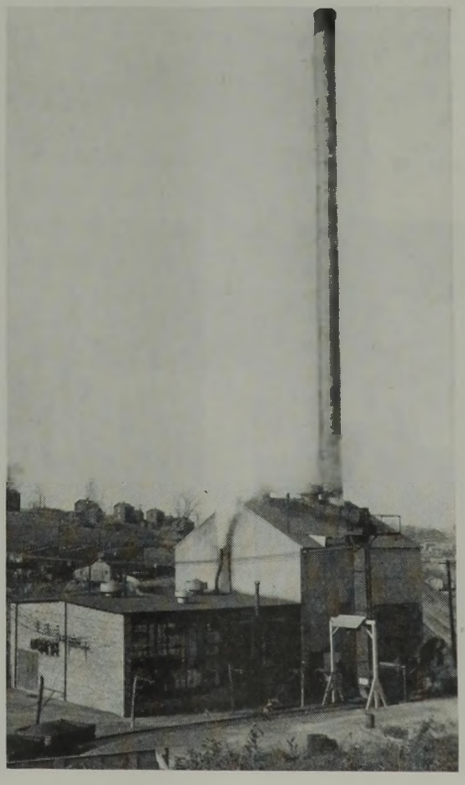
"BASED on the continuation of production at the present level, we expect the saving to return our power plant investment in three years," said W. F. Hazen, general superintendent, Wheeling Township Coal Mining Co., Adena, Ohio, in discussing the new plant which has been carrying the power load at the Somers mine since April 1, 1934. The mine has been averaging a little more than half time. Full-time work would cut the unit power cost almost in half and thereby shorten the time in which the savings would return the investment. A relatively small plant investment resulting from the transfer of certain equipment from plants of the parent company—Goodyear Tire & Rubber Co.—at used-equipment prices and the use of tipple refuse as fuel are major factors facilitating the production of cheap power. Numerous items of the plant equipment are new and those that had seen service were completely reconditioned before installation.

Somers mine, the sole load of this power plant, is in Harrison County. Production comes from the Pittsburgh No. 8 seam and all of the coal is handled by Joy loading machines. A middle band of bone, running 41½ per cent ash, is loaded with the coal and picked out by hand at the tipple. The mine is operated two seven-hour shifts per day and during the two shifts approximately 40 tons of the bony material—including the coal that clings to it—is available for power-plant fuel. When power was being purchased, all this material, together with the rock, was hauled by electric larry to a waste pile.

Average analysis of the bone and coal mixture that could be separated from the rock at the picking tables is as follows: moisture, 3.20 per cent; ash, 27.1; volatile matter, 31.4; carbon, 41.5; sulphur, 4.2 per cent; B.t.u. (dry basis), 10,450. This indicated a fuel that could be used successfully with stoker equipment. A survey of the water supply indicated that sufficient surface water for a condensing plant within 100 ft. of the mine portal could be caught and impounded by building across a near-by hollow a dam 200 ft. long and 15 ft. high at the deepest point. The reservoir thus formed, 600 ft. long and 300 ft. across at the widest point, would have a capacity of 3,500,000 gal., would be so close to the power plant that it could be used as a spray pond, and, when full, would provide a head of approximately 15 ft. on the condensers.

The power plant was erected at this pit mouth, which is approximately 2,000 ft. from the tipple. Equipment consists of two 500-kw. (80 per cent power factor) turbo-generators supplied with steam from two 306-hp. Stirling-type water-tube boilers equipped with chain-grate stokers. The fuel is hauled to the plant in mine cars loaded direct from a crusher at the tipple. Cinders are loaded by conveyor into the empty mine cars and are hauled into the mine for ballast or to the tipple for disposal in the rock bin.

Car-Hoist Frame, Coal Elevator and Inclined Cinder Conveyor Are to Be Seen on the Near Side of the Boiler House.



As shown in Table I, the 15-minute demand varies from 700 to 850 kw. and the energy consumption from 175,000 to 275,000 kw.-hr. per month. For the years 1932 and 1933, the net cost of purchased power, demand and energy charges included, was 1.64c. and 1.60c. per kilowatt-hour, respectively. Demand billing was based on the average of the three highest 15-minute periods during the month. (The highest average for any month in 1932 was 706 kw. and in 1933 was 811 kw.) This power was metered at 4,000 volts and was transmitted at this voltage to the substations supplying d.c. power at 275 volts. One of these substations, located on the outside 600 ft. from the site of the power plant, contains one 300-kw. synchronous motor-generator set. The other, located inside of the mine and fed by a 1¼-mile line to a borehole, is equipped with two 200-kw. rotary converters. Aside from the substations the largest a.c. motor in use is a 150-hp. 440-volt slip-ring unit driving the tipple crusher.

Changes necessary in the tipple to prepare and load the power-plant fuel into mine cars consisted of the installation of an 18-in. conveyor belt 65 ft. between centers, a 10-ton bin, reciprocating feeder and crusher. The belt, equipped with troughing idlers, carries the bone pickings from the table pockets to the bin. The crusher is a 20x24-in. Flex-Tooth hammer mill. It and the feeder are driven by a 20-hp. a.c. motor taken from surplus equipment available at the mine.

At the power plant the mine cars loaded with fuel are dumped into a 3-ton hopper by raising one end of the car with a 3-ton hoist. A bucket elevator and screw conveyor transport the fuel to two steel bunkers, each holding 25 tons. A chain conveyor beneath the two ashpit hoppers in the basement is

extended up to the car track serving the coal dump to convey the ashes to the empty cars.

The boilers each have 310 tubes with a diameter of 3¼ in. The drums are used equipment but the tubes are all new. The stokers, providing grate areas 7 ft. 10 in. wide by 10 ft. long, are of the chain-grate type arranged for forced draft.

Steam pressure is 165 lb. and there is no superheat, which are the maximum conditions allowed on the turbines. Soot blowing is done with a hand lance using compressed air. The steel stack is 60 in. in diameter, 141 ft. 10 in. high above the boiler-room floor, and is double guyed. Forced-draft equipment consists of two blowers designed for a 4½-in. water gage, each blower direct-connected to a 7½-hp. 1,200-r.p.m. 440-volt motor. Either blower can be used for both boilers or on each boiler independently.

Furnaces are equipped with flat suspended arches, and the bridge wall is protected by waterbacks. Feed-water regulation is by manual control. The ash hoppers are equipped with water sprays for cooling the ash and with sliding gates for discharging it onto the ash conveyor. Stokers are driven by a 6½x6-in. vertical single-cylinder steam engine, but a 5-hp. 250-volt d.c. motor is installed as an emergency drive, which can be made ready by putting on a belt. A 5-hp. 440-volt a.c. motor, located in the boiler-room basement, drives the ash conveyor.

Feed water is maintained constantly at about 210 deg. F. This is made possible by the use of an oversize open heater and hot-water storage tank (2,500 hp., set 15 ft. above the feed pumps. There are two steam-driven piston-type 12x7½x12-in. boiler feed pumps. An analysis of the pond water used for boiler feed showed the following contents, expressed in grains per gallon: alkalinity as NaOH, 13.5; hardness in terms of $CaCO_3$, 18.9; magnesium, 8.1; non-carbonate hardness, 0.7; sulphates, 44.4; chlorides, 3.1; total solids in solution, 28.2. The same analysis reported suspended matter, "trace"; and free acid, "none."

The water is not treated nor have compounds been used. Inspection of tube ends indicated only a slight accumulation of scale, but after about eight months of operation and when one boiler was pushed to carry full load while the stoker of the other was undergoing an emergency repair, several tubes of the bottom row were bagged at the bends. It was then learned that considerable scale had been deposited at this point. In the future, the tubes will be drilled at regular intervals to eliminate this scale and, if found necessary, boiler compound will be used.

Table I—Current Consumption and Demand, Somers Mine

Period	Tons Shipped	Kilowatt-Hours per Month	Kilowatt-Hours per Ton Shipped	15-Minute Demand, Kilowatts
Power Purchased				
Year 1932	426,000	172,988*	4.54	639*
Year 1933	500,051	193,769*	4.66	711*
Power Generated				
April, 1934	49,276	274,184	5.02	848
May	43,025	202,818	4.71	816
June	39,300	219,719	5.09	816
July	33,349	211,046	6.34	704
Aug.	34,002	198,036	5.83	768
Sept.	35,303	201,213	5.70	800

*Average over the year.

A bath house for the miners is located 300 ft. from the power house, and as a means of conserving water the waste from the bath showers is filtered and drained into the storage pond.

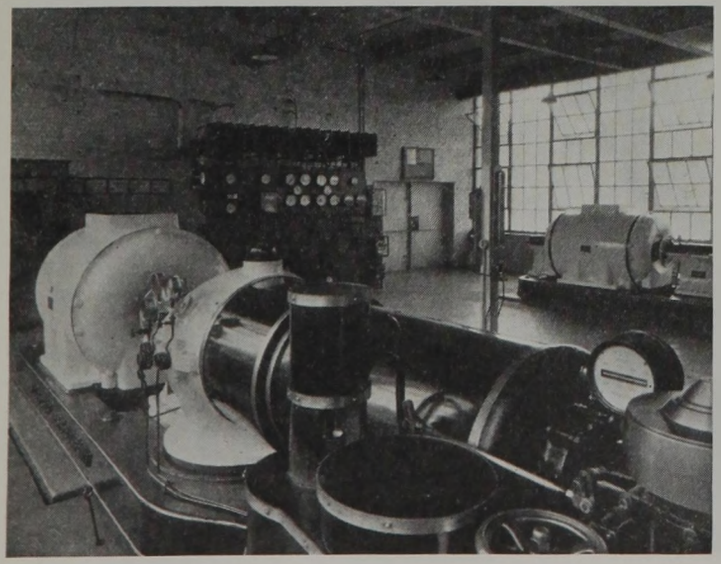
Turbo-generators are the Parsons, or reaction, type. Only the extreme lengths of the units compared to the latest type indicate the probability of many years of service in another location. Operating speed of the units is 3,600 r.p.m., and the guaranteed water rate when new was around 23 lb. per kilowatt-hour, as compared to a water rate of approximately 17 lb. for a modern unit of the same size. With an abundance of fuel that costs practically nothing, this difference in efficiency means little in power cost.

Surface condensers are new. Centrifugal circulating pumps are driven by turbines rated at 25 hp., 1,400 r.p.m. Condensate is handled by two new motor-driven centrifugal pumps, 2 hp., single-stage, 2½x1¼-in.; speed, 3,500 r.p.m. Air is removed from the condensers by two "Evactor air pumps" which operate on the steam-ejector principle. A 9x5¼x10-in. duplex piston pump regularly used as a house pump also is piped for use as an emergency boiler-feed pump. For forcing water from a make-up well to the spray pond there is installed a new centrifugal pump with automatic float control driven by a 3-hp., 440-volt motor.

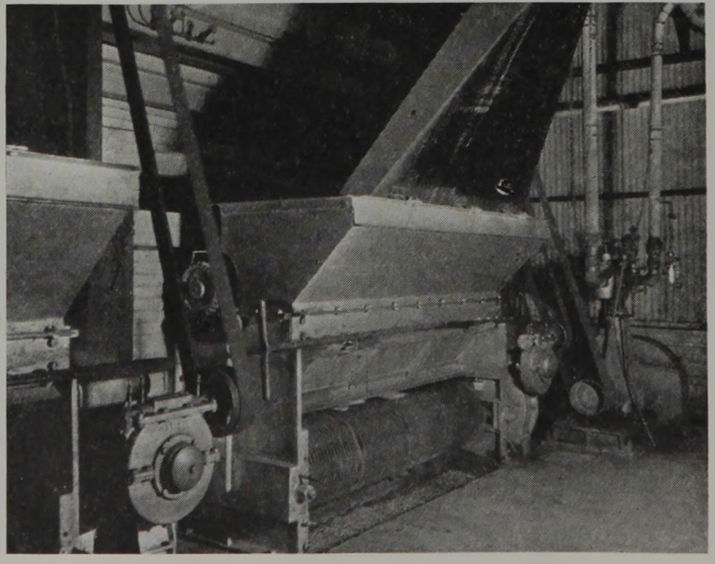
During regular operation, d.c. current for a.c. generator excitation is supplied by a motor-driven exciter operating at 850 r.p.m. The motor is rated at 33½ hp., 440 volts, and the generator at 187½ amp., 120 volts. Excitation for starting the plant from shutdown is supplied by a generator driven by a turbine rated at 20 hp., 150 lb. steam pressure, 2,500 r.p.m.

Engine-room construction is steel frame, brick walls, steel sash, and built-up roofing on wood deck. Floor dimensions are 40x40 ft. and the height to the eaves is 15 ft. 6 in. A craneway is not included in the construction but the steel does include stationary I-beams above each generator for support of a trolley and chain block. The boiler room, also of steel construction, is 35x40 ft. and 27 ft. from floor to eaves. Walls and roofing are corrugated and galvanized sheet. Both rooms have full-sized basements 10 ft. 6 in. deep. In the piping of the power plant, done under contract, all steam and hot-water pipes were cov-

Turbo-Generators Are Set Near Outside Walls at the Somers Power Plant.



Tipple Refuse Is Burned on Chain-Grate Stokers Equipped for Forced Draft.



ered with heat insulation. Most of the rest of the plant construction was handled by engineers of the coal company and of the parent organization.

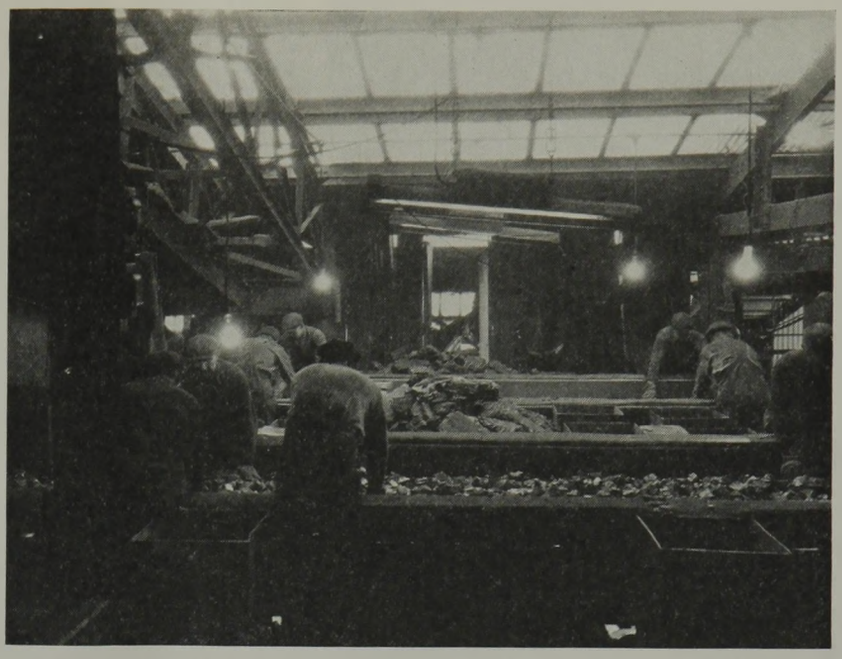
Every indicating and recording instrument necessary to check plant operation is installed, and most of these are new equipment. Graphic electrical meters include a wattmeter, combination totalizer and 15-minute demand meter, frequency meter, and a "Micromax," made by Leeds & Northrup Co., to register temperature at three points in the windings of each generator. Other recording instruments include two vacuum gages, four thermometers connected in the circulating-water intake and discharge lines of the condensers, a steam gage, and a feed-water thermometer.

The new power plant was given its first trial Dec. 23, 1933, but the purchased-power connection was retained until August, 1934. Beginning April 1, 1934, however, the plant began to carry the entire load regularly. Operating expense under the half-time schedule has been practically 1c. per kilowatt-hour. Full-time operation possibly would reduce the power cost to ½c. per kilowatt-hour, but the mine has not operated at full production since the power plant was started. In the operating expense, the only cost charged against fuel is about $50 per month on the average for time required in handling mine cars from the tipple to the plant. A supply locomotive that was in use before the plant was built handles this extra work. Six-car trips are moved to and from the plant.

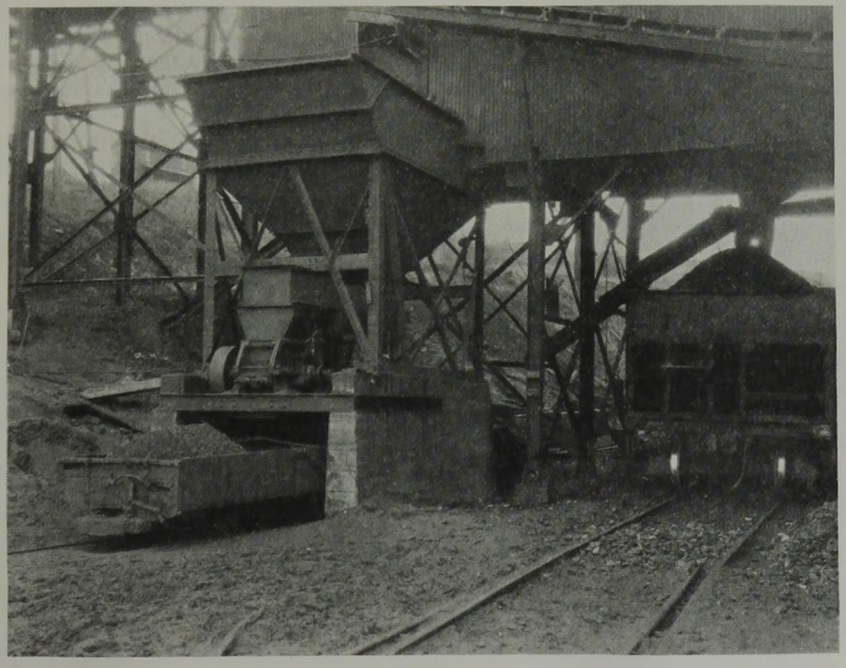
As a result of the doublt-shift operation of the mine the load factor for a month, based on the 15-minute demand, runs as high as 40 per cent even with operation at half time and in spite of the fact that the continuous load, consisting principally of the mine fan, is relatively small. The power-plant thermal efficiency for August and September averaged 72,700 B.t.u. per kilowatt-hour, which is somewhat better performance than the average of plants of its size and type of equipment. The fuel used amounted to 7.2 lb. per kilowatt-hour, and at the average heating value assumed—10,000 B.t.u. per pound—the over-all thermal efficiency of the plant under the half-time condition was 4.7 per cent.

Fuel burned at the plant is not weighed but the calculations are based on the known average capacity of the mine cars and on observations made at the plant, which revealed that the requirements are one-half car per hour for mine working hours and one-fourth car per hour for idle hours. The calculated amounts are: September, 713 tons; August, 736 tons. These quantities constitute about 75 per cent of the bone fuel that was available from the tipple. Because of a shortage of mine cars in which to store the crushed pickings in past months a certain quantity of slack coal was burned on idle days, especially over week-ends. Now cars are available for storage and no slack coal is diverted to the plant.

The dam which forms the reservoir and spray pond was constructed by building a concrete wall for water tightness and making dirt fills on each side for strength. A chimney-type spillway with underground tunnel is provided for the overflow.



Bone Middle Band Picked From Machine-Loaded Coal Now Goes to the Power Plant Instead of to the Refuse Dump.



Belt Conveyor, Bin, Feeder and Crusher Added to the Tipple.

Somers Equipment Log

Turbo-generators, surface condensers, condensate pumps operating exciter	Allis-Chalmers
Boilers, stokers and stack	Babcock & Wilcox
Bone-handling equipment in tipple (conveyor, bin, feeder and crusher); coal- and ash-handling equipment in power plant (coal hopper, elevator, screw conveyor, bunkers and ash conveyor)	Jeffrey
Mine-car dump hoist	Shepard
Forced-draft blower (Type CL, "Limit-Load")	Buffalo
Blower motor	General Electric
Furnace arches	Detrick
Stoker engines	Wheeler
Boiler-feed pumps	Burnham
Condenser circulating pumps, emergency boiler-feed pump	Worthington
Circulating-pump turbines, starting exciter turbine	Terry
Evactor air pumps	Croll-Reynolds
Make-up water pump (size No. 21)	Goulds
Boiler walls and roof (Toncan)	Republic Steel
Power-plant piping	Pittsburgh Piping & Equipment Co.

AIR SHOOTING

+ Meets the Test of Operation

At Standard Mine

MECHANIZATION of every possible operation is the guiding principle at the Wheatland (Ind.) mine of the Standard Coal Co. As a result, the operation has been on a 100 per cent mechanical-loading basis for some years, with a corresponding use of machinery in all other departments. And now, as the latest step in its mechanization program and as a means of promoting safety and increasing the yield of coarse coal, the company is equipping the entire mine for air shooting.

In line with this objective, two air-shooting units are in service and ultimately enough additional equipment will be added to break down the entire output. The present units are handling 80 per cent of the daily production of 2,000 tons in seven hours and, in the opinion of operating officials, have reduced slack output from the sections in which they are stationed between 10 and 15 per cent, with a corresponding increase in the yield of coarser sizes over 2 in.

Standard mine is a shaft operation in the No. 5 seam, which averages 7 ft. in thickness and is characterized by sulphur streaks. These streaks make for hard shooting. The checkerboard system of mining (*Coal Age,* February, 1930, p. 85) is standard. Entries are driven 16 ft. wide; rooms and crosscuts, 30 ft. The working area, in accordance with general practice, is divided between loading units, each unit consisting of a Joy loader, locomotive, undercutter and drill. Each air-shooting unit breaks down the coal for three loading units.

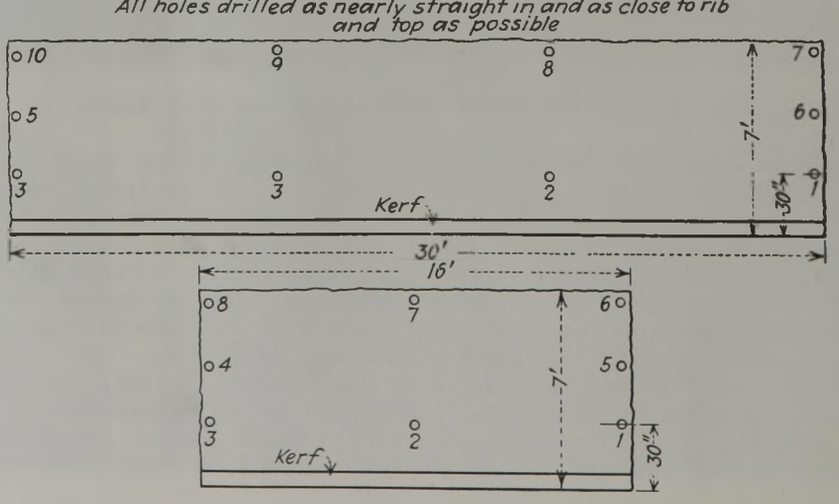
In preparing a place for loading, the first step is undercutting to a depth of 6½ ft. with a Jeffrey 35B shortwall machine. Drills (5-hp. Chicago Pneumatic electric) are carried on the cutters and holes are put in while the place is being cut by the one-man drill crew. Ten holes, all drilled as nearly straight in as possible, are used in breaking down a room face; eight holes are used in entries. Location of the holes and the sequence in which they usually are "shot" are shown in Fig. 1. The extra holes midway between the top and bottom holes on each rib—the only deviation from the previous drilling plan with powder shooting are put in to insure a better cutting effect and thus make it easier for the loader to get in.

Hole diameter with air shooting is 3 in., and Hardsocg augers with mole-foot bits are employed. This size of hole just permits the insertion of the 200-cu.in. shells used at Standard. No tamping is employed, as experience has convinced mine officials that better results are obtained by omitting it. Elimination of tamping, making up charges and other labor in connection with powder shooting offsets the time and labor required to drill the two extra holes in each place.

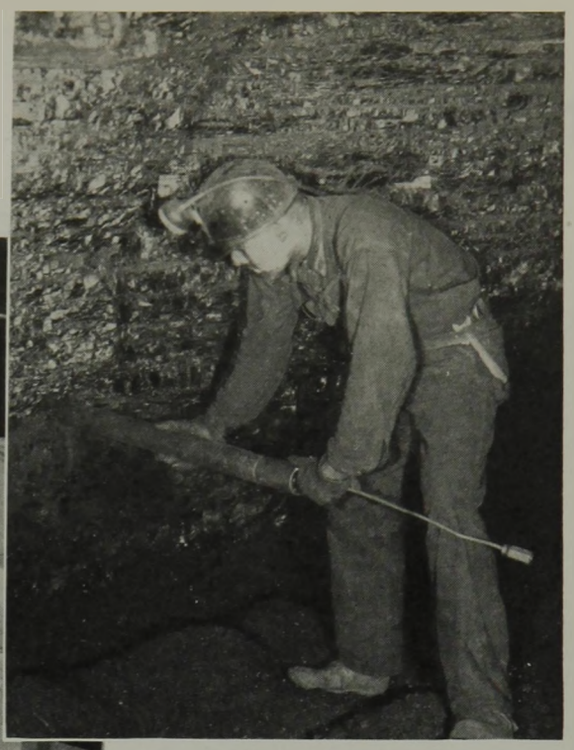
Air-shooting crews consist of two men, one placing the shell and estimating the charge and the other operating the compressor. The Sullivan "Airdox" system is employed, its operation depending upon the sudden release of a large volume of air from a steel shell inserted in the drillhole. Shell design embodies the use of a valve for holding the charge, which is released automatically to fire the "shot" by venting the air line at the compressor. After shooting, the shell is ready for the next shot immediately upon recovery from the coal. Approximately 60-75 ft. of copper tubing is used at Standard to connect the shell to the compressor—a Sullivan track-mounted machine affording pressures up to 12,000 lb. per square inch. Pressures used at Standard vary from 8,000 to 10,000 lb. per square inch, depending upon conditions surrounding the individual shot, and the "shell-sticker" is provided with a whistle for signaling to the compressor operator the desired pressure. The possibility of varying the pressure at will is considered at the mine to be one of the major advantages of the system, allowing, as it does, almost exact control of the breaking force.

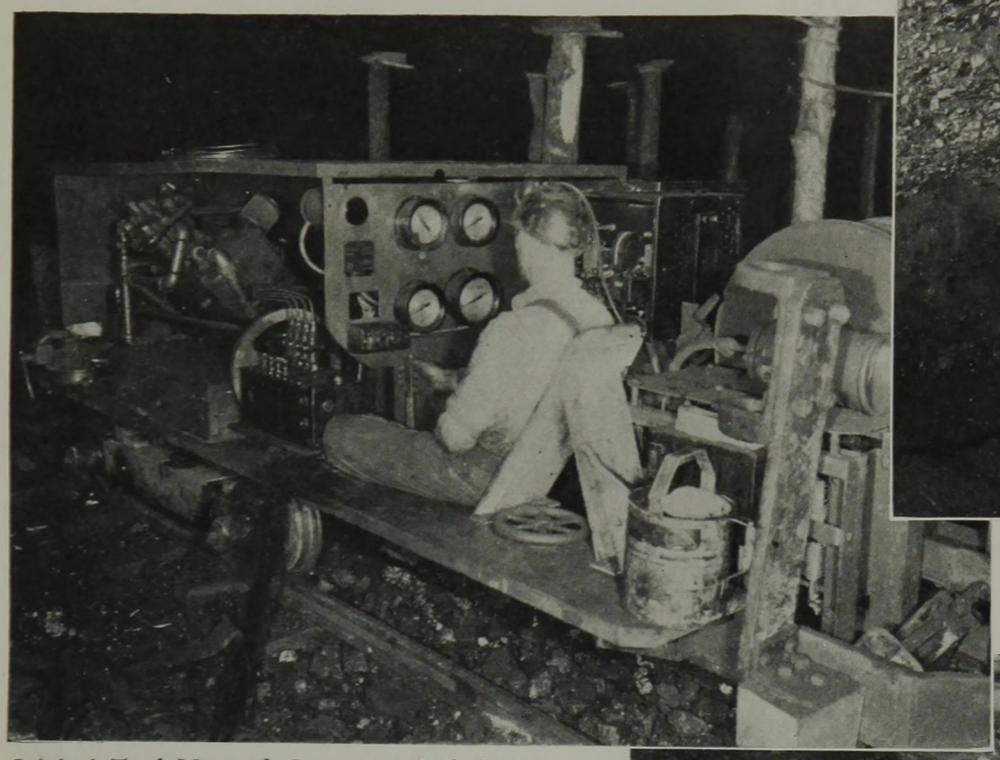
Possible interference with transportation and the movement of other equipment has been experienced to only a slight degree, due to the high tramming speed of the compressor (maximum, 500 ft. per minute). And, as the major increase in coarse coal is in the sizes under 6 in., loading-machine output has not been affected appreciably. Due to the design of the escape ports of the shell, which direct the air on an angle back toward the front of the cut, thus holding the container in the hole, flying shells are rarely encountered.

Fig. 1—Position of Holes and "Shooting" Sequence.



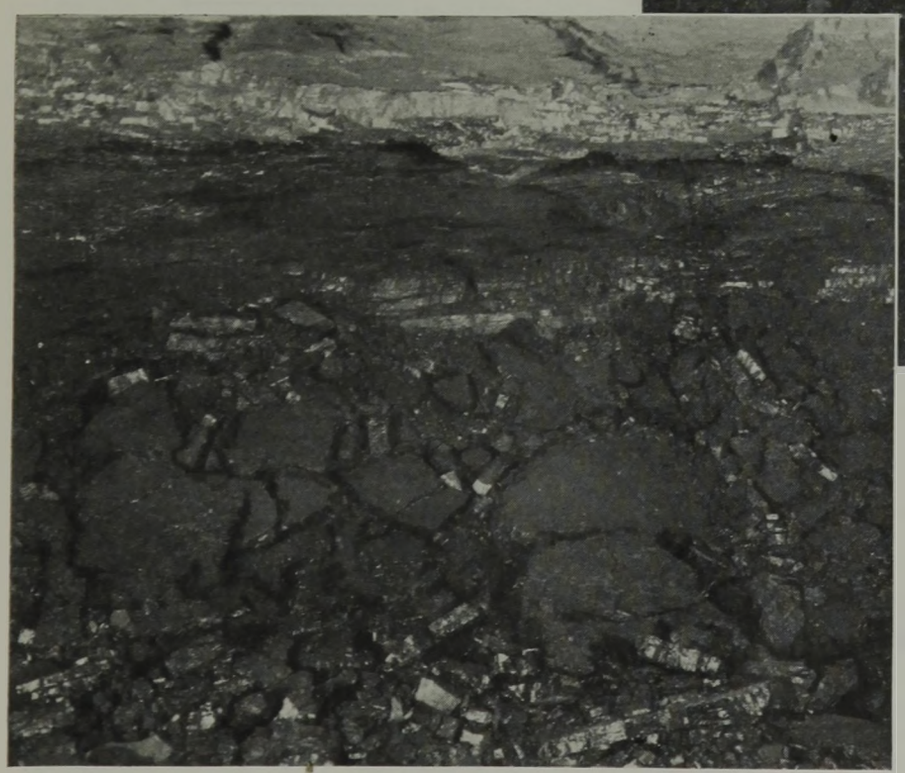
Placing the Shell in the Hole. Copper Tubing Leading to the Compressor Is Connected to the "Pig Tail" Shown, and After the First Shot Is Left Attached Until Work in a Place Is Completed. Tools Required for Making Connections Are Shown in the "Shell-Sticker's" Belt.





Original Track-Mounted Compressor Unit Employed at Standard. Present Units Are Identical Except That Air Cooling Has Replaced Water Cooling. Pushbutton Controls and Gages Are Mounted in Front of the Operator, Who Has His Hand on the Lever Used to Vent the Tubing and Discharge the Shell.

Drilling a 3-In. Hole to Receive the 200-Cu.In. Shell.



Air-Shot Place Ready for Loading.

NOTES

. . . from Across the Sea

STEEL belts have been used for twenty years, especially in the top works of Sweden. George F. Lee Coal Co., an anthracite company, has one at its J. M. Lee, Inc., sales plant in Brooklyn, N. Y., and has been using belts of this type for many years with satisfactory results. Such belts recently have been introduced underground in Germany and are described in the *Eickhoff Mittelungen.* These steel belts are rolled in Germany to a width of 26 in. and a thickness of 1 mm. (0.039 in.), somewhat over 1/32 in. They are said to be practically rustproof. Because of their surface hardness they generally have a longer life than rubber or fabric belting, and are said to cost half as much as rubber belts of equal width and capacity. However, the driving and tail mechanisms are somewhat more expensive than those of the rubber-belt conveyor, though the supporting frame costs about as much, so that in Germany the entire unit is said to be less expensive than a rubber-belt conveyor of the same capacity

For its entire length, the steel belt runs between wood strips. When these are removed, the material can be plowed off by a stripper. It needs large driving and reversing drum diameters and firmly riveted connections, and cannot be troughed but must be used as a flat belt. It is suited for down gradients of 6 deg. and under, and can be used on up gradients of 14 deg. The tail end has a tension roller of 40-in. diameter—the same diameter as the driving pulley. To keep this roller clean, a scraper has been fitted on it and a stripper on the under belt. So far, the steel-belt conveyor has been manufactured solely for use in gateroads, but it is hoped that it will be possible to adapt it for use at the face. Here again Germany is endeavoring to introduce equipment that demands for its construction only material that can be manufactured out of native products.

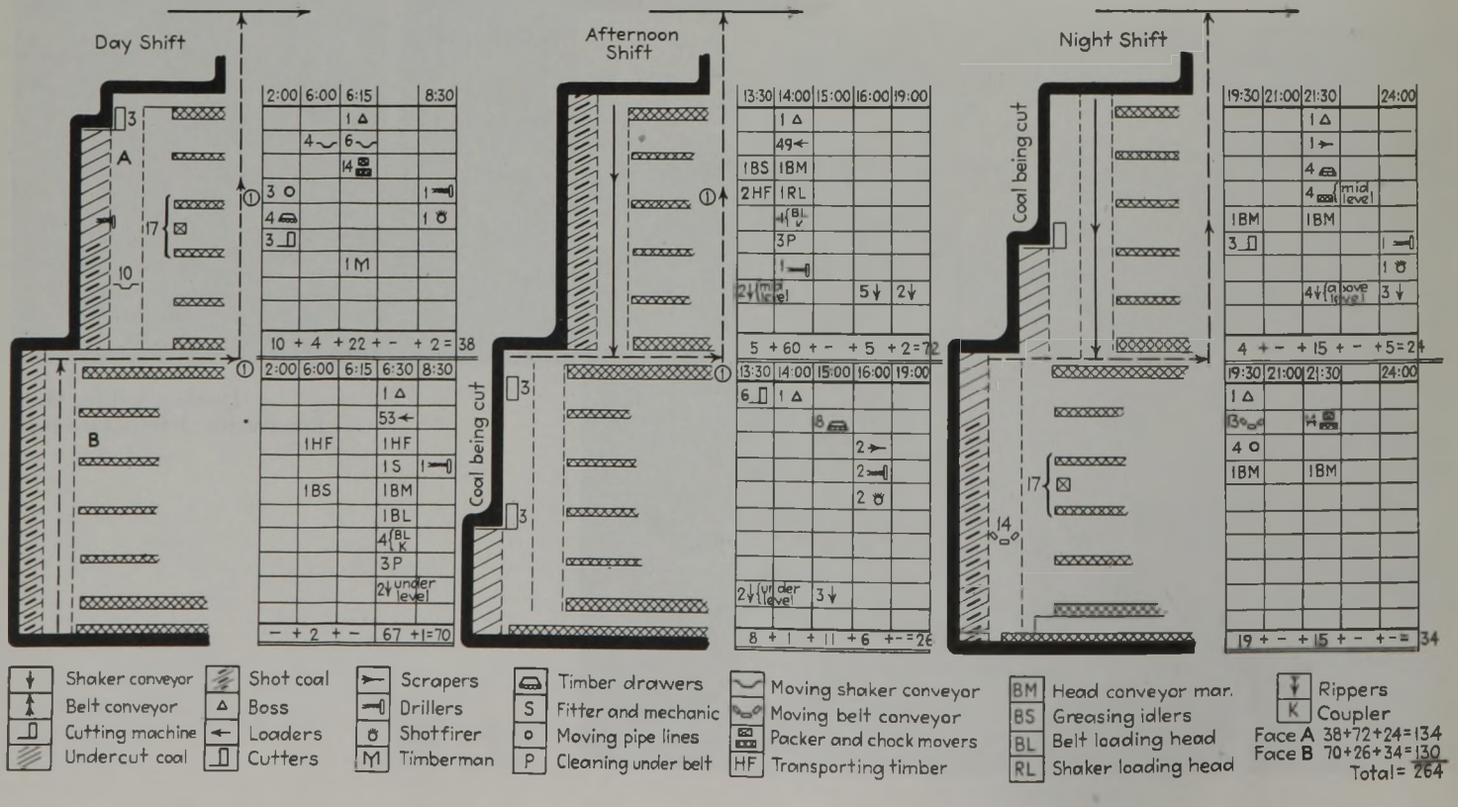
TIME scheduling has been carried to far greater lengths on the Continent of Europe than in the United States, as witness the chart at the foot of this page brought back by Dr. L. E. Young, vice president in charge of operations, Pittsburgh Coal Co., from the Saar region. There, the mine workers do not come to work at uniform hours, as in this country, but arrive at the precise time set for each man, which time depends on the nature of the work to be performed. Thus in face *A*—which is shown as it appears at the beginning of the shift—the first men to arrive at 2 a.m. are three pipemen, four timber drawers—or should it be timber movers?—and three cutting-machine operatives. The hours are reckoned from midnight as zero and run to 24 o'clock. Thus 21:30 is 9:30 p.m. in our time.

KOLINITE, a plastic made from lignite, at the laboratories of the Kaiser Wilhelm Institute for Coal Research, Mühlheim, Ruhr district, Germany, described in *Coal Age,* September, 1933, pp. 308-309, is said by *The Modern Hospital* to have all the desirable qualities of Bakelite and to be tougher, more pliable, and less expensive than that product. It is described as being made from lignite coal to which are added phenolin, rubber and other chemicals, including amonbromid, to prevent oxidation. It is said to be well suited for the manufacture of battery boxes, electric switch plates and other insulating materials.

IN England, the bottom-belt conveyor is making progress, having been first introduced at the Silksworth collieries in Durham, England, by J. N. O. Rogers. It is now manufactured by Messrs. Hugh Wood & Co., Ltd., of Newcastle-on-Tyne, England. Coal usually is loaded on the top belt, which is flat, the coal being retained by side, or "spill," plates, says T. Campbell Futers, in the *Colliery Guardian.* In the bottom belt conveyor, coal is loaded on the bottom belt and is carried on troughing rollers set in separate frame sets, which have an upper deck provided with a flat roller for carrying the top belt.

Near the gatehead, the bottom belt is inclined upward and when it reaches the gatehead it is turned down over a roller into a vertical position, so that it discharges onto a chute which carries the

Time-Schedule Chart for a Saar Mine.



coal to mine cars. This chute is swiveled so that it can deliver its coal on either side of the conveyor, as desired. The belt passes under the chute and back up to the top of the frame and thence returns to the tail roller as the top belt. At a Northumberland colliery, mining a 2-ft. 10-in. seam, the belt used is 26 in. wide.

It is said that the belt requires less horsepower than that used when the coal is carried on the top belt, that it is more readily moved (three men can easily advance a 600-ft. conveyor in 3 hours) and that no trouble is experienced at the head and tail ends from dust accumulating inside, as the bottom belt takes away immediately any accumulation of dust which normally is carried into them. Also the idler rollers along the length of the conveyor do not become choked and impeded by fine coal accumulations inside spill plates and troughs. Furthermore, costs are reduced, because no spill plates are required in either face or center gate conveyors, and also because, by reason of the use of a 28-ft. extensible loop, only one length of belting need be put on the conveyor weekly. The system is used both for face and gatehead conveyors.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Where no price is appended in the notice of a publication of the U. S. Bureau of Mines, application should be directed to that Bureau. Orders for other 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.

Bumps in Coal Mines of the Cumberland Field, Kentucky and Virginia—Causes and Remedy, by George S. Rice. U. S. Bureau of Mines. R. I. 3267; 36 pp., mimeographed.

Frequent bumps in the coal mines of the Cumberland field of Harlan County, Kentucky, and Wise County, Virginia, have caused much apprehension, declares the author. Bumps are sudden ruptures of coal pillars in which coal is thrown from the ribs in large and small fragments; the floor heaves, timbers break, crush or are thrown about; drawslate and loose roof are thrown down, and a wind blast is produced, stirring up a dense cloud of dust. Men present in the vicinity may be killed or injured by flying objects, flung by the blast against cars or ribs, or buried by broken coal. Others may have their means of escape cut off.

Bumps are of two kinds: pressure and shock bumps. When pillars are overloaded they may suddenly collapse if coal, roof and floor are strong, causing a pressure bump. When the upper rock strata are more rigid than lower rock strata, they fail to bend as much as the upper rocks and a void occurs between them. When the more rigid bed collapses, it falls on the lower bed, producing a shock bump.

Methods of operation pursued in the Cumberland field with 60 per cent of coal removed in first mining and short and irregular break lines often at intersecting angles, favor bumps, but the effect is accentuated by hard roof, coal and floor, and a cover ranging up to 2,000 ft., in Mr. Rice's opinion. Mining methods similar to those in the Cumberland field rarely produce similar phenomena because natural conditions are different.

As much as 1,500 tons has been blown out by a single bump in the Cumberland field. Sometimes the roof, after crushing the coal, lifts off the pillar 4 or 5 in. Mr. Rice believes this action to be due to vibration under shock. Little gas is found in the field, but some might be emitted by a severe bump. Much fine coal dust fills the air during this phenomenon and, if ignited, an explosion would follow. Permissible lights and no smoking are recommended, at least in the area likely to be visited by bumps. The author suggests a plan of working which would leave the goaf cushioned, and in a degree supported, by rock-filled chocks.

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Explosions in Indiana Coal Mines, 1878 to 1933, by C. A. Herbert. Information Circular No. 6801; 19 pp. Coal-Mine Explosions in West Virginia, 1883-1933, by J. J. Forbes and C. W. Owings. Information Circular No. 6802; 51 pp. U. S. Bureau of Mines, Washington, D. C.

Every State has its peculiarly hazardous conditions. Indiana's troubles in the matter of explosions in the main have been due to open lights, shooting on the solid and to improper placement of shots and undue charging. Out of 32 explosions listed in the bulletin, 16 are ascribed to open lights, 15 to blowout shots and one is charged to ignition of several kegs of black blasting powder. As to thirteen of the fifteen blowout shot explosions, the recommendation is made that the coal be undercut.

In West Virginia only in four cases in 287 was the recommendation made after an explosion that the coal be undercut or sheared, showing that undercutting is more generally practiced in that State. Explosives caused 94 explosions; open lights, 73; electricity, 35; unknown causes, 83; smoking, 1, and fire, 1. Both bulletins list the ways in which greater safety can be assured as against coal-mine explosion hazards.

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History of the Consolidated Coal Co., 1864-1934. Compiled by Charles E. Beachley. 100 pp.

In commemoration of the seventieth anniversary of its organization, "Consol" has published this interesting narration of its founding, early growth in Allegany County, Maryland, and its subsequent expansion into West Virginia, Pennsylvania and Kentucky until in 1927 it became the country's largest producer of bituminous coal with an output of 12,768,704 tons.

Although chartered in 1860, actual organization of the company was delayed four years by the unsettlement of business caused by the Civil War. Once under way, however, it grew rapidly for a while. Within a month after its organization, its capital stock was increased from $100,000 to $6,000,000 and 11,000 acres of land had been acquired. For the next 36 years its growth was gradual, followed by another spurt with the turn of the century. In 1902 the Milholland holdings in West Virginia were acquired, and a year later the company purchased control of the Fairmont and Somerset coal companies, which had mines in West Virginia and Somerset County, Pennsylvania, respectively. Entering the eastern Kentucky field, the company purchased 30,000 acres of coal land in Johnson, Martin and Lawrence counties in 1909, and a year later added about 100,000 acres in what is now the Elkhorn field. Naturally enough, there was a close relationship between this spread of the company's far-flung interests and the expansion of railroad facilities.

Among the distinguished names on the company's directorate in its early days were those of Warren Delano, grandfather of President Franklin D. Roosevelt, and James Roosevelt, the President's father. In 1902 Clarence W. Watson, afterward Senator from West Virginia, became the guiding spirit in the company's affairs, but it was not until 1915 that the Rockefeller interests acquired stock in it.

Printed on coated paper and profusely illustrated, the book is likely to find a permanent place on the coal producer's bookshelf.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

■

Five-Year Maintenance Cost of Super-Locomotive Totals One-Half Cent Per Ton

NEARLY six years ago, two 40-ton main haulage locomotive units of advanced design were installed at mine No. 63 of the Consolidation Coal Co., Monongah, Marion County, West Virginia. Every feature known to reduce maintenance cost was incorporated in the design. These locomotives have hauled nearly 3,500,000 tons of coal and only recently were they put through the shop for the first turning of the tires. The total maintenance cost, including lubricants and regular inspection, has averaged approximately ½c. per ton, or about one-third of the maintenance cost of the 10-ton locomotives which they replaced. In maintenance cost alone, the two 40-ton units have saved over $30,000.

Installing these two locomotives in 1929 was the final step in revision of the main haulage. Beginning in 1926, the 40-lb. track steel was replaced with 60-lb. steel laid on tie plates and creosoted ties. The roadbed was graded, drained, aligned and ballasted with crushed rock. Maximum grade was reduced from 4.5 per cent to 3.75 per cent. New steel cars with a capacity of 4 tons, a weight of 4,426 lb., and equipped with roller bearings were installed. Mine production per shift was increased from 2,000 to over 3,000 tons. At present the average one-way distance over which the main haulage units operate is approximately 2.7 miles, practically all underground and on an average grade of only 1.21 per cent against the loads.

Each of the two haulage units consists of two 20-ton locomotives permanently hitched in tandem. They are equipped with anti-friction bearings throughout. Motors are rated 150 hp., 250 volts, and are geared to drive the locomotives at a speed of 11.5 miles per hour at full load. They are equipped with blowers, the primary purpose of which is to reduce bearing temperatures in order that grease may be more easily retained, rather than to lower winding temperatures.

Control is of the solenoid-operated contactor type with master drum controller, and the braking mechanism is air-operated. Wheels are one-piece rolled steel with thick tread, and the gear cases (when wheels are new) have a 4-in. clearance to the ties, thus allowing a full 3 in. of wheel-tread wear.

Three months was the maximum tire service per turning on the old 10-ton locomotives originally used on the main haul. Over five years' service was secured from the wheels of the new locomotives before they were turned for the first time. The units were put into use May 2, 1929, and the wheel treads were first turned during 1934. The use of comparatively little sand accounts for the long life, and this is made possible by properly limiting the size of trips. Forty-four cars per trip has been the regular schedule during most of the period.

Data in the maintenance cost table deviate slightly from the actual performance, due to the fact that one 10-ton locomotive has been employed a large part of the time on the same main haul with the two 40-ton units and the tonnage hauled by the 10-ton locomotive is included. Over certain periods for which data are available, this 10-ton unit hauled less than 2½ per cent of the total; therefore its effect on the accuracy of the table is slight. The five-year maintenance cost of 5.3 mills per ton includes the recent wheel-turning expense. During two of the years the total maintenance ran less than 3 mills per ton. Ton-mile performances and maintenance costs are given for each of the years 1932 and 1933.

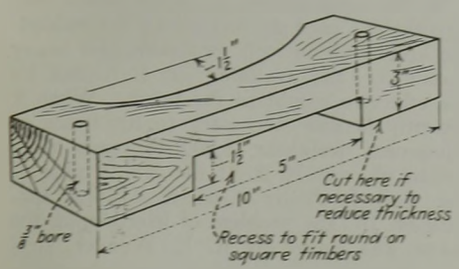
Based on the experience at Monongah, a 40-ton unit is about the limit of size of 250-volt equipment that can be supplied with current through a single trolley pole and its collecting device operating in a mine on size No. 6/0 trolley wire. The peak demand of a 40-ton unit is 2,000 amp. Trolley wheels of special construction lasted but two or three round trips at most. Gliders (in other localities termed "slippers" or "shoes"), the type of collecting device regularly used at Monongah, last an average of sixteen shifts each. The life would be much less if trolley wires were not greased regularly. To date it has not been necessary to turn any of the motor commutators, and no armature or field coil losses have occurred. Brake shoes, controller contactor parts, flexible tie cables and gliders are the principal items that require regular renewal.

Operating Data for Two 40-Ton Tandem Main-Haulage Units, Each Consisting of Two 20-Ton Units

	May 2, 1929-Sept. 30, 1934 (5¾ Yr.)	Year 1932	Year 1933
Coal hauled, tons	3,372,873	465,479	656,884
Maintenance cost, labor	$8,918.40	$1,172.82	$1,493.87
Supplies	$8,904.81	$1,224.13	$2,645.14
Total	$17,803.20	$2,396.95	$4,139.01
Per ton of coal hauled	$0.0053	$0.00515	$0.0063
Maintenance cost, per-ton mile, coal only		$0.0019	$0.0023
Coal, mine refuse and cars, one way		$0.0011	$0.0014
Coal, mine refuse and cars, both ways		$0.0008	$0.0010
Average haul, one way, miles		2.706	2.720
Average grade against loads, per cent		1.19	1.21
Ton-miles, coal only		1,258,737	1,783,267
Coal, mine refuse and cars, one way		2,089,454	2,959,031
Coal, mine refuse and cars, both ways		2,822,990	3,995,701

Guide Block for Vertical Pulleys

To prevent the damage to vertical pulleys and ropes on rope haulage that occurs when ropes slide under the flanges, Charles W. Watkins, Kingston, Pa., recommends the use of the standard guide block shown in the accompanying illustration instead of the usual method of nailing hand-cut blocks on timbers to guide the rope onto the pulleys. The latter method, Mr. Watkins observes, kills a lot of time. Where proper machinery for making the blocks is available in the colliery work shop, better results can be obtained. Dimensions of the block before operations begin are: length, 10 in.; width, 4 in.; and thickness, 3 in. An arc



Details of Standard Guide Block.

1½ in. deep at the center is cut out as shown to suit the diameter of the pulley, using a band saw. This is followed up by cutting a recess 5 in. long and 1½ in. deep in one face of the block, which is then bored with two ⅞-in. holes to accommodate 6-in. spikes.

The recess is designed to allow the block to be placed on either round or square timbers. If the thickness of 3 in. is suitable, it is then nailed in place. If too high, the thickness is reduced by cutting away the required amount on either side of the recess. When the block is worn, all that is necessary is to rip it out and substitute a new one. By having a number of blocks on hand, says Mr. Watkins, it may be possible to make a quick repair and eliminate, in some cases, a serious delay. Left-overs from car and wood working shops can be used in making the blocks.

Trading Ideas

When trading in ideas is brisk, progress is accelerated. Trading, however, requires at least two parties, or it isn't trading. These pages might be termed a marketplace where operating, electrical, mechanical and safety men can meet to exchange ideas for cutting cost, increasing efficiency or promoting safety to mutual advantage. That is why we solicit your ideas, each of which receives our careful attention. Technical skill in writing is not necessary—merely a straightforward description of the method or equipment offered, supplemented by a sketch or photograph where it will add to clearness. Each acceptable idea will bring the man submitting it $5 or more.

Door Designed to Cut Leakage

The mine ventilation door shown in the accompanying illustration was offered as a means of reducing air leakage to a minimum at the annual meeting of the Coal Mining Institute of America by S. J. Craighead, inspector, Sixth Bituminous District, Pennsylvania Department of Mines, Johnstown, Pa. This door closes on the outside of the frame, and the upper hinge strap is provided with a take-up for making adjustments in case the door drops down and drags on the rail. With the usual type of door, it is pointed out, dragging usually is eliminated by cutting off the bottom. This increases the opening at the top and adds to air loss. The two bolts in the hinge hanger prevent its turning and thus further guard against drag.

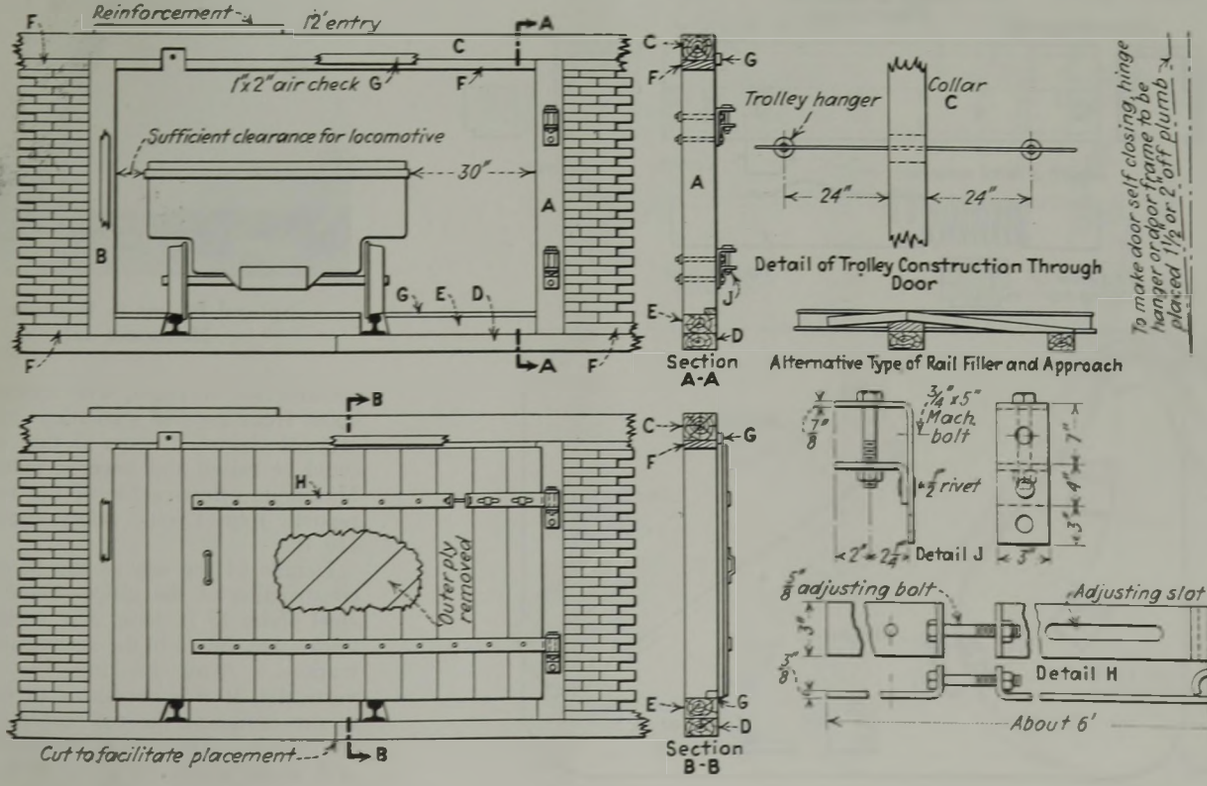
Air checks are nailed to the outside of the collar and striking post, and on top of the sill plate, to reduce leakage through the door; and to avoid the large loss of air resulting when the corner of the door is cut away, the trolley wire is placed in a dap cut in the collar, which may be reinforced by bolting a plank to the top of the collar timber. The open space below the door usually results in the greatest leakage, which can be remedied in part by the use of a sill.

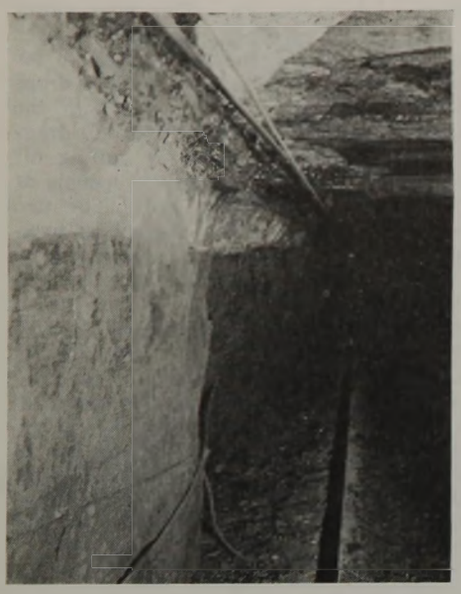
Bonding Is Backed by an Emergency Return

In order to eliminate delays to production because of broken rail bonds, it is the practice at mines of the Hanna Coal Co., in eastern Ohio, to carry a No. 4/0 solid copper return wire parallel to the bonded track and to tie this wire to the track at a crossbond about every eighth rail. It is not the idea that the copper adds materially to the conductivity of the track but that it does offer a continuous path in case two bonds should become broken in a section of track between two crossbonds. Bonding is watched as closely, however, as if the return wire were not there.

The illustration, from a recent photo-

Construction Details of Mine Door for Reducing Air Losses.





Showing Tie Between Wire and Track.

graph made on the main haulway in Willow Grove No. 10 mine, shows the return wire fastened to the rib in its regular position about 18 in. from the bottom. In the foreground is one of the connections to a crossbond. Along this haulway the area of the positive feed is practically 1,000,000 circ.mil, consisting of a No. 4/0 trolley and a 750,000-circ.mil cable. This is typical of the "ample copper" policy of the company.

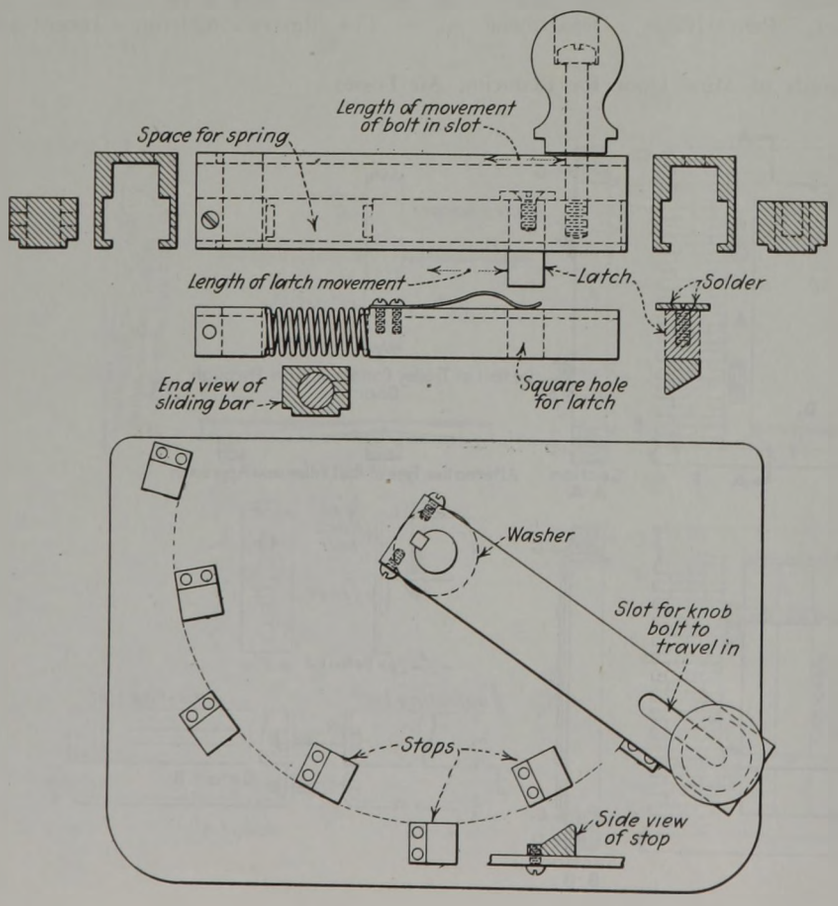
Controlling Acceleration

To prevent too rapid acceleration with drum-type controllers, John J. Nolan, Terre Haute, Ind., offers the modified control system illustrated. With this system, the original cover plate is replaced by a flat plate approximately 3/32 in. thick, which is drilled to accommodate the hold-down bolts and the drum shaft. Raised triangular-shaped stops are mounted in two offset rows, as indicated, and the handle is equipped with a catch mechanism which requires a definite halt at each stop during the advance to running position.

With the handle in the "off" position, the latch part of the handle mechanism rests against the first stop, and movement to the first point requires that the knob be moved in toward the center of the controller to disengage the latch. The handle can then be advanced to the second stop, or first point, where a further advance is prevented until the knob is moved out toward the edge of the case (under the action of the coil spring) to disengage the latch. This procedure is followed step by step until the handle reaches the running position.

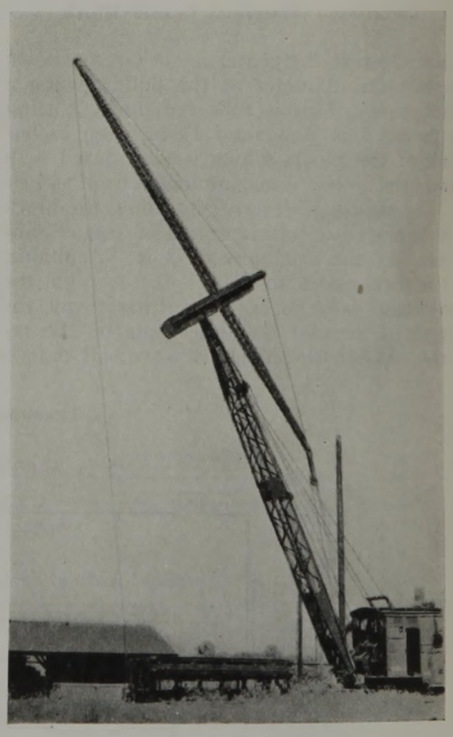
In making up an installation of this kind, according to Mr. Nolan, the cover is first laid out and drilled for the cap bolts and drum shaft. Holes for the stop screws are located after the handle has been mounted on the shaft. With the handle in the off position, a stop is placed against the latch and the location of the holes is marked. The handle is then advanced to the first point and the knob is moved in to bring the latch in proper position, whereupon holes for the second stop are located as before. This process is repeated to locate holes for the remainder of the stops. The outer row of stops should be as close to the edge of the cover as possible, and the height of individual stops should be such as to just enough clear the underside of the handle to increase the area engaged by the latch.

Construction Details of System for Controlling Acceleration.



Extension Adds to Effective Lift Of Clamshell Hoist

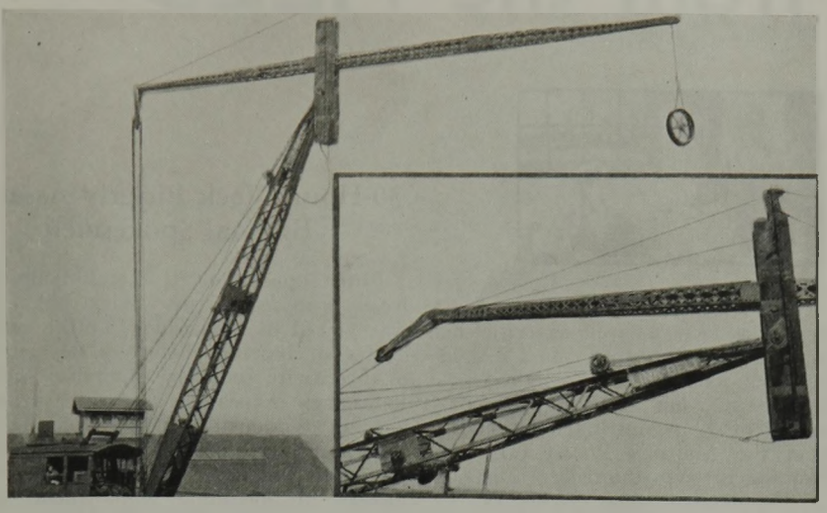
While steam-driven clamshell hoists frequently are used around mines for unloading and handling rails, crossbars and heavy machinery, the available lift is limited by the effective height of the boom. When it recently became necessary to lift items of equipment weighing 1,800 lb. each to a height of over 70 ft. at the No. 2 mine of the Bell & Zoller Coal & Mining Co., Zeigler, Ill., the problem of lengthening the boom was solved by R. E. Weaver, steel



Spliced Booms in Position for Maximum Lift.

construction foreman, who spliced a 66-ft. boom from another stationary crane to the original clamshell boom so that each boom could be raised and lowered independently. Maximum effective lift of the two booms, reports John Lyons, safety engineer, was 110 ft.

Details of the use of the boom and the construction of the splice—made from two steel plates 15 ft. long, 3 ft. wide and ½ in. thick—are shown in the accompanying illustrations. After hoisting the machinery vertically, it was necessary to set it down in the center of the rescreener building in the tipple. This was impossible with a stiff boom, which led to the adoption of the



Construction Details of Splice; Also, Auxiliary Boom Lowered to Place Equipment.

hinge idea, so that when the vertical height was reached, the machinery could be placed where desired by manipulation of the center hinge.

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Pipe Employed for Smooth Curve In Trolley Wire

To insure a perfect curve in installing trolley wire, writes A. W. Evans, chief mine inspector for Tennessee, the Tennessee Jellico Coal Co. employs 2-in. pipe bent to the required shape at its Morley mine, in Campbell County. The curved pipe is then fixed in the proper place and the trolley line suspended from it.

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Finding Capacity of Pipe

For determining the number of gallons in a round pipe, Fred W. Stout, general superintendent, Cornett-Lewis Coal Co., Louellen, Ky., offers the method described below and included in a paper read before the Harlan County Mining Institute. Using this method, the number of gallons that 100 ft. of round pipe will hold is determined by squaring the diameter, in inches, multiplying the product by four and adding to the latter product 2 per cent of itself. Taking a 3-in. pipe 100 ft. long, application of the method gives the following results:

$$\begin{aligned} 3\text{x}3\text{x}4 &= 36.00 \\ 36\text{x}0.02 \ (2 \text{ per cent}) &= 00.72 \\ \text{Volume (in gallons)} &= 36.72 \end{aligned}$$

Proving the result, volume of a cylinder 3 in. in diameter and 100 ft. long is

$$3\text{x}3\left(\frac{0.7854\text{x}12\text{x}100}{231}\right) =$$

$$3\text{x}3\text{x}4.08 = 36.72 \text{ gal.}$$

The part of the fraction in parentheses is constant, and by cancellation and completion of the multiplication equals 4.08, which is equal to 4 plus 2 per cent of four. By shifting the decimal point, the volume of a cylinder with the same diameter and a length of 1 ft. can be determined immediately, and from this the volume of any required length.

Transformers Will Handle Heavy Short-Time Loads

Often the man in charge of electrical equipment at a coal mine is confronted with the problem of setting the safe overload limit for short-time operation of a transformer. This problem may arise, for instance, when it is desired to operate a hoist intermittently from a bank of transformers which carry other load or from transformers available from stock but which are too small to handle such a load continuously.

Recently the transformer subcommittee of the American Institute of Electrical Engineers issued a report giving recommendations for short-time overloading of self-cooled oil-immersed transformers in service, published in the October, 1934, issue of *Electrical Engineering*. The report is proposed for incorporation in A.I.E.E. Standards No. 100 and, although now awaiting "constructive criticism," the tentative data form a valuable guide to anyone encountering the transformer overload problem. The "emergency loads" referred to in the table and accompanying notes, reproduced herewith, are unexpected and infrequent overloads for a short time due to some disturbance, and "recurrent loads" are premeditated occasional short-time overloads.

The report includes a proposal that the overloads given in the table "be reduced 2 per cent of continuous self-cooled rating below the recommended load for each degree that the temperature of the cooling air exceeds 40 deg. C."; also that the overloads "be increased 1 per cent of the continuous self-cooled rating for each degree that the ambient air is below 30 deg. C., except that no further increases are to be made for ambient air temperatures lower than 0 deg. C."

Table I—Permissible Short-Time Loads for Self-Cooled Oil-Immersed Power Transformers at an Ambient Temperature of 40 Deg. C.

Duration of Load	Emergency Loads* Following Full Load†	Emergency Loads* Following No Load‡	Recurrent Loads* Following Full Load†	Recurrent Loads* Following No Load‡
2 sec.	25.00	25.00	6.50	13.00
5 sec.	14.00	16.00	4.00	8.00
10 sec.	9.00	10.50	3.00	6.00
30 sec.	5.00	6.00	2.20	4.00
60 sec.	3.70	4.70	1.60	3.25
5 min.	2.30	3.00	1.25	2.10
30 min.	1.60	1.90	1.10	1.45
2 hr.	1.25	1.40	1.00	1.20

*The overload values contained in the table are expressed in multiples of the continuous rating of the transformers; e.g., the figure 25 indicates a load 25 times the continuous rating.

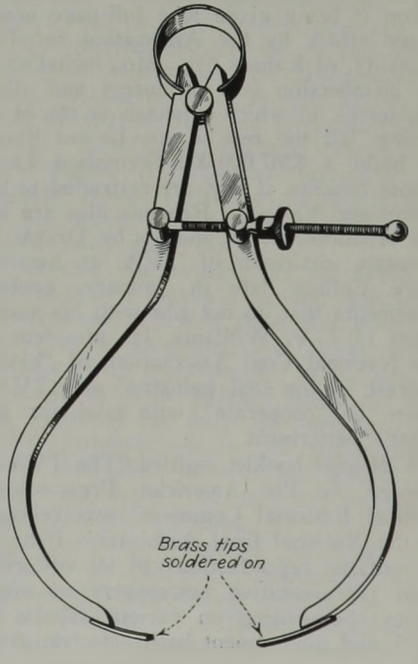
†For the permitted loads in the columns headed "Following Full Load" it is understood that prior to the overload the transformer has been operating at continuous rated load and at an ambient temperature of 40 deg. C. for a period long enough to have established steady temperature conditions.

‡For the permitted loads in the columns headed "Following No Load" it is understood that prior to the overload the transformer has been under normal excitation with an ambient temperature of 40 deg. C., but without load current, for a period long enough to have established steady temperature conditions.

Caliper for Magnetic Service

"It often is necessary to caliper parts which are magnetic," writes W. H. Rogers, electrician, Three Points, Ky., "in which case it is difficult and sometimes impossible to get the proper 'feel' if the shaft or other part to be measured is highly magnetized." In the illustration is shown a method of modifying calipers to avoid this trouble, which requires soldering two small pieces of brass wire or rod (which are nonmagnetic) to the legs. The additions should be made as long as possible consistent with convenience to keep as far as possible from the magnetic field—½ in. usually is sufficient. The method is equally applicable to inside and outside calipers, and in case the brass is desired only temporarily it can be removed quickly with a hot soldering copper without injury to the instrument. Points should be shaped to suit the job.

Brass Tips Facilitate Measurement of Magnetic Parts.



WORD from the FIELD

Texas Gas Project and TVA Are Targets in Fuel War

Threat of further inroads from natural gas divided attention with TVA as a target in the bituminous industry's war on competing fuels and sources of energy during the past month. Arrangements are under way, it was disclosed Feb. 5, to construct with PWA funds a pipe line from the Texas Panhandle gas fields to St. Louis and Detroit, with branch lines to adjacent territory. R. B. Anderson, State Tax Commissioner of Texas, representing Governor Allred, is arranging a State Natural Gas Authority to obtain an allotment of $50,000,000 from PWA to create the proposed outlet for 1,000,000,000 cu.ft. of natural gas which, it is alleged, is wasted every year in the Panhandle.

The menace to Illinois coal markets of this proposed line brought a quick response from the Southern Illinois Reciprocal Trade Association. J. W. Bristow, managing director of the association, dispatched a telegram and letter of protest to Harold L. Ickes, Secretary of the Interior, in which he characterized the project as prejudicial to President Roosevelt's program to relieve unemployment, particularly among coal miners in Illinois.

At a conference of mayors and other officials of sixteen Mid-Western cities held Jan. 28 in Columbus, Ohio, arrangements were made to request a U. S. Senate investigation "into the entire natural-gas industry" and to call upon Congress for legislation to place this industry under "effective regulation" so that its product can be had at "fair and reasonable rates." It was proposed that long-distance pipe lines be under control of the Interstate Commerce Commission.

Broadsides from the coal industry continue to be directed at TVA. Wide circulation is being given to a full-page newspaper attack by the Association for Tax Equality, of Kansas City, Mo., including in its membership coal producers and allied businesses, in which emphasis is placed on taxing "all the rest of the United States to build a $367,000,000 'Promised Land' whose benefits, if any, are restricted to the Tennessee Valley." Reprints also are being broadcast of an address by Dr. A. E. Morgan, chairman of TVA, at Swarthmore College late in January, quoting statements that do not jibe with his assurances to J. P. Williams, Jr., president of the National Coal Association, of "kindly interest in the coal industry" and TVA's desire to "cooperate" with coal for the latter's betterment.

A 24-page booklet entitled "The TVA as Viewed by the American Press—Some Critical Editorial Comment" was released by the National Coal Association Feb. 16. It contains reproductions of 90 editorials from representative newspapers in many States commenting on various aspects of TVA and government hydro-electric projects, presenting facts as well as criticism, arranged to give the story of TVA in sequence from its inception to date.

Meanwhile, the suit attacking the constitutionality of TVA, instituted by stockholders of the Alabama Power Co., has been dragging through the federal District Court at Birmingham, Ala. Judge W. T. Grubb continued on Feb. 2 an injunction restraining fourteen northern Alabama municipalities from obtaining loans from PWA to construct electric distribution systems to obtain power from TVA. In asking the injunction, Alabama Power shareholders alleged that the loans constituted an illegal diversion of public funds. Judge Grubb indicated that he would make a final ruling on the injunction when TVA offered its defense against a further restraining order aimed at halting its northern Alabama electrification program.

To Revise Maryland Laws

In accordance with instructions from Governor Nice, of Maryland, a committee has been appointed to study and revise the mining laws of that State. A. B. Stewart, president, Davis Coal & Coke Co., and B. H. McCracken, manager, Maryland Division, Consolidation Coal Co., represent the operators on the committee, and I. M. Bradburn, secretary-treasurer, District 16, UMW, Cumberland, and William Peel, Lonaconing, represent the miners. The present law was passed in the 1922 session of the Legislature and became effective Oct. 1, 1922.

Permissible Plates Issued

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

Myers-Whaley Co.; sizes 3 and 4 "Whaley Automat" loading machine; 25-hp. motor, 230 volts, d.c.; Approval 276; Jan. 11.

Goodman Mfg. Co.; Type 260B loading machine; three motors: 50, 4 and 1½ hp., 250 volts, d.c.; Approval 277; Jan. 17.

Joy Mfg. Co.; Type 8-BU loading machine; 15-hp. motor, 220-440 volts, a.c.; Approvals 278-278A; Jan. 17.

Joy Mfg. Co.; Type 8-BU loading machine (redesigned); 15-hp. motor, 250-500 volts, d.c.; Approvals 235-235A; reassigned Jan. 17.

30-Hour Week Bitterly Assailed By Coal Spokesmen

Bitter opposition to the 30-hour work week proposed in the Black bill (S.87) was voiced by spokesmen for the coal industry at hearings before a subcommittee of the Senate Judiciary Committee early in February. Appearing as a witness for the bituminous industry, Feb. 8, John D. Battle, executive secretary, National Coal Association, declared that a 30-hour week, instead of spreading employment, would have the opposite effect. "Shortening hours and maintaining wages will increase the labor cost of producing coal, which must lead to increase in prices, if operators are to remain in business," said Mr. Battle, "and that increase in price will give additional impetus to the movement away from coal to rival sources of energy which has already wrought such havoc in the industry. A lessened demand for coal, shorter running time, reduced employment and lower aggregate earnings would be the result."

Appearing at the hearing of Feb. 14, Julian D. Conover, secretary, American Mining Congress, said the bill would reduce the product of labor and therefore would inevitably reduce real wages in terms of net purchasing power. "It will increase the cost of goods, and hence the price of goods; hence it will diminish the consumption of goods and therefore decrease the labor employed in the production of goods." A further increase in mining labor costs, he declared, would, under present conditions, necessitate the closing of so many operations as actually to reduce the employment of labor instead of increasing it.

Anthracite representatives were no less emphatic in opposing the measure at the Feb. 14 session. Louis C. Madeira, 3d, executive director, Anthracite Institute, said: "Enactment of this bill would bring distress to an industry which is already suffering by reason of a loss of markets to competing fuels, and would further add to the unemployment in the anthracite field." Dr. Wilford I. King, professor of economics at New York University, said that "experiments" in shorter working hours had failed; that the only way to restore national income was to restore production levels.

Scrip Limitation Again Put Off

The stay of the effective date of the retail trades code provisions regulating the acceptance of scrip has again been extended. The preceding stay would have expired Feb. 6, but on the previous day, NIRB ordered a continuance of the stay until May 1, 1935, "or such prior date as may be further ordered." The provisions affected are Art. IX, Sec. 4, of the code for the retail trade; Art. VIII, Sec. 4, retail jewelry trade, and Art. LX, Sec. 3, retail food

and grocery trade. The latest order extending the stay cites the board's findings that such a stay is "desirable until further efforts have been made to effect a control of the problem relating to company scrip, either by amending the codes of fair competition for the so-called basic producing industries, or otherwise."

NRA Advisory Council offered a recommendation on Jan. 31 to NIRB stating that "the Council believes that elimination of the scrip problem would best be dealt with in the codes for industries making payment of wages in scrip, as has been done in the bituminous coal code. Among the most important needing such action are the lumber, steel and the textile codes, through provision along the lines suggested in the following draft:

"1. Each employer shall make payment of all wages due at the end of each week in lawful currency or by negotiable demand check. If checks are given, the employer shall provide reasonably accessible facilities for cashing checks at face value without expense to the employee. Employers shall also provide such identification as is necessary to utilize such facilities.

"2. These wages shall be exempt from any charges, fines, or deductions, except payments for pensions, insurance or sick benefits which are voluntarily paid by the wage earrners or required by state law. No employer shall withhold wages. Employers or their agents shall not accept directly or indirectly rebates on such wages or salaries nor give anything of value or extend any favors to any person for the purpose of influencing rates of wages or working conditions of their employees.

"3. No employee shall be required as a condition of employment to trade at a store or to rent a home specified by the employers.

"The action taken could be through voluntary amendments after public hearings for individual codes."

Early in February, the West Virginia House of Representatives called back and defeated a previously approved bill to require the redemption of scrip in cash at face value. This action was taken after delegates from several coal-mining counties said the bill might force coal companies to discontinue the use of scrip and thereby work hardship on miners. A letter of opposition from Van A. Bittner, UMW representative, also was read to the House.

Mine-Car Manufacturers' Code Approved by NIRB

Approval of a code for the mine-car manufacturing industry was announced by NIRB on Feb. 6. The code is supplemental to the machinery and allied products industry code, and contains the general labor provisions of the master code: the basic 40-hour maximum work week and minimum wage rate of 40c. an hour. The code was approved on condition that certain provisions regarding price filing would be stayed and others deleted.

The mine-car manufacturing subdivision includes the manufacture for sale or lease of non-powered wheeled vehicles not exceeding 350 cu.ft. level-full capacity, such as are customarily used in coal mining; chilled cast-iron mine-car wheels, and parts and repairs for such vehicles. Included in the code are provisions containing definitions, methods and procedures for handling bids, price filing, discounts, other trade practices, and a code authority of seven industry members.

A.I.M.E. Sessions Cover Wide Range of Topics Affecting Coal Mining and Marketing

BOTH economic and operating problems affecting the anthracite and bituminous industries were considered at the annual meeting of the American Institute of Mining and Metallurgical Engineers, held at the Engineering Societies Building, New York City, Feb. 18-21. Economic discussion was directed largely toward questions of distribution, competitive fuels and energies, and planning for the mineral industries; operating topics included subsidence, roof control, ventilation, safety, preparation and fuel applications.

A mineral program for the United States was the subject of a general session of coal, metal and non-metallic men and oil producers during the course of the annual meeting. As a basis for discussion, C. K. Leith, Washington, D. C., vice-chairman, summarized the recent report of the Planning Committee for Mineral Policy to the National Resources Board (January *Coal Age*, p. 38). Analyzing certain conclusions of the report, Howard N. Eavenson, retiring president, A.I.M.E., concurred in recommendations for the compilation of statistical information as a basis for forecasting the progress of the industry, and stated his belief that coal men, in general, are in favor of production control. So far, this latter objective has been sought through the medium of price control, with some measure of success, and in any case control of production would almost inevitably involve price regulation.

Coal in recent years has been furnishing 50 per cent of the energy of the country, Mr. Eavenson continued. Now, it is proposed to make coal a public utility without reference to oil and gas. These fuels also should be subject to equivalent regulation. Referring to the national bituminous coal reserve proposed in the Guffey bill, Mr. Eavenson felt that holding of marginal lands by the government would be subject to a lack of continuity of policy and furthermore would take such lands off the tax rolls, thus throwing many counties, particularly in the East, into bankruptcy. If a corporation controlled by the government should be set up, however, it might be possible to continue collection of taxes. In returning retired lands to the active list, established mining corporations should be given first call in leasing.

Rehabilitation of miners, Mr. Eavenson felt, may not require the sum set aside in the Guffey bill, which errs in excluding research from the benefits of the $300,000,000 fund to be raised by taxation. The taxing plan, he observed, has been objected to on the ground that certain areas would be discriminated against in favor of others. This principle, however, has been adopted in other instances, and what is fair in one case should be fair in another.

Terming the Guffey bill "the most maudlin piece of legislation ever presented to Congress," Eugene McAuliffe, president, Union Pacific Coal Co., declared that it attempts to turn control of the industry over to labor, which in the last analysis cannot be held responsible for results and therefore has no rightful claim to control. Citing English difficulties with allocation and the ownership of coal lands, Mr. McAuliffe expressed his doubts of the possible benefits of such moves and recommended attention to the translation of some of the expenses into greater rewards for labor, without forgetting the interests of the consumer, as in the Guffey bill, as well as greater study of the question of smoothing out peaks and valleys in operation. Storage and seasonal freight rates are both factors that might be considered in connection with the latter recommendation.

"No legislation, *per se*, can spell prosperity for any length of time for any industry," declared C. B. Huntress, president, Appalachian Coals, Inc., in analyzing the place of the sales agency in rationalization of the coal industry by reducing waste and fostering united merchandising efforts. Efficient distribution, Mr. Huntress contended, is of prime importance, and the sales agency, as evidenced by the results of ACI operation, allows joint action by price and fuel engineers in the determination of relative and actual coal values and thus facilitates the freest movement of all grades of coal involved. The sales agency also is better able to prepare the market to accept the coals at the prices fixed.

A total of 116,000,000 tons of coal per year will be displaced and 116,000 miners will be deprived of employment if the federal government persists in its plan to develop hydro-electric power in the Far West, the Tennessee Valley and along the St. Lawrence River and continues to permit unrestricted exploitation and burning of fuel oil without regard to its intrinsic value, declared Samuel S. Wyer, consulting engineer, Columbus, Ohio. Far Western and Tennessee Valley developments, he pointed out, provide for the delivery of about 14,000,000,000 kw.-hr. to the market, after allowance for transmission losses, replacing, at 1½ lb. per kilowatt-hour, 10,500,000 tons of coal annually. The St. Lawrence program (excluding the Niagara development) involves an ultimate annual output of 26,280,000,000 kw.-hr., which would displace about 20,000,000 tons per year.

Unsound competition in oil production, however, works a greater hardship on the coal industry than the government power program, Mr. Wyer held. Because the government in its desire to compete with private industry has lost sight of its duty of curbing cut-throat competition in oil production, about one-third of the oil output is burned as mere fuel and has replaced 86,000,000 tons of coal.

Sales to retail dealers for final distribution is the most generally used method of distributing anthracite, declared Norman F. Patton, Anthracite Institute. Supplementary avenues include sales directly to consumers in the

case of closely priced steam sizes and distribution through wholesalers and brokers in the case of smaller operators, who pay some 5 per cent for this service. Ten years ago, he continued, approximately 8,300,000 tons annually was shipped west of Buffalo, N. Y., but high freight rates and natural-gas, oil, coke and bituminous competition have cut this to 1,200,000 tons, and these factors, in whole or in part, supplemented by increased importations of foreign anthracites, have resulted in substantial losses in Canada, New England and the Middle Atlantic States.

Anthracite Over the Years

Steady inroads in the past ten years have left anthracite in a position where 79 per cent of the tonnage is absorbed by New York, New Jersey and Pennsylvania. An additional 12 per cent goes to New England, and 3 per cent to Canada, leaving Delaware, Maryland, the District of Columbia, Virginia and the Middle West to absorb the remaining 6 per cent. Distribution by sizes, however, is by no means uniform, Philadelphia, New York and other points enjoying relatively low freight rates taking most of the buckwheat, while chestnut and larger are most in demand in sections in New England, Canada and the Middle West where markets have been retained. Pea appears to find its largest market in Pennsylvania and New Jersey.

Railroads naturally lead the list of anthracite transportation media, Mr. Patton pointed out, but the high rates charged by these carriers have "contributed in no small degree to the loss of our markets, both distant and near by." Combination rail-and-water routes are the second major outlet, and the relatively low rates on such shipments have prevented even greater losses in certain consuming territories, notably the West and Canada. Trucking now accounts for a movement of approximately 9,000,000 tons a year, divided equally among three classes: "local sales" to communities in the region itself, accepted by operators and carriers both as non-competitive; movement from the mines to the yards of more distant dealers or directly to the ultimate consumer in direct competition with the carriers or dealers, or both; and movement of coal stolen from the lands of producing companies, which takes its toll directly from the operators, carriers and dealers alike.

Commenting on the dealer structure, Mr. Patton cited a survey covering some 2,500 dealers in about 600 communities in a triangle roughly bounded by Quebec, the Twin Cities and Washington, which disclosed that 44.5 per cent handled less than 5,000 tons annually, but accounted for only 9.7 per cent of the total volume, while dealers handling over 150,000 tons constituted only 1.1 per cent of the number but handled about 25 per cent of the total tonnage. One explanation of the unusually large proportion of small dealers with their relatively small tonnage quota grows out of the fact that many are in small communities where the tonnage possibilities are limited but where the competitive situation attracts a greater number than sound distribution economics would warrant. "This duplication of facilities undoubtedly is responsible for a considerable portion of the cost of our distribution." In metropolitan New York, on the other hand, dealers handling under 5,000 tons per annum constitute but 8.2 per cent of the number and account for but 0.9 per cent of the tonnage, thus indicating "the squeezing out of the small and often uneconomical yards through pressure of the competition of the better merchandising methods, larger advertising expenditures and more aggressive selling tactics of the progressive and better-financed yards."

In the course of the discussion following the paper, Warren Blauvelt, Hudson Valley Fuel Co., Troy, N. Y., suggested the adoption of a system of freight rates varying in accordance with the tonnage moved to stimulate movement in slack seasons. Average loading per car possibly may be a factor in the higher anthracite rates, remarked Mr. McAuliffe, who declared that he had long been interested in seasonal rates and had at one time, with the cooperation of some other operators, been able to get a bill introduced, which was promptly killed by the bituminous industry itself. Consequently, the carriers are not entirely to blame for the present rate situation.

Analyzing the automatic coal burner for anthracite, Allen J. Johnson, director, Anthracite Institute Laboratory, stated that average stoker efficiency varies little as between intermittent and continuous firing, although continuous operation may minimize any tendency toward "cold 70" and offer a more uniform supply of heat, particularly where the heating systems are somewhat sluggish. Thin, rapidly moving beds on underfeed stokers, coupled with the fact that anthracite does not ignite instantaneously, provide almost ideal conditions of acceleration, and the constant body of fuel and relatively small air openings permit long banking periods (14 to 15 hours on the average) and prevent passage of excessive quantities of air through the boilers during off periods—a major factor in the elimination of "cold 70."

Minimum stoker life can be assumed as five years, Mr. Johnson pointed out. Maximum burning rate, as distinguished from maximum feed, is from 17 to 20 lb. per square foot of tuyere area per hour. Average consumption is 1 lb. of buckwheat per 30 sq.ft. of radiation per hour; rice, 1 lb. for 20 to 30 sq.ft. of radiation. Approved types of stokers show relatively little variation in efficiency. With stokers, as compared with hand-fired installations, heat absorption in the furnace is considerably reduced, thus increasing the importance of absorption in flue passages. For this reason, stokers will show substantially higher efficiencies in properly designed boilers, as compared with conversion jobs using hand-fired boilers.

Accuracy of sizing is of great importance in securing proper stoker operation. Rice, tests have shown, is slightly less efficient than buckwheat, and its use therefore should be avoided where the heating system is overloaded. Barley usually is not suitable for domestic stokers because of its naturally decreased efficiency and output, extreme difficulty of air adjustment and tendency to clinker or burn in spots in underfeed retorts.

Two anthracite companies have experimental installations of automatic equipment using chestnut. One machine involves the use of a chain-grate stoker with a cast-iron boiler and the other a revolving grate with an overhead bin. Efficiencies generally are higher than with underfeed stokers using buckwheat or rice. Pointing out that over-all house-heating efficiency depends upon the type of house, Mr. Johnson also stated that comparative tests are being conducted to determine this efficiency for anthracite, oil and natural gas. Most efficient stoker operation, said E. L. Buller, is obtained when oversize and undersize in the fuel is reduced to a minimum, as segregation in operation may be a substantial factor in the result attained. As for ash, the quantity, within limits, may not be as important as the constituents governing fusion temperature.

A.I.M.E. Leaders

Henry A. Buehler, state geologist and director, Missouri Bureau of Geology and Mines, has been elected president of the A.I.M.E., succeeding Howard N. Eavenson, president, Clover Splint Coal Co., Pittsburgh, Pa. John M. Lovejoy, president, Seaboard Oil Co., New York, and Paul D. Merica, assistant to the president, International Nickel Co., New York, have been elected vice-presidents. Newly elected directors are: Charles K. Leith, University of Wisconsin; Edwin E. Ellis, United States Steel Corporation; Wilber Judson, Texas Gulf Sulphur Co.; Wilfred Sykes, Steel & Tube Co. of America; and R. M. Roosevelt, Eagle Picher Lead Co.

John T. Ryan, vice-president Mine Safety Appliances Co., Pittsburgh, Pa., heads the Coal Division, with Eugene McAuliffe, president, Union Pacific Coal Co., Omaha, Neb., as vice-chairmen. New members of the executive committee are: Edward Graff, general manager, New River Co.; David Ingle, president Ingle Coal Co.; and Thomas Moses, president, H. C. Frick Coke Co.

Factors in Coal Sampling

In coal sampling as large a percentage of the whole product cannot be taken as in metal smelters, where 5, 10 or even more per cent of the ore received is not infrequently taken in sampling, because the sample can be sent back to the furnace charge. Coal crushed to ¼ in. has lost a large part of its value for steam and domestic markets, which is not true with ore sampling, declared J. B. Morrow and C. P. Proctor, preparation manager and chief chemist, respectively, Pittsburgh Coal Co. Commercial sampling should recognize that the odds are against any one sample representing the true quality of the coal sampled, and that a tolerance is essential.

An accuracy such that 99 per cent of the samples would be within plus or minus 1 per cent from the true average has been

recommended by the British Engineering Standards Association. The probable error r equals $0.85 \frac{P}{n}$, where P is the sum of the deviations from the average and n is the number of tests.

PROBABLE PERCENTAGE OF TESTS WITH ANY GIVEN ERROR

Limits of Error	Percentage of Tests
Plus or minus $1r$ from average..	50.0
Plus or minus $2r$ from average..	82.3
Plus or minus $3r$ from average..	95.7
Plus or minus $4r$ from average..	99.3
Plus or minus $5.7r$ from average	Once in 10,000 tests

AVERAGE ASH OF 8 PER CENT GIVES FOLLOWING DISTRIBUTION WITH 0.5 PROBABLE ERROR

Limits of Error, Per Cent	Percentage of Tests
7.5- 8.5	50.0
7.0- 9.0	82.3
6.5- 9.5	95.7
6.0-10.0	99.3
2.9-10.9	Once in 10.000 tests

Further fundamental studies are needed, said Mr. Morrow, to see if the conclusions of E. G. Bailey, Arthur D. Little, Inc., New York City, in the *Journal of Industrial Chemistry*, March, 1909, still hold good with changes in preparation methods and mechanical loading. Bar screens of that day took out more of the rock than today's round-hole screens and made a cleaner product of unwashed coal, even though one less well-sized. For these reasons the Pittsburgh Coal Co.'s preparation force is endeavoring to review the whole problem of sampling. Difficulties in getting a correct result arise: (1) in obtaining an average gross sample, (2) in the preparation of this gross sample, (3) in analytical errors. It is in preparing the sample by breaking down to 4-mesh that some of the largest errors are made.

Authorities on sampling all recognize that there always is greater variability in high-ash coals, and larger samples consisting of more separate increments should be taken. This is true also of coarse coal. Results may be found perhaps to differ from the simple laws of probability because, though the upper limits of ash and sulphur are unset by nature, there cannot be less than zero ash or sulphur. Again, a small quantity of low-fusion material added to a medium- or high-fusion coal will have more effect in changing the resultant fusion than the addition of similar quantities of high-fusion material.

Where to Sample

Samples should be taken at the mine, said Byron M. Bird, Battelle Memorial Institute, reading the discussion of H. E. Nold, professor, mining engineering, Ohio State University. Buyers and sellers should agree on the manner in which samples should be taken. In his own comment, Mr. Bird stated that he had been in the habit of using Dr. Taggart's straight-line chart, which is plotted on exponential paper, to determine the size of his sample. In this chart the diameter of the largest size in the coal is plotted as abscissa and the size of the sample to be taken as ordinate. He followed the chart in testing raw coal, divided its readings by two for washed coal and by four for float-and-sink coal. Both T. W. Guy, consulting engineer, Charleston, W. Va., and H. J. Rose, Mellon Institute, Pittsburgh, Pa., added that they had regulated the size of sample by the chart and found the samples gave concordant results.

John T. Ryan
President-Elect, Coal Division

Vigorous discussion of M. A. Mayers' paper, "Mechanism of Combustion of Coal," read at the State College meeting, Oct. 19, 1934, followed. S. P. Burke, director, Division of Industrial Science, West Virginia University, declared that the pulverized-coal particle on entering the furnace showed for a time only the steady straight-line increase in temperature with time shown in Mr. Mayers' paper, but he declared that when distillation of gas occurred, this distillation cooled the particle so that the ascent of the line was perceptibly checked and the line of increasing heat with increasing time began to droop. Temperature increased, it is true, but with declining rapidity. The sudden upcurve of the second stage he would put more nearly at 150 milli-seconds. Loss of heat from distillation, Mr. Mayers admitted, was a factor, but a negligible one, the rise in temperature being far greater than the loss of heat to distillation, leaving the line practically straight, as shown in his diagram.

Was the final temperature only 1,550 deg. C? asked Mr. Burke. He had obtained temperatures as high as 1,650 deg. C.; to which Mr. Mayers replied that his figures were for pulverized coal as burned in the furnace atmosphere, which was much less pure than the air in which Mr. Burke burned his particles. The cenospheres from Pocahontas coal were thicker than those made from the less strongly coking coals of the Pittsburgh (Pa.) region, and this was why the curve of heat from combustion did not curl down and die in the first case as soon as in the second.

The underfeed stoker case selected by Mr. Mayers, said D. F. Pennell, was an easy one. In most cases the tuyeres were cluttered with ash and there was a producer-gas action, especially with a 24-in. bed. Mr. Mayers replied that even with a 12-in. bed there could be a reduction of carbon dioxide to carbon monoxide. Mr. Bailey called attention to the statement that a particle of fuel requires about 1,000 times its own volume of air to burn it. He declared it took more of the order of 61,000 times as much, and Mr. Mayers conceded that the larger figures were more nearly correct.

Combustion catalysts, said E. H. Johnson, have no effect on speed of combustion, as his own and other organizations have determined.

Possible revisions in dewatering practices was the theme of a luncheon session of the institute's Coal Preparation Committee. Citing the unexpectedly good results observed at two plants where the wash water had been heated to obviate freezing troubles, Mr. Bird suggested further study of the possibilities of such a method of dewatering. Hoods would be necessary to remove steam, but the viscosity and surface tension of the water would be lower, thus facilitating drainage, and all equipment carrying coal would be warmed. The use of a small gas flame under vibrating screens for handling fine sizes of coke to prevent blinding, cited by George R. Delamater, W. S. Tyler Co., led to a discussion of the possibility of using a steam pipe or heating element under coal vibrators for the same purpose. Remarking that he had no knowledge of an actual installation, F. A. Jordan, Youngstown Sheet & Tube Co., suggested the use of jets of superheated steam as a means of facilitating removal of moisture on coarse-coal dewatering shakers. Agreement on possible advantages of this method was expressed by H. F. Hebley, Allen & Garcia Co., who pointed to the relative specific heats of steam and air and also to the better diffusion of water vapor into steam than into air. Commenting on heating the wash water, T. W. Guy, consulting engineer, expressed belief that settlement of solids would be facilitated, thus resulting in a cleaner washer supply.

Codifying Ventilation

Final touches were put to the Coal Mine Ventilation Code, completed under the chairmanship of A. W. Hesse, chief engineer, Buckeye Coal Co., Nemacolin, Pa. Change in the draft was made only in the matter of booster fans, which George S. Rice, chief mining engineer, U. S. Bureau of Mines, said should not be put in operation by an automatic starter because it might restart the motor after too long an interval and thus cause an explosion of gas that meantime had collected. H. P. Greenwald, Bureau of Mines, thought the provision good because of no-voltage releases. The fan would drift for two minutes and the air at the fan would be safe for five minutes at least. It was decided to require that the time interval be restricted to that period and that motor and accessories be in an explosion-proof case. Dr. Rice would have liked a separate armored cable for the booster fan, to prevent any interruptions from excessive draft and circuit breaking, but this change was not adopted. The code goes to the board of directors of the institute and then to the American Standards Association.

Standing coal is proved to be permeable to gas for a depth of at least 100 ft. and gas apparently travels as freely through coal as it does through the more permeable gas sands in the Eastern gas fields, said Mr. Burke for himself and L. V. Parry, lecturer, Division of Industrial Sciences, West Virginia University. Observations and deductions indicate the possibility that the coal studied may be undergoing metamorphosis at a surprisingly rapid rate.

In the mine in which tests were made

probably thirteen billion cubic feet of methane had been released prior to the date at which observations were made. When the average production per day was 2,000 tons, the average methane production was 5,750,000 cu.ft. daily. The authors are disposed to question whether more than 400,000 cu.ft. of this was due to the emission of gas from broken coal and believe that much of it was due to advance of headings into the solid coal and the exposure thereby of unbled coal with its higher gas pressures.

By covering 16 sq.ft. of the coal face and measuring the volume of gas emitted, the following table was obtained:

RATE OF GAS LIBERATION

Distance of Point of Emission From End of Entry Face, Ft.	Velocity of Flow in Cu.Ft. Per Hour Per Square Foot of Exposed Face
22	6.32
104	1.74
193	1.86
289	1.0
365	1.1

As the entry had six headings and these were connected at the end of the entry by crosscuts, the entry face aggregated about 340 ft.

The authors believe that a large quantity of the gas made when the mine was working at large tonnage came from entries and headings and not from the broken coal, but A. F. Marshall, who was then in charge, speaking for T. G. Fear, then general manager, said the greater part of the gas came from the roof over the pillar line. It was then making about 7,000,000 cu.ft. The gas could not have come from the measures below the coal seam because it was free from ethane, a general constituent of natural gas.

In a further paper the authors explained the recurrence of outbursts of gas by the presence of cavities behind the coal face, which, being in connection at one end with a high-pressure area many feet back of the face, became filled with compressed gas. The cavity thus brought the high-pressure near the coal face, which a pick might puncture, relieving suddenly the pent-up gas and loose coal which the pocket contained.

Promoting Safety

Although mine fatalities increased from 1933 with 1,064 to 1934 with 1,150 and from 2.78 per million tons in 1933 to 2.85 in 1934—a definite recession in coal-mine safety—a marvelous improvement has occurred since the days in which the U. S. Bureau of Mines was first established, declared Daniel Harrington, U. S. Bureau of Mines, in opening the mine-safety session.

Despite persistent efforts, little definite progress in safety was made at the Union Pacific Coal Co.'s mines so long as safety work was divorced from operation, said Frank V. Hicks, safety engineer. At that time, he reported to the president and had unlimited authority in matters pertaining to safety. In 1931, the chief operating official was made responsible for the safe conduct of the mine, and the safety department reported to him. Immediately an intense interest in safety developed among the mine officials and the record improved. A prize competition among the various sections of the mines aroused a keen interest among employees. One mine went 1,004 days without a lost-time accident, worked 495,497 man-hours and produced 552,715 tons of coal.

Three fatal accidents from explosives in the period from 1931 to 1934 inclusive, as against 21 in the period from 1927 to 1930 inclusive, suggests an improvement in blasting practice at the anthracite mines of the Lehigh Navigation Coal Co. Changes made to that end beginning in 1930 were described by Evan Jones. Almost all firing batteries are brought at the end of each shift to a station where they are kept dry. Every six months they are sent to the electrical department for inspection and needed repair. Detonators are taken into the mine in quantities sufficient for a day's work and are carried by each miner in a wooden box which keeps them dry and prevents their being lost in the coal and carried therein to market. Faulty lead lines cause many misfires, and lines at the Lehigh Navigation mines are of Nos. 14, 18 and 20 insulated wire, depending on the number of shots to be fired and length of line.

Where lines are carried up both manways of the breast and connected to one main line, where lines from two working places are carried into the same manway, where lines from chutes are connected to lines from the gangway face, where lines from several chutes terminate at the same place, mistakes are made in firing and accidents occur. Firing lines must be fastened on wood cleats about 6 in. long, securely nailed to timbers; they must be kept apart and free from coal, rock, air pipes, sheet iron and all metals. At a safe distance from the face, a safety break is installed consisting of a board about 2 ft. long, nailed to timbers. The wires are fastened on the board on two cleats placed about 2 ft. apart and are cut between cleats and the ends shunted. This break is connected only after the shots have been connected for firing and is disconnected afterward. This protects the miner against the mistakes of others and against stray currents.

Sixty per cent of the men at one mine had found occasionally on returning to their faces that loose powder was sprinkled in front of some holes; all the holes had fired, but most of the powder remained in these holes unexploded. Investigation disclosed that the powder ignited and burned when the match-head shell of the delay electric igniter was embedded in the powder in accordance with instructions furnished with each box of powder. When the shots were fired, fire from the vent hole in the shell ignited the powder. Tests proved that five grades of permissible burned thus when primers were prepared in this way, some more readily than others. The condition was corrected by securely tying the igniter in place with the match-head shell outside the shell of the cartridge. Such ignition causes partial detonation, delayed shots, improper shot rotation, evolution of dangerous gases and perhaps mine fires.

Where Detonators Go

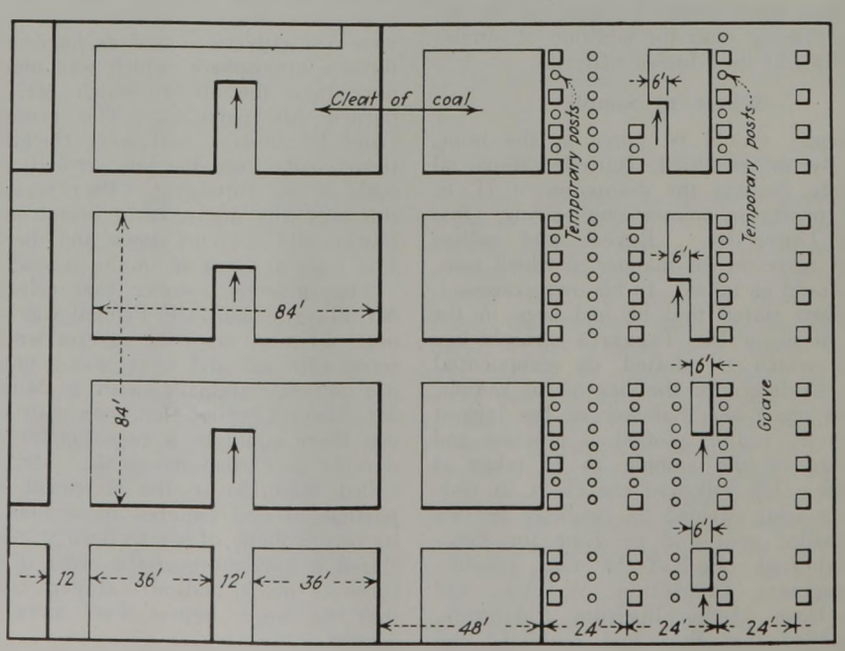
Detonators passing into the breaker become wetted and crushed and temporarily harmless, but when they get to the fire they become hazardous. If the wires adhere to the detonator, there are means to catch such wires, but no way to remove detonators that escape detection.

Defending multiple shooting, Mr. Jones and Mr. Harrington both stated that in heavily pitching seams it was safer to use time delays because the miner returning to fire another shot would face a rain of falling material from the loose face. It was customary for him to leave his place for the day after firing the shots and noting that they had exploded.

With shafts that are vertical or inclined at 60 to 65 deg. and inclinations from zero to 25 deg., said Mr. Harrington, speaking for W. B. Hillhouse, chief mine inspector for Alabama, equipment for hoisting and lowering men can be protected from accidents. For slopes between 25 and 65 deg., no catches are available, although Mr. Hesse and W. R. Chedsey, professor of mining, Pennsylvania State College, declared they were available. Mr. McAuliffe declared that he did not use drags because they introduced hazards. Ropes usually break at the socket. A rope carried under the cars and connected with every or every other car passes beyond the socket and is attached to the hoisting rope.

Only the simpler problems in regard to beams, arches and other structures have been solved satisfactorily, declared P. B.

Suggested Plan of Pillar Extraction Under High Cover Using Rock-Filled Cribs



Bucky, Columbia University; an analysis by means of centrifugal and photo-elastic testing therefore is necessary if any but the simplest case is to be solved. Unfortunately, photo-elastic methods will work only to the point of elasticity, and roofs are not wholly elastic bodies. Mr. Bucky showed a prototype of the mine roof and floor failing when stress was exerted on it. A sandstone layer failed before the limestone layer above it. With the layers reversed, both failed together. By photo-elastic methods he showed that the weight of the roof fell mostly on the outside edges of the pillar.

How and Why of Bumps

Bumps are phenomena of infrequent occurrence, said George S. Rice, chief mining engineer, U. S. Bureau of Mines, describing the bumps in Nova Scotia, South Staffordshire (England), British Columbia, Washington State and in the Cumberland field of Kentucky and Virginia. (Much of the matter of the paper has been covered in previous publications and a similar paper entitled "Bumps in Coal Mines of the Cumberland Field" is reviewed on p. 121 of this issue.)

It did not seem possible, said J. F. Bryson, director of safety, Harlan County Coal Operators' Association, that gas could cause bumps in the Harlan field, for the greatest quantity of gas he could ever find was 1.7 per cent. The operators did not want to go to longwall and packs. One tried working on the butts and got smaller bumps than when working on the face. After Dr. Rice's suggestion was made (see illustration on facing page), one company adopted it but tried to work it advancing instead of retreating and had a bump. Now, a 300-ft. face is being worked retreating.

Why not use seismologist's instruments to detect preliminary movements leading to bumps and to locate territory under heavy strain? asked W. B. Plank, Lafayette College. Geophones have been used, declared Mr. Greenwald, where the mine is quiet. Continuous sounds were obtained, but what they might signify as to possible bumps did not seem clear.

When steel is stressed it has an elastic limit. Up to that point it will come back to its former dimensions as soon as released, said Mr. Greenwald. Coal and other semi-plastic materials will come only part of the way back. Experiments in the Experimental Mine at Bruceton, Pa., were made over an area of only 6.25 sq.in. and it is the intention to increase this until 200 sq.in. is reached. With steel under the elastic limit, time is not an item of importance; the material responds instantly to stress, but semi-plastic bodies receiving pressure go on compressing for a long time after the load is first applied. Approximately 24 hours elapsed after pressure was applied before movement of coal became negligible. Below 5,000 lb. per square inch, compression was proportional to load; above 5,000 lb., compression increased more rapidly than load, although it appeared that stable conditions could be established under pressures as high as 7,250 lb. Above 8,000 lb., movement continued with no sign of cessation at the end of 23 hours.

Tests have been made on the Pittsburgh coal bed under vertical pressures up to 3,460 lb. per square inch, Mr. Greenwald stated. No more could be attained, for the hydraulic jack had a capacity of only 60 tons. The coal showed elastic limits when stressed on the bed in the same manner as in the earlier experiments on the face. Much work also has been done to determine the safe strength of silvinite pillars.

Introducing the paper on "Subsidence at Merrittstown Airshaft Near Brownsville, Pa.," which he prepared jointly with F. W. Newhall, L. N. Plein, U. S. Bureau of Mines, briefed the discussion of Henry Briggs, University of Edinburgh, Scotland. Prof. Briggs wanted angle of draw based on a subsidence ahead of the shaft of 0.02 ft., instead of 0.05 ft., which Mr. Plein had used because he felt some uncertainty about such small measurements.

James H. Pierce

Recently elected chairman of the board of the Scranton Coal Co. Besides being head of the engineering firm bearing his name, Mr. Pierce is president and general manager of the East Bear Ridge Colliery Co.; president, Monarch Anthracite Mining Co. and Temple Anthracite Coal Co.; vice-president in charge of operations, Wyoming Valley Collieries Co.; vice-president, Wyoming-Shamokin Coal Sales Co., all of Scranton, Pa. He also is in charge of operating activities of the Price-Pancoast, Kingston and West End Coal Companies.

Hamilton Heads Program Group For Cincinnati Convention

Charles F. Hamilton, vice-president, Binkley Mining Co., Chicago, has accepted the chairmanship of the national program committee for the twelfth annual convention and exposition of mining equipment to be held under the auspices of the manufacturers' division of the American Mining Congress at Cincinnati, Ohio, May 13-17. Organization of the committee is under way, and preliminary meetings will be held in Chicago, Terre Haute, Ind.; Columbus, Ohio; Charleston, W. Va., and Pittsburgh, Pa.

Though no details of the program of technical sessions have been announced, more than two-thirds of the space available has been assigned to prospective exhibitors of equipment. George R. Delamater, W. S. Tyler Co., is chairman of the manufacturers' section of the Coal Division.

Personal Notes

HOWARD CUNNINGHAM has been promoted to mine foreman by the New River Co., Macdonald, W. Va.

W. M. DAVIS has been made assistant superintendent in charge of operations at Nellis mine, Nellis Coal Co., Nellis, W. Va.

RAY EDMUNDSON was appointed president of District 12, UMW (Illinois), by John L. Lewis, international president, effective Feb. 1. Mr. Edmundson succeeds William J. Sneed, who recently resigned and will be special representative of the international union.

EDWARD M. FLYNN has been appointed general manager of the Kingston Coal Co., Kingston, Pa., vice T. H. Williams. He began his mining career 35 years ago with the Hudson Coal Co., with which he successively became assistant superintendent of the Plymouth division, superintendent of Archbald colliery, general superintendent of Baltimore No. 5, and general superintendent of Loree operations. Five years ago he retired from the Hudson company and later joined the James H. Pierce Engineering Co., which now controls the Kingston company.

MILT GILLESPIE has been appointed mine superintendent by the New River Co., Macdonald, W. Va.

LOUIS F. LUMAGHI, JR., has been elected president of the Lumaghi Coal Co., St. Louis, Mo., vice Joseph D. Lumaghi, deceased. The company operates mines at Collinsville, Ill.

PAUL R. MAXEY has been appointed general mine foreman at Nellis mine, Nellis Coal Co., Nellis, W. Va.

J. D. A. MORROW, president, Pittsburgh Coal Co., was elected president of the Coal Control Association of Western Pennsylvania at the annual meeting, and RALPH E. JAMISON, sales manager, Jamison Coal & Coke Co., was made vice-president. BYRON H. CANON was renamed secretary-treasurer.

LOUIS SANNER, formerly superintendent of Ewen Colliery, of the Pittston Co., Pittston, Pa., has been named as assistant manager of the Kingston Coal Co., Kingston, Pa.

A. W. VOGTLE, sales and traffic manager, De Bardeleben Coal Corporation, has been appointed chairman of the traffic and transportation committee of the Alabama Mining Institute, vice S. L. Yerkes, deceased.

GEORGE P. FITZ, general manager, Ajax Coal Co., was elected president of the Hazard Coal Operators' Association at the annual meeting. Other officers named were: vice-president, H. K. ENGLISH, vice-president, Kenmont Coal Co.; secretary, C. B. ROSE, Lexington; treasurer, SWIFT PARRISH, Lexington (reelected); directors, J. H. BOWLING, M. R. DAYTON, C. F. BARBIEUX, W. E. DAVIS, J. E. JOHNSON, F. M. MEDARIS, WILLIAM W. MILLER, W. H. SIENKNECHT and S. B. HARDY.

WILLIAM THOMSON, Affinity, has been elected president of the New River and Winding Gulf Electrical and Mechanical Institute for 1935. Other officers chosen are: vice-president, T. C. HARMON, Glen White; secretary-treasurer, M. K. CLAY, Raleigh.

Roosevelt Asks Two-Year Extension of NIRA; Special Coal-Control Bills Offered

WASHINGTON D. C., Feb. 20.—Two-year extension of NIRA was urged by President Roosevelt today in a special message to Congress. Extolling the progress toward recovery already made under this law, the President declared that abandonment of "the fundamental purposes and principles of this act" would be "unthinkable" and "would spell the return of industrial and labor chaos." In extending the life of the statute, however, he recommended that the policy and standards for its administration should be further defined to clarify the legislative purpose and guide the execution of the law, "thus profiting by what we have already learned." More effective enforcement measures should be sought, but the way was not to be found through putting people in jail.

While favoring voluntary submission of codes, the President asked that unquestioned power continue in the government to impose at least certain minimum standards of competitive practices and "especially adequate standards of labor relations." These should include minimum hours and rates, and free exercise of the right to organize and bargain collectively. No specific mention of Sec. 7(a), however, appears in the message. "Monopolies and private price fixing within industries," he said, "must not be allowed or condoned.

"But I submit that in the case of certain natural resources, such as coal, oil and gas, the people of the United States need government supervision over these resources, devised for the purpose of eliminating their waste and of controlling their output and stabilizing employment in them to the end that the public will be protected and that ruinous price cutting and inordinate profits will both be denied."

This formal announcement of the White House program climaxed a busy month from the standpoint of proposals involving both the future of NRA in general and plans for special regulation of the coal industry. On Jan. 24, Senator Guffey and Representative Snyder of Pennsylvania introduced identic bills for the creation of a bituminous coal commission, a statutory code and the establishment of a national bituminous coal reserve. This proposal, summarized in later paragraphs, incorporates in slightly modified form the allocation and mine-quota scheme suggested in earlier sessions of Congress by Senator Hayden of Arizona and Representative Lewis of Maryland, which had its inspiration in the British Coal Mines Act of 1930.

A few days after the introduction of the Guffey-Snyder bill, Senator Guffey and John L. Lewis, president, United Mine Workers, discussed the measure with the President. Still later, the Washington bureau of the United Press put out a story to the effect that the President was satisfied with the progress the industry had been making under the code and as long as that progress continued saw no reason to change to some other method of regulation. Should the code method fail, however, consideration of some other form of control would be in order.

On the eve of hearings on the Guffey-Snyder bill before a Senate subcommittee, Senator Hayden and Representative Lewis claimed their brain child and introduced a new bill to regulate both the anthracite and the bituminous divisions of the mining industry. This bill, submitted Feb. 18, revived the allocation scheme with its national coal operators' council, district boards and court of coal conservation put forward by the same Congressmen in 1933 and paid the authors of the Guffey-Snyder bill the compliment of taking over their coal reserve sections practically verbatim.

In the meantime, the special legislative committee appointed by the National Coal Association (*Coal Age*, February, 1935, p. 92) proceeded to draft a bill for the two-year extension of NIRA indorsed by the operators at their 1934 annual convention last October. Work on this draft was completed by the committee under the chairmanship of D. A. Thomas, president, Montevallo Coal Mining Co., the day after the Guffey-Snyder bill was introduced in Congress. The NCA proposal was submitted to the NIRB on Jan. 28. The coal operators' proposals specifically provide for:

1. Statutory declaration that emergency recited in Title I of the original act still exists and may continue beyond June 16, 1935.

2. Specific extension of act to noon June 16, 1937, unless Congress or the President shall declare the emergency ended before that time.

3. Specific prohibition against any revival of the licensing feature of the act which expired last June.

4. Amendment to subsection (c) of Sec. 3 permitting the institution of suits for enforcement by code authorities as well as federal district attorneys. The text of this proposed amendment with the new language in italics reads as follows:

> (c) The several district courts of the United States are hereby invested with jurisdiction to prevent and restrain violations of any code of fair competition approved under this title *and any rules and regulations adopted pursuant thereto with the approval of the President.* It shall be the duty of the several district attorneys of the United States, in their respective districts, under the direction of the Attorney General, to institute proceedings in equity to prevent and restrain such violations. *Such proceedings in equity may be likewise instituted in such courts and maintained by any administrative or marketing agency duly constituted or recognized under any code of fair competition, in its own name as such or by any officer thereof duly empowered thereunto by such agency.*

5. Specific enabling legislation as subsection (g) to Sec. 3 authorizing any code administrative agency to act as an agency "to further the objectives of any State law designed to promote industrial recovery, if such State law empowers such agency so to act."

6. A new section, Sec. 3½ to Title I, to prolong for the extended life of NIRA all codes which do not carry a specific expiration date; to terminate any code so extended upon application of associations or groups truly representative of the trade or industry for which the code was originally approved; to renew or extend the life of any code which has expired or which will expire prior to June 16, 1937, for all or part of the remaining life of NIRA as extended in the same manner specified in subsection (a) of Sec. 3 for the original approval of a code.

7. Clarification of amendment procedure by adding the following new subsection (c) to Sec. 10 of the original act:

> (c) The President may from time to time, upon application of any trade or industrial associations or groups truly representative of any trade or industry for which a code of fair competition has been, or shall hereafter be, approved under the provisions of subsection (a) of Sec. 3 of this title, and upon finding that the requirements of said subsection (a) of Sec. 3 are satisfied, amend any such code; and may issue rules and regulations prescribing the procedure by which proposed amendments may be initiated, considered and promulgated.

8. A new section, Sec. 11, declaring it to be the government policy that the disbursement of all federal funds by federal officials, departments and agencies and upon grants or loans made to any person, State, State subdivision or agency shall be conditioned to secure the widest possible observance of approved codes of fair competition. Any violation of rules or regulations issued by the President to carry out this policy would be punishable as provided in subsection (a) of Sec. 10 of the act.

The Guffey-Snyder bill (S.1417; H.R. 4661), declaring bituminous coal "to be affected with a national public interest" and calling for regulation of the industry as a public utility, is in two main divisions. Title I covers the establishment of a National Bituminous Coal Commission of five members appointed by the President; a code with allocation, district and mine quotas, price-fixing and other marketing provisions; and a Bituminous Coal Labor Board of three members appointed by the President. This title also incorporates the first clause of Sec. 7(a) of NIRA and that part of the second clause which says that "no employee and no one seeking employment shall be required as a condition of employment to join any company union."

Title II provides for the creation of a National Bituminous Coal Reserve to control existing federal lands containing bituminous coal deposits and to purchase privately owned undeveloped acreage and mines. Funds for such purchases would be provided by a federal bond issue; these bonds, in turn, would be liquidated through a tonnage tax. Sixty per cent of this tax, however, would be expended under the direction of the President "for the rehabilitation of miners who have been displaced from employment by reason of the withdrawal of coal lands from mining operations as provided under this title."

Except in the case of the initial appointments (which would be for two, three, four and five years, respectively), members of the national commission would be appointed for five years; each commissioner would receive a salary of $12,000 per annum and expenses. Three members "shall have no financial interest in the mining, transportation or sale of coal, oil or gas; one member shall be a representative of the producers and one member shall be a representative of the employees."

Under Sec. 3 of Title I, a tax of 25 per cent of the sale price of coal f.o.b. mines is levied, but producers accepting the code established under Sec. 4 would be entitled to a 99 per cent drawback. Expenses of code administration (Sec. 4) would be met through assessments on a tonnage basis. Producers accepting the provisions of the code would be known as code members and

would not be subject to the anti-trust laws. Code administration would be in the hands of a national and 24 district boards.

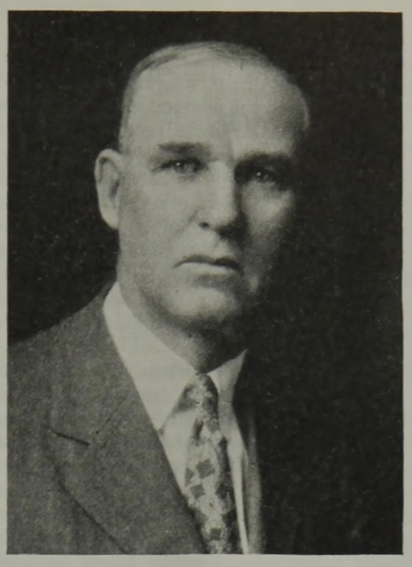
Membership in the national board would consist of representatives appointed for two years by the various district boards on the basis of one representative for the first 15,000,000 tons or fractional part thereof and an additional representative for each additional 15,000,000 tons or major part thereof produced by the district in the preceding calendar year. The national board also would include five members "selected by the national organization of employees representing the preponderant number of employees in the industry." Each district board would consist of five producer members and one labor member "selected by the national organization of employees above mentioned."

The national board "shall determine the standard maximum tonnage to be allotted the various districts, in doing which equal consideration shall be given the production history of the district as shown by its average annual output since 1918 and its current service as shown by its output for 1934. The mean average thus determined shall be combined and the proportions thereof for the respective districts shall fix the maximum district tonnage and be employed in fixing subsequent periodic district allotments. District allotments may thus be made by the national board, if reasonably necessary, to cover coals of distinct natural character or use, if suggested by any district board or boards."

From time to time, as directed by the commission and after district boards have had an opportunity to submit estimates, the national board shall allocate "a periodic maximum output marketable for each district" which shall "maintain the relative proportions fixed by the standard allocation." Upon complaint by any district, the commission may increase a periodic maximum allocation upon a finding that current requirements or services of the coal or coals of such district "warrant such increase in the public interest." District boards shall determine district mine quotas on the basis of the average output per mine since 1929 in relation to the standard maximum allotted the district.

Where a mine has been closed during these years and the orders transferred to another mine of the same producer in the district, the quota assignable to the closed mine may be added to the quota of the operating mine or mines of the producer if he so elects. Subject to approval by the national board, separate mine quotas may be made, "if reasonably necessary, to cover coals of distinct character." In any district where a tonnage standard has been determined for any class of coal, a separate quota may be fixed for that coal "according to the proportion of the standard tonnage of coal, or of the class of coal, as the case may be, found for the coal mines in the district."

Producers dissatisfied with a mine quota may appeal to the commission, which shall hold a hearing and be governed in its findings by the same considerations controlling action of appeal involving a district allocation. Should national or district boards fail to make allocations or allot quotas, the commission is directed to make such allotments. Transfer of quotas from one mine to another may be made only upon express approval of the commission after hearing and due notice to the district board and to



Eugene McAuliffe
President, Union Pacific Coal Co., denounces Guffey-Snyder bill at A.I.M.E. meeting in New York.

representatives of employees affected. New standard maximum district allocations and mine quotas shall be made biennially on the basis of the output during the two preceding years.

Any code member desiring to open a new or abandoned mine or anyone desiring to become a code member and to open a new mine must file application for a quota with the commission. Such application shall be referred to the national and district boards for report within 30 days. If, after hearing, the commission finds that increased demand for such coal or a market shortage therein requires such quota assignment, it may so order. The bill also proposes (Sec. 10) that no certificate of convenience and necessity authorizing the extension of railroad facilities for the service of any bituminous mine shipping coal commercially shall be issued by the Interstate Commerce Commission without the approval of the national coal commission.

Coal boards and code members must accept the jurisdiction of the commission to approve or fix maximum and minimum prices (Sec. 4). In fixing minimum prices, "the commission shall ascertain the cost of production, f.o.b. mines, including cost of labor, supplies, power, workmen's compensation, taxes, insurance, administration, and all other direct expenses of production, but not including depreciation or depletion, in each of the producing districts. The average cost, f.o.b. mines, thus ascertained for each district taken at the next highest even cent per ton shall be announced by the commission not later than March 1 of each year as the fair minimum market price in each district during the ensuing twelve months beginning April 1. The determination of cost for each year beginning April 1 shall be based on the actual costs for the preceding calendar year, adjusted, if necessary, to compensate for any changes in wage rates, hours or other basic cost factors."

Subject to approval by the commission, each district board shall submit maximum prices for coal and grades of coal produced within the district. Where a district board fails to submit such lists or refuses to modify them in accordance with the commission's recommendations, the commission is authorized to fix such maximums "at not less above the minimum prices as will provide a fair return upon the investment and with the view of permitting competition within the brackets of minimum and maximum prices." These price brackets shall be fixed for periods of six months. Sales at less than the minimum prices, except to mine employees, or above the maximum are prohibited.

In an effort to check price evasions, the bill authorizes the commission to investigate the relations between producers and subsidiary companies and the use of dock or other storage facilities. All sales and contracts are made subject to the act and code prices. Nothing in the proposed measure, however, "shall impair the price provisions of any bona fide contract" executed prior to its enactment "in which the selling price is not below the minimum price to be established as hereinbefore provided."

Provided such agencies comply with the provisions of the code, code members are authorized to establish cooperative marketing agencies. Subject to approval by the commission, district boards and/or marketing agencies "may provide for fair competitive prices and practices" in consuming markets which shall be binding upon all code members within the districts or marketing agencies so agreeing. District boards, marketing agencies or code members who object to such agreements or to failure to reach such agreements may appeal to the commission, which must then hear the complaint and "may confirm, modify, or fix such price or prices upon the basis of establishing a fair and reasonable relationship in the delivery price of such coal or coals." Delivery prices, however, must be made "with due regard to the minimum and maximum mine prices established as hereinbefore provided."

In addition to the incorporation of part of Sec. 7(a) of NIRA, the labor relations provisions of Sec. 4 specify that the code much guarantee workers right of peaceable assemblage to discuss the principles of collective bargaining, right to select checkweighmen and to live and trade where they please. The chairman of the labor board made part of the code "shall be an impartial person with no financial interest in the industry or connection with any organization of the employees." One board member shall be a representative of the producers and the third member a representative of the organized employees. Salaries are fixed at $12,000 per annum and the term of service at five years. This board is "to be assigned to the Department of Labor"; the coal commission is "established in the Department of the Interior." Findings and orders of the labor board, however, shall be transmitted to the parties interested and to the coal commission.

The labor board is authorized to determine questions involving company control or domination of employee organizations and to conduct elections to determine who are "the freely chosen representatives of the employees." It also may order a code member to meet represntatives of the employees for the purposes of collective bargaining and may offer its services as mediator for disputes not determinable "by the tribunal set up in a bona fide collective contract" or, upon joint request, act as arbiter. The final mandatory code labor provision imposes majority action upon all code producers and reads as follows:

"Whenever the maximum daily and weekly hours of labor are agreed upon in any contract or contracts negotiated between the producers of more than one-half the annual national tonnage and representatives of more than one-half the mine workers employed, such maximum hours of labor shall be accepted by all the code members. The wage agreement or agreements negotiated by collective bargaining in any district or group of two or more districts between representatives of producers of the majority of its annual tonnage production and representatives of the majority of the mine workers therein belonging to a recognized national association of mine workers shall be filed with the Labor Board and shall be accepted as the minimum wages for all such classifications of labor by the code members operating in such district or group of districts."

Upon evidence of failure or refusal of a member to live up to any provision of the code, the commission may revoke such producer's membership in the code. Such revocation cancels the producer's right to the 99 per cent drawback of the tax levied under Sec. 4. Membership shall be restored, however, "upon payment of all taxes in full for the month or months during which it was found by the commission that his violation of the code had occurred." This same section (5) also directs the commission to expedite the formulation of the code and the establishment of the national and district boards.

Members of the commission and the labor board are authorized to administer oaths and issue subpoenas duces tecum and to appeal to the U. S. District Court to compel obedience to such orders (Sec. 7). Producers declining to accept code membership (Sec. 8) lose the drawback and are subject to the anti-trust statutes; employees of such producers, however, retain the collective bargaining and peaceful assemblage rights and freedom to live and trade where they will given employees of code members under Sec. 4. But, under Sec. 11, every corporation shipping in interstate commerce or using the mails or other means of communication in interstate commerce to dispose of its coal must file acceptance of the provisions of Title I "as a prerequisite of its right as a corporation to engage in interstate transactions."

The commission is directed by Sec. 13 to study means of increasing the use of bituminous coal, the problems of exports and imports, economic operation of mines with the view to conservation, safe operation to minimize working hazards ("and for such purposes as shall be authorized to employ the services of the Bureau of Mines"), the rehabilitation of mine workers displaced from employment and the relief of mine workers partially employed, and the problem of marketing to lower distributing costs for the benefit of the consumers. The commission also is authorized under Sec. 14, "upon substantial complaint" that prices are excessive and oppressive of consumers or that any of the agencies established under the code is operating against the public interest, to hear such complaint itself or through a committee, to make its findings public and issue such orders as may be necessary to correct abuses.

Title II, establishing the Bituminous Coal Reserve, authorizes the Secretary of the Interior, upon approval by the coal commission, to purchase and hold lands containing bituminous coal deposits. All lands so acquired shall include the fee-simple title and full mineral rights and, where necessary to perfect complete title, the government may acquire either surface or mineral rights through condemnation. In order that such purchases may constitute tracts suitable for future mining operations, the government also may acquire such other land or lands as the commission deems necessary. Where an operator desires to sell, his offer can be considered only if he has fully complied with the requirements of Title I.

Except in war time, when the President may direct operation or leasing of mines in the reserve, no such lands may be mined or leased except upon the order of the coal commission, after finding that an emergency in the coal market or a shortage of producing facilities in any district reasonably warrants such increase in productive facilities. All federal public lands containing bituminous coal deposits would be included in the reserve, subject to the proviso that this sequestration would not affect federal laws regulating the mining of other minerals on public lands.

To carry out the purposes of Title II, the bill would appropriate $300,000,000 to be raised by the issuance of 3 per cent 50-year bonds convertible at par at any interest date. All lands acquired by voluntary sale would be paid for in such bonds. In addition, bonds would be sold from time to time at not less than par to provide funds for the payment of land and mineral rights acquired by condemnation. This title also would levy a special tax of 10c. per ton on production; 40 per cent of this tax would be used as a sinking fund to pay bond interest and to redeem bonds, 60 per cent would go to a miners' rehabilitation fund. The tax, however, is subject to the proviso that "not more than 1c. per ton shall be levied for each $30,000,000 of the bond issue, or fractional part of such amount, delivered or sold in any one year for the purchase or condemnation of lands." All proceeds from the sale of coal reserve lands, royalties from mining rights therein or other revenue derived from such lands would be paid into the sinking fund for the service and retirement of the bonds.

The 24 producing districts to be set up under Title I may be described as follows:

District 1—All bituminous coal-producing counties in Pennsylvania other than those shown in District 2; Maryland; and Grant, Mineral and Tucker counties, West Virginia.
District 2—Allegheny, Beaver, Butler, Greene, Lawrence, Mercer, Venango and Washington counties, Pennsylvania; Ohio, Brooke, Hancock and Marshall counties, West Virginia (Panhandle area).
District 3—Michigan and Ohio.
District 4—Northern West Virginia.
District 5—High-volatile fields of Virginia and high-volatile fields of West Virginia not included in districts 2 and 4.
District 6—Low-volatile fields of Virginia and West Virginia.
District 7—Eastern Kentucky.
District 8—North Carolina; Tennessee counties not included in District 9.
District 9—Alabama; Georgia; and Bledsoe, Grundy, Hamilton, Marion, McMinn, Ray, Sequatchie, Van Buren, Warren and White counties, Tennessee.
District 10—Western Kentucky.
District 11—Indiana.
District 12—Illinois.
District 13—Iowa.
District 14—Kansas and Missouri.
District 15—Arkansas and Oklahoma.
District 16—North and South Dakota.
District 17—Montana.
District 18—All coal-producing counties in Wyoming except Sweetwater and Uinta.
District 19—Utah; and Sweetwater and Uinta counties, Wyoming.
District 20—Adams, Arapahoe, Boulder, Douglas, Elbert, El Paso, Jackson, Jefferson, Larimer and Weld counties, Colorado.
District 21—All coal-producing counties in Colorado not included in Districts 20 and 22.
District 22—Huerfano and Las Animas counties, Colorado; New Mexico.
District 23—Washington.
District 24—Texas.

Sec. 4 of Title I provides that "the territorial boundaries or limits of any district or districts may be changed or districts may be divided or consolidated, after hearing, by the commission.

With two important exceptions, the labor provisions of the Hayden-Lewis bill (S. 1922; H. R. 5856) are couched in the same language as the Guffey-Snyder measure. These exceptions are the application of control to anthracite as well as to bituminous mining and the requirement that mandatory imposition of majority decision on maximum hours follows agreement thereon between producers and representatives of mine workers representing more than two-thirds of the national tonnage and workers, respectively, instead of the one-half specified in the other bill. Title II, creating a National Coal Reserve, departs from a stencil copy of the same title in the Guffey-Snyder bill only in its application to all coal, the substitution of a Court of Coal Conservation for the National Bituminous Coal Commission and the authorization of a $400,000,000 bond issue to carry out the purposes of the title, subject to the limitation that not more than 1c. per ton of the tonnage tax shall be levied for each $40,000,000 of the bond issue delivered or sold in any one year for the purchase or condemnation of lands.

The first section of Title I expatiates at some length on the conditions in and the importance of the coal-mining industry and upon the practical impossibility of distinguishing between interstate and intrastate commerce in coal. While declaring coal to be "affected with a national public interest," it does not specify that the industry shall be regulated as "a public utility." In addition to clinging to the Court of Coal Conservation, used in Hayden-Lewis measures of earlier sessions, as the coal-control body, the present bill also continues to designate the national producers' board as a national coal operators' council. To take care of the anthracite set-up, three more districts are added to the roll. Membership in each district board would consist of ten producers and one labor representative.

Subject to revision by the council, cost determination would rest with the district boards and would be based upon "the weighted average cost of mine-run production," which, it is specified, must take into account wage rates necessary to afford reasonable living standards. These costs, plus 25c. per ton for profit on bituminous coal and 50c. on anthracite, would become the minimum mine prices for the district for the next coal year. District boards and code members, however, would be required to accept the jurisdiction of the court to fix maximum prices, modify allocations of standard tonnage, hear and determine complaints with respect to prices and the functioning of the code. "The court shall encourage members of the code, hereinafter provided for, and their employees to make and maintain agreements concerning wages and working conditions."

Where the establishment of cooperative

marketing agencies is authorized, the bill provides that "such agency shall include all members of the code within such district." The council also is directed to establish an arbitration panel to consider and determine disputes which may arise between code members, between district boards, between a code member and a district board, and between a district board and the national council. The court (Sec. 6) is empowered to file complaints with the Interstate Commerce Commission and that commission is authorized to avail itself of the cooperation, services and records of the court and, upon request of the court, "to detail thereto such members of its staff as may be necessary for the purpose of aiding the court in carrying out the provisions of this section."

With a large gallery of spectators drawn from the adjourned Appalachian wage parleys, hearings on the Guffey-Snyder bill opened before a subcommittee of the Senate Committee on Interstate Commerce Feb. 19. Senator Guffey and Henry Warrum, general counsel, United Mine Workers, were the only witnesses at the opening session. Enactment of the bill, said Senator Guffey, would save the bituminous industry by preventing a recurrence of cutthroat competition. Labor, he insisted, would be protected from unfair pressure and investors in coal-mining properties would be able to secure a fair return on their investments.

While conceding that the enactment of NIRA had helped the union, Mr. Warrum declined to admit that NRA itself had been a factor in unionization. "The trouble with NRA," he said, "seems to me to be in lack of enforcement of compliance. In any event, the one essential to any stabilization of the coal industry and any set-up of a price structure was certainly not authorized by NRA—that was the allotment of production to the various districts." Such allocations, he believed, would not result in the dislocations which so many operators feared.

The hearings, which were resumed before the subcommittee today, promise to develop some sharp differences of opinion in the management side of the industry, while the United Mine Workers, which is considered the real active sponsor of the bill, undoubtedly will present a solid front in support of the measure. The Coal Control Association of Western Pennsylvania, for example, has announced its decision to support the bill in principle although members of that organization believe that modifications will be necessary to make the bill workable and effective. Opinion on what these modifications should be, however, is widely split. Many other operators are bitterly opposed to the bill because, they say, the allocation scheme set up is faulty and because the bill would hand over control of the industry to organized labor.

Short Course in Coal Utilization

A short course in coal utilization will again be offered by the College of Engineering of the University of Illinois, through its department of mining and metallurgical engineering and department of mechanical engineering, at Urbana, Ill., June 11-13. There will be no charge for registration or tuition.

Miners Ask 30-Hour Week and Wage Boost; Hard-Coal Rioters Enjoined

PROPOSALS by the United Mine Workers for a shorter work-week and increased wages in the Appalachian region were the outstanding development in the labor situation in February, although conditions were far from quiet in the anthracite field. The joint conference on a new Appalachian agreement began Feb. 18 in Washington, D. C., with C. W. Watson, receiver, Elk Horn Coal Corporation, presiding. These permanent officers were chosen: chairman, D. C. Kennedy, executive secretary, Kanawha Coal Operators' Association; secretary, Thomas Kennedy, secretary-treasurer, United Mine Workers; assistant secretary, A. J. Musser, vice-president, Clearfield Bituminous Coal Corporation.

When organization details had been disposed of, John L. Lewis, UMW president, presented a proposal for a 6-hour day, 5-day week with exceptions to permit certain employees to work the additional time necessary (not to exceed 30 minutes) to handle man-trips and coal in transit; dump and prepare coal delivered to the tipple each day, and complete the usual duties incidental to the operation of coke ovens. Overtime would be paid time and one-half, and double time for Sundays and legal holidays.

John L. Lewis

Opens wage conference with demand for 30-hour week and increase in basic rates of pay.

Wage increases proposed by Mr. Lewis were as follows: cutting and loading, 15c. per ton, divided 13c. to loaders and 2c to cutters; inside and outside day rates, 50c., with proportionate increases in monthly scales; pick mining, 25c. per ton; yardage and dead work rates, 20 per cent, with corresponding increases in rates on conveyors and mechanical loaders.

Consideration also shall be given to the elimination of all inequitable differentials both in and between districts and to their proper determination in accordance with facts and equity, Mr. Lewis proposed, adding that the agreement should cover the two-year period ending March 31, 1937, although the miners are not irrevocably committed to the latter proposition.

Discussing his formal proposal, Mr. Lewis stated that while a large number of employees were put back to work in the first eight months of the code, there had been practically no increase in employment since March, 1934, as both miners and the management have become more efficient. The increased cost of the proposed wage increases he estimated at 22c. per ton, contending that the industry can bear the increases and the consumers can pay to insure a living wage in mining. Certain fixed differentials have not been accepted by the union as proper, and it approaches the question on the basis that the same work should command the same price regardless of the section. Furthermore, the union has never admitted that it should be responsible for the bad judgment of the Interstate Commerce Commission in fixing freight rates and that the miners are not responsible for the maladjustments in freights that now exist.

The Progressive Miners' union, in scale convention at Gillespie, Ill., Feb. 12-16, also demanded a 6-hour day, 5-day week and $6 day wage. However, a resolution was adopted "that the scale committee endeavor to get the best agreement possible, but that they should not sign any agreement" with the operators "until it has been handed back to the rank and file for a referendum vote, whether it be for a certain specified wage or strike." Another resolution adopted provided "that the same rate of pay be given oilers on loading machines as is paid the repair men, and that this be written in the contract."

Governor Laffoon of Kentucky last month yielded to union demands for an investigation of conditions in the Harlan field, where difficulties have arisen in connection with efforts of the UMW to unionize the mines. The chief executive on Feb. 12 appointed a commission headed by Adjt. Gen. Henry H. Denhardt to hold public hearings in the field and take testimony from operators, miners and "disinterested citizens," and submit a report with recommendations.

Developments in the attack of western Kentucky operators on the wage provisions of the bituminous code were featured by the setting of Feb 21 for a hearing on a permanent injunction sought by the Hart Coal Corporation and other operators in the field to restrain enforcement of code provisions. A temporary injunction had been granted by Judge Charles I. Dawson of the U. S. District Court at Louisville on Jan. 16 upon the strength of affidavits from a number of operators alleging losses under code operation. The Jan. 16 order was the outgrowth of the action of the U. S. District Court of Appeals in Cincinnati in referring an earlier suit back to Judge Dawson's court for rehearing.

Four decisions were issued late in January by Division I—North Labor Board, as follows:

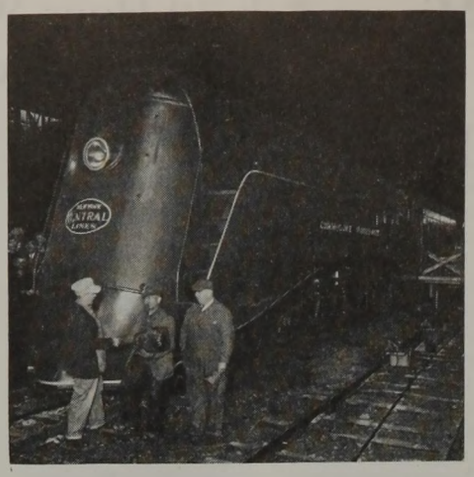
Collective Bargaining Ordered—UMW filed a complaint with the Labor Board charging the St. Mary's (Pa.) Sewer Pipe Co. with refusal to participate in collective bargaining at its captive mine. Two representatives were chosen by the miners in January, 1934, but the company declined

to discuss wage matters with them, stating that it was complying with Sec. 7 (a) and that there was nothing to discuss unless there was a change in the wage schedule. In April the company superintendent presented a wage schedule to a mine-committee member, but the two miners were not at that time empowered to bargain collectively. The superintendent later said he had no authority to negotiate a working agreement with the workers' representatives. When the union filed its complaint, both sides were summoned to a hearing before the board. The board ruled that the company had not complied with Art. V (a) of the Bituminous Coal Code and that the mine management must meet with the workers' chosen representatives for collective bargaining, as set forth in the article specified.

Orders Compliance With Supplemental Agreement—W. F. Wetzel, of Canfield, Ohio, is charged by UMW with non-compliance with a decision of the Joint Board of Division II on Feb. 6, 1934, wherein it was stated that the defendant failed to recognize a supplemental agreement for the Salem-Leetonia district in October, 1933, in regard to wages to be paid for mining and loading coal, etc. The Labor Board reaffirmed the Joint Board decision and ruled that all miners working for W. F. Wetzel from the effective date of the supplemental agreement to Feb. 6, 1934, must be paid for that period at the rate specified therein, individual miners to file claims for adjustment of the amount due and payment as soon as adjustment is made. Men formerly but not at present employed by the company may apply for work and are to be taken on within 30 days of date of the decision, the company being under no obligation to reemploy any miner not applying during that period. Under this ruling, W. F. Wetzel, as party to the Salem-Leetonia agreement, is adjudged to be under valid contract with UMW and must recognize its representatives during the life of the present contract.

Orders Negotiation of Wage Agreement—It was found that the majority of the employees of Feeney & Rudneski, Ralston, Pa., belong to UMW and have selected officials of the union as representatives for collective bargaining; that the union made several attempts to negotiate a wage agreement with the firm without success; that the reason the firm had not signed a contract was that it considered yardage rates of the Morris Run agreement detrimental to it, although it had no objection to the union. The board ruled that the company enter at once into an agreement with the union, the conditions in the company's mines to be given consideration, but the wage rates must conform with those of other commercial mines in that section of District 2. The case of Joseph Peck, a discharged employee, is to be heard under the rules for adjustment of disputes in the contract immediately after an agreement is entered into, any decision not be retroactive beyond the date of this decision.

Compliance With Code Wage Provisions Ordered—North Brothers Mine Co., Ironton, Ohio, was charged by UMW with violating Art. V (a) (3) of the Bituminous Coal Code, covering hours of labor, rates of pay, etc. The board found virtual admission in a letter from the company that it was not paying code wages and was selling coal at less than established prices.



Streamlined Coal Burner Inspected by Miners

America's first streamlined, steam-driven train, the New York Central's "Commodore Vanderbilt," won the interest of western Pennsylvania miners during its first stop at Pittsburgh, Pa. Pittsburgh Coal Co. miner is shown handing a lump of Champion coal to the fireman as the engineer looks on.

No answer was received to the board's letter of Nov. 6 notifying the company it must pay code wages, nor had there been a reply to a notice of a hearing set for Dec. 21. The board unanimously found the company had violated Art. V (a) (3) of the code and ruled that the company immediately begin paying wages prescribed in the code and the wage agreement for its district, and so notify the board in writing. This decision was sent to the legal division of the Coal Secton of NRA, to be submitted to the National Compliance Division, and unless the board is promptly advised that the company is fully complying with the decision, the board will urge enforcement by the National Compliance Division and that the full penalty be imposed. In regard to refusal of the company to confer with the miners' representatives, the board desires further data and reserved the right to take up the question at any future meeting.

For violating the wage provisions of the Bituminous Coal Code, the Whited Coal Co., Swords Creek, Va., was denied the right to use the blue eagle.

Continued battling between the United Mine Workers and the Anthracite Miners of Pennsylvania for ascendance in the northern hard-coal field harassed the Glen Alden Coal Co., during February. Hand-to-hand clashes between pickets, bombing of a fan house of the company's South Wilkes-Barre colliery and shots from a police car directed at pickets fleeing in an automobile were high spots of violence during the struggle. The Glen Alden company obtained a restraining order Feb. 6 from Judge Valentine, of the Luzerne County Common Pleas Court, which enjoined the insurgent union "from doing any act or thing intended to induce employees . . . to leave their employment." In a preliminary injunction granted by the court Feb. 16 the new union was directed to rescind its action of Feb. 2 declaring a strike at the Glen Alden collieries.

Employees of No. 7 colliery of the Susquehanna Collieries Co., at Nanticoke, voted to return to work Feb. 14, after a "holiday" called Feb. 7 when the company failed to reopen No. 28 plane at the colliery, closed five weeks previous. Workers at the Lansford colliery of the Lehigh Navigation Coal Co., whose wage dispute developed into a sympathy strike of large proportions, voted to go back to work Feb. 13 and to attempt settlement of their grievances by conciliation.

Obituary

Seward Button, 59, former Secretary of Mines of Pennsylvania, died Feb. 9 at his home in Wyoming, Pa., after an illness of nearly a year. Born in England, he came to this country with his parents when a youth and started to work in the mines in the Wyoming Valley of Pennsylvania. He became a foreman for the former Hillside Coal & Iron Co. and later was general superintendent for the Temple Coal Co.

U. U. Carr, 59, general manager of the Diamond Machine Co., Monongahela, Pa., for nineteen years, died Feb. 10 at his home in Monongahela, after an illness of three months. After his graduation from Rose Polytechnic School, Mr. Carr was successively in the employ of the Pennsylvania R.R., Heyl & Patterson, Eagle Iron Works, Monongahela River Consolidated Coal & Coke Co. and the New River Co.

C. H. Dyson, 61, fuel agent of the Baltimore & Ohio R.R. for the last seven years, died Feb. 15 in St. Francis Hospital, Miami Beach, Fla. He entered the employ of the B. & O. in 1900, first becoming identified with the fuel department in 1913.

Arthur N. Fancher, 59, president, Colorado & Utah Coal Co. and the Colony Coal Co., Denver, Colo., died in Denver early in January. Born in Parish, N. Y., he entered the coal business in Bay City, Mich., where he eventually became manager of operations and sales for the Winona and What Cheer coal companies. He was U. S. Fuel Administrator for the State of Michigan in 1918, after which he moved to Denver.

Leslie L. Faust, 46, co-receiver, Guaranty Coal Co., and president of the Windber Fuel Co., Windber, Pa., was killed in an automobile accident at Twinsburg, Ohio, Feb. 12.

Edward Hughes, 65, vice-president and comptroller, Lehigh Navigation Coal Co., died in Philadelphia, Pa., late in January from pneumonia. He joined the company as an auditor in 1906.

Adrian A. Iselin, 88, head of the banking firm of A. Iselin & Co. and prominently associated with the development of the Rochester & Pittsburgh Coal Co., Helvetia Coal Mining Co. and Kent Coal Mining Co., in the central Pennsylvania field, died at his home in New York Jan. 29. He had been heavily interested in the coal industry for many years, his father having made extensive purchases of coal lands in the central Pennsylvania field more than 60 years ago.

Priestley Toulmin, 71, president, Lehigh Coal Co., Lehigh, Ala., died suddenly Jan. 24 from a heart attack at Birmingham. Born at Northumberland, Pa., he moved to the Birmingham district in 1887, shortly thereafter becoming chief mining engineer for the Sloss Sheffield Steel & Iron Co., a

position he held for many years. When he left that company he founded the Lehigh Coal Co., which has operations in Jefferson County, Alabama.

David White, 72, senior geologist, U. S. Geological Survey, died Feb. 7 at his home in Washington, D. C., of cerebral hemorrhage. He joined the Geological Survey in 1886, shortly after his graduation from Cornell, and his earlier labors aided greatly in the advancement of the coal and petroleum industries. In later years he had been the recipient of high honors for his work in geological research.

Morris Williams, 79, president of the Glogora, North East and South East coal companies, of Kentucky, and former president of the Susquehanna Collieries Co., died at Ardmore, Pa., Jan. 25, as the result of a heart attack. Born in Wales, he came to this country with his parents in 1857 and settled in Luzerne County, Pennsylvania. In the early eighties he assumed charge of the Susquehanna Coal Co. operations in Wyoming and became manager for the company at Wilkes-Barre, Pa., in 1897. He became president of the Susquehanna Collieries Co. in 1902, a post he held until 1917, when the company was acquired by the M. A. Hanna Co., Cleveland.

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Bureau of Mines Activities Outlined by Dr. Finch

Plans for broadening the usefulness of the U. S. Bureau of Mines were outlined by Dr. John W. Finch, the new director, following the Senate's confirmation of his appointment, late in January. At first, emphasis will be placed on the activities of the Bureau's economics branch, "which will be reorganized by realignment of facilities within the Bureau to concentrate the collection and distribution of economic and statistical data pertaining to the mineral industry in its broader aspects and to meet the requirements of the government's recovery program." Improved and less costly production methods for domestic metals, petroleum research and safety in coal mining also are to be given serious study.

Although the funds at the Bureau's disposal are only about half what they were in 1929, Dr. Finch said he was hopeful that its appropriations will be gradually increased. With this in mind, the new director plans resumption of explosives research; recommissioning of the Bureau's nine mine-rescue cars for use in case of mine disasters; for first-aid and mine rescue training and safety education; the study of methods of accident prevention, particularly with respect to falls of roof in mines; expansion of first-aid training; and the resumption of studies of health of miners and of sanitation in mining communities.

In the Senate on Feb. 6, Senator James J. Davis, of Pennsylvania, formerly Secretary of Labor, decried the reduction in appropriations for the Bureau of Mines and the Geological Survey in the last two years. He emphasized the harmful effect of curtailment of the Bureau's "life-saving courses in first-aid and mine-rescue work," made necessary by reduced funds. The Senator professed to see "trouble ahead in the bituminous coal industry unless this Congress takes action toward stabilization of this basic industry."

National Coal Arbitration Board Organizes And Issues Rules of Procedure

ELECTION of members and organization of the National Coal Board of Arbitration, as provided for in amendment No. 6 (*Coal Age,* February, 1935, p. 91) of the Bituminous Code, was an important step in code developments last month. On Feb. 1, NBCIB unanimously elected the following to membership on the arbitration board:

Capt. Godfrey M. S. Tait, technical assistant, Coal Section, NRA; A. W. Gauger, director of mineral industries research, Pennsylvania State College; J. R. Henderson, former executive secretary, Illinois subdivisional code authority of Division II; W. H. Sadler, Jr., attorney, Birmingham, Ala.; John A. Sargent, former vice-president, Central Coal & Coke Co., Kansas City, Mo. The board held its first meeting Feb. 7, elected Captain Tait chairman; Mr. Sadler, vice-chairman, and Mr. Henderson, secretary, and established headquarters at the Shoreham Hotel, Washington, D. C.

Rules of procedure issued by the board provide that its jurisdiction is limited to hearing and decision of complaints arising out of disputes among marketing agencies or code authorities representing different divisions or subdivisions with respect to fair competitive prices and practices relating thereto. No complaint may be submitted, however, "until the complainant shall have, in good faith, endeavored to settle the matter set out in the complaint" with the party complained against.

Mr. Henderson resigned as executive secretary of the Illinois subdivision Feb. 6 to accept appointment to the national arbitration board. His post in the Illinois subdivision has been taken over by H. E. Stuart, who has been granted temporary leave of absence by the Illinois Coal Bureau, of which he is secretary. Carl Scholz, Charleston, W. Va., was elected Feb. 15 by the executive committee of Smokeless Coal Code Authority Subdivision No. 1 of Division I as arbitrator for the Smokeless subdivision.

Organization and procedure plans for three trade practice complaints committees have been conditionally approved by NRA, as follows: Ohio Subdivision—Ezra Van Horn, manager, divisional code authority; Roy C. Gilbert, Lorain Coal & Dock Co., eastern Ohio district; H. B. Salkeld, Tasa Coal Co., stripping representative; R. C. Harris, R. C. Harris Coal Corporation, Cambridge district; Ralph Paul, Muskingum Coal Co., river and truck mines; J. S. McVey, Central West Coal Co., southern district; Ivor Harris, Reeves Mfg. Co., middle district; Elliott Willard, United States Coal Co., eastern district. Northern West Virginia Division—R. A. Courtney, Fuel Sales, Inc., Fairmont; E. E. Ober, Katherine Coal Mining Co., Fairmont; Paris Shay, H. & G. Coal Co., Tunnelton; Carl L. Hornor, Hornor Bros., Clarksburg; John T. Davis, Davis Coal Land Co., Elkins; D. A. Reed, Consolidation Coal Co., Fairmont; F. C. Shriver, Chaplain Collieries Co., Fairmont. Northern Panhandle (West Virginia) of Division I—William Taylor, Valley Camp Coal Co., Cleveland, Ohio; E. G. Mathiott (chairman of division's marketing committee), Valley Camp Coal Co.; Frank Costanzo, Costanzo Coal Mining Co., Wheeling; M. J. McQuade, Moundsville Coal Co., Pittsburgh, Pa.

Applications for approval of budgets have been made by three subdivisions of the Bituminous Coal Code, as follows: Southern Subdivision No. 2, Division I, $313,760 for Jan. 1 to Sept. 30, 1935, on a basis of not exceeding 7 mills per ton on total production in the subdivision; Illinois Subdivision, Division II, $40,000 for Jan. 1 to March 31, 1935, on the basis of 3 mills per ton on production for the year 1934; Tennessee-Georgia Subdivision, Division III, $18,000 for the year ending April 30, 1935, on the basis of 1½ mills per ton monthly and/or such shorter period as NRA and the code shall be in effect.

As the result of a hearing held Feb. 13 before Wayne Ellis, administrator of Division I, NRA, it was announced that NRA had withdrawn until March 1 its disapproval of wholesale discounts and rules and regulations made by bituminous coal code authorities, which, in its opinion, were contrary to the procedure outlined by NRA. Unless an agreement is reached by producers and wholesalers by March 1, NRA will act to establish discounts, rules and regulations. A meeting of a subcommittee of the marketing committee of Division I and the Wholesale Code Authority was arranged for a later date to work out an agreement.

Complaining that a 15 per cent tolerance on bids to the government is resulting in destructive price cutting in the retail solid-fuel industry, a reduction is sought by the National Code Authority and certain divisional code authorities within the retail solid-fuel industry, NIRB announced Feb. 9. Under Executive Order No. 6767, authorizing the 15 per cent tolerance, NRA is permitted to reduce the tolerance on governmental bids to "not less than 5 per cent," and NIRB now considers limiting such price cuts to that figure in all trade areas in which the board has approved lowest reasonable costs for the retail solid-fuel industry.

After conferences with representatives of the National Code Authority for the Retail Solid Fuel Industry, the planning and coordination committee and NRA, the Petroleum Administrative Board announced Feb. 8 that in its opinion any member of the petroleum industry who engages in the sale at retail of petroleum coke and petroleum carbon (excluding manufacture, sales at wholesale and sales for remanufacture) is governed by the provisions of the retail solid fuel code in so far as his business pertains to the retail sales of those products as defined in that code.

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New Preparation Facilities

New contracts and construction of preparation-plant facilities were reported as follows in February:

Amherst Coal Co., Amherstdale, W. Va.; contract closed with the Pittsburgh Coal Washer Co. for coal screening and washing equipment, steel construction, with an over-all capacity of 300 tons per

hour. Capacity of the washing equipment is 200 tons per hour.

New River Co., Cranberry No. 3 mine, Sprague, W. Va.; contract closed with the Interstate Equipment Co. for installation of a two-tower 2,800-ft. aerial tramway equipped with 4-ton aluminum-alloy carriers. Capacity of the installation is approximately 50 tons per hour when dumping 2,500 ft. away from the loading point.

Pittsburgh Coal Co., Champion No. 1 mine, Imperial, Pa.; contract closed with the Koppers-Rheolaveur Co. for dedusting plant equipped with Birtley dedusters, vibrating screens and auxiliary conveying and bin equipment. Dedusting will be done at approximately 48 mesh and screening at approximately 10 mesh, these provisions allowing production of ⅜-in. x 10-mesh, 10 x 48-mesh and 48-mesh x 0 sizes or combinations, as desired. Capacity is 150 tons of ⅜ x 0-in. coal per hour.

Springfield Coal Corporation, Springfield No. 1 mine, Nanty-Glo, Pa.; erection of a tipple equipped with screening facilities for making several sizes of slack, nut-and-slack, nut and lump now under way. Picking facilities will be provided for nut and larger sizes and the capacity of plant is 400 tons per hour.

In addition to the installations listed in the annual summary of new preparation construction in 1934 (February *Coal Age*, p. 77), the Deister Concentrator Co. reports the following installations of Deister-Overstrom "Diagonal Deck" coal-washing tables (capacities in each case are given in terms of cleaned product):

DeBardeleben Coal Corporation, Empire, Ala.; treating ½x0-in. coal, 12 tons per hour.

Haddock Mining Co., McAdoo, Pa.; rice, 40 tons per hour.

Luther Hess, Espy, Pa.; barley, 12 tons per hour.

Jonathan Coal Mining Co., Dornsife, Pa.; barley, 10 tons per hour.

Lehigh Navigation Coal Co., Lansford, Pa.; pea, 12 tons per hour.

Lehigh Navigation Coal Co., Tamaqua, Pa.; flat nut, 14 tons per hour.

Manbeck Coal & Ice Co., Schuylkill Haven, Pa.; No. 4 buckwheat, 4 tons per hour.

Susquehanna Collieries Co., Glen Lyon, Pa.; No. 2 buckwheat, 12 tons per hour.

Wyoming Valley Collieries Co., Luzerne, Pa.; barley and No. 4 buckwheat, 21 tons per hour.

Cumberland Coal Cleaning Corporation also reports the following installation in 1934:

Splash Dam Coal Corporation, Splashdam, Va.; four-deck, counterbalanced, self-contained Cumberland cleaner for 3x⅜-in. coal, replacing an original unit cleaning the 1½x⅜-in. size.

Stoker Sales Advance Sharply

Stoker sales in 1934 by 83 manufacturers, according to final figures by the U. S. Census Bureau, totaled 21,253 units, an increase of 43½ per cent over sales for 1933, when 14,810 stokers were sold; the 1932 total was 9,571. Seventy-eight per cent of the 1934 sales were domestic units having a capacity of 100 lb. coal feed per hour or less.

Coming Meetings

Committee on Coal and Coke, American Society for Testing Materials: Warwick Hotel, Philadelphia, Pa., March 4-8.

Canadian Institute of Mining and Metallurgy: annual meeting, Royal Alexandra Hotel, Winnipeg, Manitoba, Canada, March 12, 13 and 14.

Rocky Mountain Coal Mining Institute: annual meeting, Cosmopolitan Hotel, Denver, Colo., March 18-20.

Virginia Coal Operators' Association: annual meeting, April 20, Norton, Va.

American Mining Congress: annual convention and exposition, May 13-17, Music Hall, Cincinnati, Ohio.

Mine Inspectors' Institute of America: 26th annual convention, June 3, 4 and 5, Beckley, W. Va.

Industrial Notes

McNally-Pittsburg Mfg. Corporation, Pittsburg, Kan., has appointed G. M. Crawford sales agent in Pennsylvania and eastern Ohio, with headquarters in Pittsburgh, Pa. John F. Maurice, Welch, W. Va., formerly with the American Coal Cleaning Corporation, will handle Norton vertical pick breakers for McNally-Pittsburg.

Jeffrey Mfg. Co., Columbus, Ohio, announces the appointment of W. F. Barnes to its coal preparation division staff. To accept this post Mr. Barnes resigned as president and general manager of the St. Louis Structural Steel Co., in which capacity he had served ten years.

Electric Storage Battery Co., Philadelphia, Pa., announces that Thomas H. Dooling has been made manager of the company's San Francisco (Calif.) branch, after nearly ten years' service as manager of the Boston (Mass.) office.

Link-Belt Co., Chicago, announces these promotions in its central division conveyor sales organization: William L. Hartley, heretofore Detroit manager, becomes manager of foundry equipment sales at Chicago headquarters; Harold L. Hoefman, manager of Indianapolis branch, succeeds Mr. Hartley at Detroit; Richard B. Holmes, of the St. Louis office, has been made manager at Indianapolis; Carl A. Blomquist, Chicago, takes the place of Mr. Holmes at St. Louis, assisting Howard L. Purdon, manager.

Homestead Valve Mfg. Co., Coraopolis, Pa., announces appointment of the following sales representatives: Carey Machinery & Supply Co., 119 East Lombard St., Baltimore, Md.; L. E. Livingstone, 2012 Ward Parkway, Fort Worth, Texas; Charles A. Randorf, 83 Delham Ave., Buffalo, N. Y.

Jessel S. Whyte, vice-president and general manager, Macwhyte Co., manufacturer of wire rope and aircraft tierods, has been elected to the board of governors of the National Aeronautic Association.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces the removal of its Pittsburgh (Pa.) office to 2037 Koppers Building. Guy V. Woody is Pittsburgh manager.

Worthington Pump & Machinery Corporation, Harrison, N. J., has consolidated its mining, quarrying and construction equipment activities into one mining and construction department, under the management of W. A. Neill, with headquarters at the company's main office.

Mine Death Rate Falls

Coal-mine accidents caused the deaths of 79 bituminous and 20 anthracite miners in December, according to reports furnished the U. S. Bureau of Mines by State Mine Inspectors. This compares with 82 bituminous and 19 anthracite fatalities in November. Based on a production of 31,386,000 tons, the bituminous death rate was 2.52 per million tons in December, against 2.69 in the preceding month and 2.67 in December, 1933. The anthracite fatality rate was 4.25 in December, based on the production of 4,705,000 tons, which compares with 4.46 in the preceding month and 4.73 in December, 1933. For the two industries combined, the death rate in December was 2.74 per million tons, against 2.91 in the preceding month and 3.00 in December, 1933.

Comparative fatality rates for the twelve months of 1934 and 1933, by causes, are given in the following table:

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

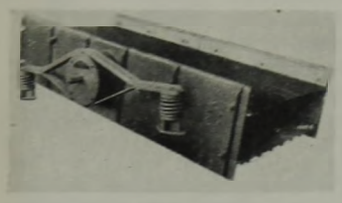
Cause	Bituminous		Anthracite		Total	
	Number killed	Killed per million tons	Number killed	Killed per million tons	Number killed	Killed per million tons
January-December, 1933						
Falls of roof and coal	458	1.373	119	2.402	577	1.506
Haulage	162	.485	32	.646	194	.506
Gas or dust explosions:						
Local explosions	20	.060	13	.263	33	.086
Major explosions	7	.021	...	.....	7	.018
Explosives	24	.072	10	.202	34	.089
Electricity	46	.138	7	.141	53	.139
Machinery	23	.069	2	.040	25	.065
Surface and miscellaneous	93	.279	48	.969	141	.368
Total	833	2.497	231	4.663	1,064	2.777
January-December, 1934						
Falls of roof and coal	516	1.443	148	2.575	664	1.600
Haulage	156	.436	25	.435	181	.436
Gas or dust explosions:						
Local explosions	19	.053	12	.209	31	.075
Major explosions	17	.048	...	.....	17	.041
Explosives	24	.067	15	.261	39	.094
Electricity	54	.151	4	.070	58	.140
Machinery	16	.045	3	.052	19	.046
Surface and miscellaneous	91	.255	51	.888	142	.342
Total	893	2.498	258	4.490	1,151	2.774

*Figures for 1933 are final; 1934 figures based on current reports and subject to revision.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Vibrating Screen

For accurate sizing of small materials, Robins Conveying Belt Co., 15 Park Row, New York, offers the "Vibrex" screen, said by the company to possess the qualities of uniform motion, instant angle adjustment and adaptability to cable suspension or mounting on either horizontal or inclined supports. Location of the vibrator at about the center of gravity of the screen frame, according to the company, insures uniform circle-throw motion of the entire live frame and screening surfaces.



Amplitude of vibration can be changed easily, it is said, by changing the radial position of the easily accessible weights on the ends of the vibrator shaft.

Slope adjustment is provided through the medium of drum-shaped steel housings welded to the outsides of the screen frame and inclosing the vibrator mechanism. These housings support the yokes carrying the screen, which are slotted and bolted to the housing, so that adjustment involves only loosening the bolts and tilting the screen. Heavy coil springs at the ends of the yokes prevent vibration from reaching the supports. Screen-cloth tension is maintained by means of coil springs under the bolt heads, and changing is accomplished by slackening off the bolts and sliding out the panel.

"Vibrex" screens are standardized in widths of 3 and 4 ft. and lengths of 6½ or 8½ ft., double deck, or 10 ft., single deck only.

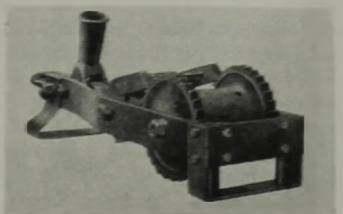
Hot Workers' Goggle

For service in confined places or where the temperature or humidity is high, American Optical Co., Southbridge, Mass., offers the "Duralite-50 Hot Workers' Goggle." This new goggle, the company points out, practically doubles the area usually allowed for ventilation, and this extra ventilation back of the lenses keeps them free from fog and steam, in addition to

keeping the area around the eyes cool and thus preventing perspiration from obscuring the vision. The hazards of stumbling, falling or colliding with objects as a result of obscured vision due to fogged lenses are eliminated by these goggles, it is asserted, and dependable eye protection is assured by sturdy construction and the use of "Super Armorplate" lenses.

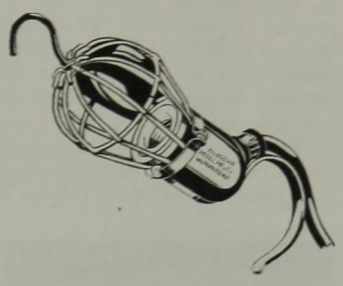
Pulling Jack

Pierce-Miller & Co., Brazil, Ind., offers the Pierce pulling jack with working capacities of from 2 to 6 tons, depending upon the size of rope employed. The jack consists of a drum actuated by a lever through a ratchet and pawl. Length is 36 in.; width, 10 in.; weight, approximately 100 lb. The drum, according to the company, accommodates the following lengths of wire rope: ⅜-in., 70 ft.; 7/16-in., 65 ft.; ½-in., 60 ft.; 9/16-in., 55 ft.; ⅝-in., 50 ft. Any of these sizes may be used with the jack, which will exert pressures equal to the breaking strength of the largest, it is asserted. Recommended working loads, however, are: ⅜-in. rope, 2 tons; 7/16-in., 3 tons; ½-in., 4 tons; 9/16-in., 5 tons; ⅝-in., 6 tons. Average breaking strain is double the working load in each case.



Hook-Handle Guards

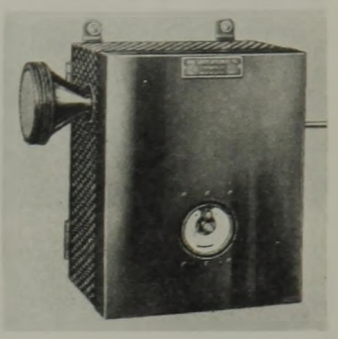
McGill Mfg. Co., Valparaiso, Ind., offers a new hook-handle portable guard with a handle consisting of a flat hook which



permits fastening the guard, according to the company, in many places where the ordinary portable guard could not be hung. It may be hung over a bench top, it is said; slipped into a crack, suspended over the arm or wedged almost anywhere, as it will stand upright as well as it will hang, thus affording a convenient source of light and leaving the hands free. Electrically welded bessemer steel is employed, with cadmium finish. A new strain-relief feature adds to strength, it is pointed out, and makes it easier to wire, as the screw-clamp fastener grips the cord firmly at the base of the handle. Twelve different models are available: with or without reflector; open or closed; or with Levolier lever switch or keyless socket in either the standard or mill type.

Carbon-Monoxide Alarm

Mine Safety Appliances Co., Pittsburgh, Pa., offers the M-S-A carbon-monoxide alarm for giving prompt, loud warning by ringing a gong when CO concentration reaches 0.02 per cent. Operation is continuous, a small fan directly connected to a 1/80-hp. motor pulling a continuous sample of air through the alarm at the rate of 20 liters per minute. CO is converted



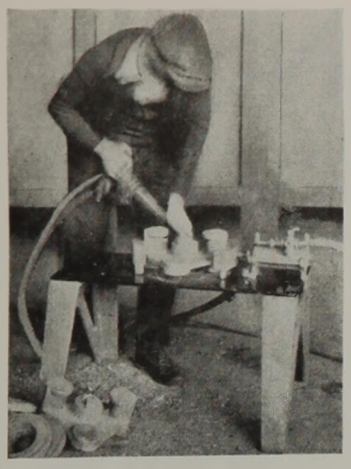
to CO_2 with the liberation of heat in proportion to the percentage of the gas in the air, and this heat is measured with a thermocouple and indicated on a dial graduated from 0 to 0.02 per cent. When the indicator needle reaches the latter figure, the alarm sounds continuously until the needle is turned back by hand.

Circuit Breaker

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has announced a new low-voltage "De-ion" breaker, which it describes as similar to the standard 600-amp., 600-volt AB breaker brought out some years ago, with the major exception that the new breaker has an interrupting capacity of 20,000 amp. The cold-cathode principle of arc extinction has been retained, and the new breaker is totally inclosed in the standard 600-amp. molded case. Ratings range from 50 to 600 amp., and the equipment is furnished complete with standard tripping accessories and motor mechanism.

Casting Grip

For medium-sized castings, the Sullivan Machinery Co., Chicago, offers a casting grip consisting of a baseplate (legs optional), an adjustable back stop and an air-operated jaw. The grip, it is asserted, firmly clamps any shape of casting from 2 to 20 in. and opens instantly, but closes slowly to safeguard the operator's fingers. To protect the surface of softer metals, the jaw and dog may be faced with wood. Grinding and chipping tools are brought to the casting as with larger pieces, and large, fast-operating swing



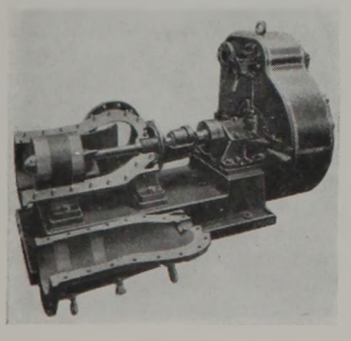
grinders can be used because heating is possible without slowing production. Substantially increased output is stressed by the company.

Blasting Material

"Nitramon," a new blasting material for quarry and strip-mine blasting, has been announced by E. I. duPont de Nemours & Co., Inc., Wilmington, Del. This blasting agent, according to the company, cannot be detonated by the strongest commercial blasting cap, by impact, by flame, or by shooting a rifle bullet into it. In actual use it is detonated by means of a large-diameter dynamite cartridge and, according to the company, is non-headache-producing and is rendered absolutely water-resistant by being sealed tightly in a tin can. Ultimate safety as a blasting agent is claimed. Nitramon, which is non-freezing, is adapted solely for use in large diameters in quarrying and stripping operations, and accordingly will be marketed in sizes such as 4, 4½, 5 and 7 in.

Propeller Pump

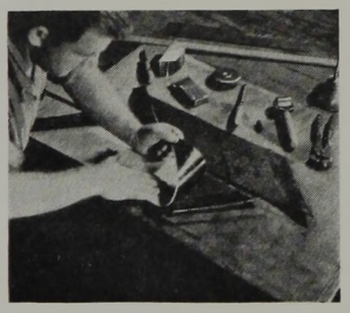
DeLaval Steam Turbine Co., Trenton, N. J., has developed a propeller pump for delivering large volumes of liquids against heads up to 40 ft. when driven at standard motor and turbine speeds. In this type of pump, the propeller, or screw, rotates within a wearing sleeve. The protecting sleeve also carries guide vanes, which allow delivery of the water without whirl. Pumps of this design, the company points out, show efficiencies comparable to those obtained with centrifugal pumps, while the high speed favors development of the maximum efficiency of the driving turbine or motor.



Hot-Material Belt

B. F. Goodrich Co., Akron, Ohio, offers the "Golden Ply" hot-material belt. Flexing life of the new construction in its original state is 85 per cent greater than that of regular grades of hot-material belting, the company declares, and the cover is constructed to offer greater resistance to abrasion even after prolonged exposure to heat. In addition, the new belt is said to show an increase of 31 per cent in flexing life in normal aging tests (fourteen days at 158 deg. F.), as compared with a reduction of 15 per cent in the case of the usual hot-material belting.

"Plastikon" putty, a compound similar in appearance and consistency to ordinary painter's putty, with the exception that it is combined with rubber, is another new Goodrich product. In addition to the usual characteristics of ordinary putty, the new compound is said to eliminate mixing, as it contains practically no oil; effectively resists chemicals, fumes and moisture; and to possess a high degree of adherence to steel surfaces. In addition to small pint cans, the compound is marketed in 15-, 75- and 225-lb. drums.



Making Belts Endless

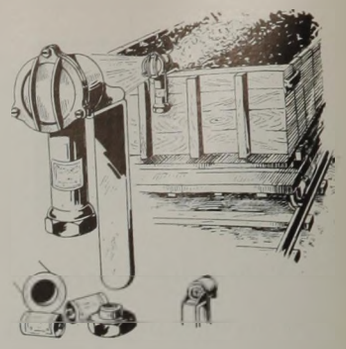
Goodrich also announces the development of a new method of making belts endless by employing the "Plylock Belt Joint," which, it declares, overcomes a tendency of the outside seams of step belt joints to open up during severe service. The new joint is based on embedding or countersinking the seam below the belt in such a position as to relieve it from strain and shield it from wear or windage, and is made possible by a thick cushion of rubber reinforced with bias fabric permanently vulcanized into position.

Goodrich mending and electric tape is another new product announced by the company. In offering this tape, the company explains that the usual 110-volt current has been considered a sufficient menace to life and property to cause the incorporation of requirements that rubber tape for electric splices contain more pure rubber than ordinary friction tape in building codes. Cotton cloth, a good conductor of electricity, usually constitutes 60 per cent of the content of friction tape. The new Goodrich tape, on the other hand, contains over 90 per cent of pure rubber, and a single thickness has tested to 8,000 volts. It also has been tested and listed by the Underwriters' Laboratories, and is offered for both industrial and household service, both as an insulator and for mending purposes.

While not designed as a general substitute for rubber, some of the characteristic properties of the new "Koroseal," a synthetic rubber-like product, render it far superior to rubber for certain specialized applications, the Goodrich company points out in an announcement of the product. Like rubber, it may be varied by compounding methods from a very hard to a soft, doughy consistency, can be molded into any shape, and can be produced in a variety of colors. Features listed by the company include: unusual resistance to swelling when exposed to oils and greases, and to disintegration in the presence of corrosive chemicals; high adaptability to piston packing because of the tight seal afforded in the presence of oil; greater flexing life; and higher resistance to light and oxidation.

Trip Lamp

Justrite Mfg. Co., Chicago, offers a new electric trip lamp bearing the U. S. Bureau of Mines approval plate. The lamp operates on standard flashlight cells, thus, according to the company, reducing the operating cost of trip lamps to the lowest possible basis. Two standard cells, it is stated, furnish a powerful light for a 35- or 40-hour week. Other features noted by the maker include: easy loading in the same manner as a flashlight; one high-grade railway signal lens 3⅛ in. in diameter and a second ruby signal lens visible to the motorman; 250-hour bulb set on spring cushions to absorb shocks; positive bulb and battery contacts for steady light; practically indestructible construction; least number of parts; and low maintenance.



Rotary Planer

A portable electric rotary planer for use wherever wood surfaces are to be smoothed, shaped or reconditioned is offered by the Black & Decker Mfg. Co., Towson, Md. The equipment consists of a heavy-duty driving unit with a universal motor and two interchangeable planer heads for gouging and surfacing, respectively. Heads themselves consist of shaped disks 5 in. in diameter, in which are set three planer blades quickly and simply adjustable for either deep or shallow cutting. As shipped, each unit includes a driving unit, detachable side handle, three-conductor cable and plug, and gouging and surfacing planer heads.

Cap Lamp

Koehler Mfg. Co., Marlboro, Mass., offers the new Wheat Model T headpiece with side-cord outlet. Advantages pointed out by the company include: lighter weight; greater resistance to the entrance of dust; more headroom through transferring the cord from the top to the side of the hat; greater comfort, due to the fact that the side outlet for the cord allows the headpiece to set lower on and closer to the hat; new and more positive contact arrangement; new and improved bulb switch control; simplified interior assembly; and Wheat automatic lock. The headpiece bears the U. S. Bureau of Mines Approval plate.