COAL AGE

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

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New York, August, 1933

Stop-Gap

CREATION of mediation boards to forestall strikes and lockouts while the National Recovery Administration is working with industry in the formulation of codes comes none too soon. Whether the boards set up early this month will be able to restrain hot-heads among both employers and employees remains to be seen. Refusal of officials of local unions of the United Mine Workers in Fayette and Greene counties, Pennsylvania, to order an immediate return to the mines is not a happy augury.

Something more than armed neutrality is needed if the administration of the law is to promote lasting industrial peace. That something is a curb upon the selfish and ruthless exercise of economic pressure. If management in open-shop industries is to be compelled to open the door to organized labor, then the uninvited guest should be compelled to lay aside the strike weapon before he is permitted to enter.

Cost of Production

WHILE the National Recovery Administration so far has avoided definite commitments on price fixing as part of the recovery program, General Johnson has given his benison to price control designed to prevent below-cost selling. Condemnation of such selling is embodied in most, if not all, of the bituminous codes submitted to Washington. Taken at its face value, such condemnation should mark the end of the dreary years in which hundreds of millions of tons of soft coal have been sold to industrial consumers at prices far below any average mine-run cost of production and the losses, as far as possible, shifted to the domestic consumers.

Sound merchandising certainly dictates such an end and the establishment of a price structure in which each grade and each size carries its own load. During Fuel Administration days, such a structure existed, but post-war competition wrecked it. By virtue of its control over all industry it lies within the power of the National Recovery Administration to reestablish a proper relationship and turn what the bituminous code makers utter more as a pious wish into an actuality.

Moratoriums and Markets

BECAUSE, in an early press conference, General Johnson informally suggested a temporary truce on plant expansion and on further installations of labor-saving machinery until the upward spiral in employment and consumption had been accelerated, some business men have elected to interpret the suggestion as an invitation for a moratorium on all investments in capital goods during the life of the National Recovery Administration. That this interpretation is not in accord with the administration's own viewpoint is clear from later categorical denial by the General of any desire or intent to discourage modernization. "The necessary installation of new equipment," he said, should go forward; to stop inventiveness and progress "would be very stupid."

Adoption of such a moratorium simply would mean that more millions of workers in the capital-goods industries would be out of a job and that more billions of dollars normally paid them in wages no longer would be poured into the purchase of consumer goods. Just how such a development would enable the

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proponents of the moratorium scheme to sell more of their own products and so maintain wages and employment in their own industries is still unexplained.

How High?

WHATEVER ELSE the shortcomings of the bituminous coal industry may be, no one can fairly charge management in that industry with any unwillingness to share prosperity with the men. The idea that any definite limit should be set upon the earnings of a worker simply because he is a manual laborer is wholly alien to the philosophy of coal-company executives. Higher wages have been resisted only when the competitive situation of the industry has been such that management has been unable to see where the money to pay increases could be found.

This basic attitude of the soft-coal idustry deserves reiteration at this particular time, first, because the struggle for bare existence during the past three years has effectively obscured it and, second, because of the bearing it has upon the position of the industry under the National Industrial Recovery Act. Beginning several weeks ago, large groups of operators gave signal proof of their sympathy with the then embyronic campaign to restore buying power to the mass of American workers by voluntarily increasing mine wages. This movement, which antedated the enactment of the new law, still continues.

How much further the industry can carry this movement will be determined by competitive conditions in the national energy market, and particularly by the prices asked on natural gas and fuel oil. Obviously, it would be an empty gain to boost basic wage rates in coal mining to such heights that more business would be captured by coal's competitors and real wages and employment in coal mining thereby reduced. That is why, without exception, every major code so far submitted by producers' associations lays such stress upon competitive conditions.

Every time one hundred tons of coal is lost to oil or gas, approximately twenty workers in the coal-mining industry (to say nothing of men employed in collateral services such as transportation and distribution) are each deprived of a day's employment. Multiply this figure by the millions of tons thus annually lost in the past decade and why mine workers in many districts welcome the chance to eke out existence on two days' work per week becomes readily understandable. Oil and gas are not even within hailing distance of coal's figures either in man-power per equivalent unit produced or in the percentage of the total cost of production directly returned to the worker in wages.

Since the purpose of the National Industrial Recovery Act is, in the plain words of President Roosevelt, "to put people back to work," this is a phase of the situation which the National Recovery Administration cannot ignore if the law is to have its intended effect. Coal can be counted upon to increase wages and widen opportunities for employment to the full extent permitted it by competitive conditions now largely in the control of Washington.

Chlorine in Coal

LITTLE IS KNOWN as to the percentage of chlorine to be found in American coals; Europe, on the other hand, has shown much interest in the presence of that element in her coal beds. It has been suggested that it is the low percentage of that constituent in our coals which has prevented or, at least, delayed this study.

The chlorine content of our coals may be derived from the ocean waters which, in Paleozoic time, laved the coast of what is today America, repeatedly overrunning a large part of what is now Pennsylvania, Ohio, Indiana, Illinois and other states. But much chlorine in coal, at least in Europe, may have its source in land waters and is only indirectly derived from sea water. The sprays from the wild seas throw salt into the air, covering the soil with microscopic crystals of salt, which rain dissolves and carries down into the ground, so that the rivers contain noticeable quantities of chlorine.

Because the coal measures of the United States are farther from the sea, little of this sea-spray chlorine is likely to be found, but the connate, or original, chlorine may be present and, as some of our rivers contain much chlorine from gas and oil wells, it may get into the ground water, especially into the coal beneath such rivers. As chlorine is harmful to boilers and coke ovens, an inquiry into its presence would seem desirable.

BACKFILLING

+ Permits Recovery of Abandoned Pillars

While Preserving Surface Improvements

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RICHMOND No. 3 colliery of the Scranton Coal Co. is an operation which ordinarily would have been abandoned, as all six beds had been first mined, leaving only sufficient coal in pillars to support the surface. All beds, with the exception of the two upper ones, were closed by a general squeeze a number of years ago. The surface is practically flat, and is improved with private dwellings, three fairly important highways, a railroad line and the tail tracks of an adjacent mine. One boundary line is the Lackawanna River. As the coal in the existing pillars is owned in fee by the operator, its recovery was a desirable objective, but it was obvious that recovery could not be attempted without an effective backfilling system.

After a careful study of the physical, technical and legal problems involved, a plan was developed by which two of the thickest beds, which also produced the best grade of coal, were to be robbed completely in conjunction with hydraulic backfilling, commonly known as flushing. An overlying thin bed, largely virgin, known as the Rock bed, was to be mined simultaneously by shaking conveyors without backfilling. The two beds selected for pillar-robbing and flushing were the 14-Foot, or Big, bed, averaging 12 ft. in thickness and lying at a depth of about 150 ft., and the Clark bed, averaging 6 ft. and lying at a depth of about 325 ft. The two beds are reached by two shafts, 1,100 ft. apart, which also cut the Rock bed. Average dip between the shafts is approximately 3 per cent, which is considered extremely flat for hydraulic backfilling.

The surface area over the pillars is roughly a right-angled triangle. The hypotenuse of this triangle is 2,400 ft. long and forms the boundary line of an adjoining colliery. One side, of about 1,800 ft., is the center line of the Lackawanna River, and the third side, approximately 1,200 ft., is formed by the robbing line of former operations. The area under consideration, therefore, comprises about 1,200,000 sq.ft. Combined thickness of the two beds to be robbed is 18 ft., and on the basis of an 85 per cent recovery of the existing pillars, this area will yield about 200,000 tons. In view of the fact that the 14-Foot bed already had been rock-packed to a large extent, and that the Clark bed was badly squeezed and caved, it was estimated that only 330,000 cu.yd. of material would be required to fill all existing and newly created voids.

Fig. 1—Gravel Pit and Flushing Plant at Richmond No. 3 Colliery.

Of major weight in the final decision to employ backfilling was the presence of an extensive accumulation of sand and gravel near the main hoisting shaft, where the flushing plant was to be built. At this point, the surface consists of river wash to a depth of about 50 ft. However, it was deemed expedient to mix this material with breaker refuse, which is shipped to the flushing plant from other collieries in railroad cars. As the coal reserve in the pillars was comparatively small for a self-sustaining operation, daily production had to be as large as possible. This meant that mining and flushing must be coordinated to exhaust the coal as rapidly as possible and reduce cost to an economic level.

The general features of the outside flushing plant are shown in Fig. 2. Essentially, it consists of a storage pocket for the flushing material, equipment for screening and crushing it, and a borehole leading underground. Two 24-in. rubber conveyor belts elevate the flushing material to the vibrating screen directly over the storage hopper. One belt carries sand and gravel from the gravel pit; the other belt elevates breaker refuse from the railroad track hopper.

The single-deck, 4x8-ft. vibrating, or

scalping, screen is inclined at 20 deg., and is fitted with wire screen cloth with 1½-in. square openings. It is driven by a 5-hp. motor through a V-belt. Operating in a counter-flow direction and at a speed of 625 r.p.m., the screen has a capacity of 150 tons per hour. Material passing through the screen falls directly into the storage hopper, while material passing over the screen is chuted to the crushing plant erected at ground level.

The crushing plant consists of a triple-unit jaw-crusher—capacity, 35 tons per hour—driven by a belt from a 100-hp. motor. The largest boulders fed to the crusher are 12 in. in diameter; the discharge is material of 1½ in. and below. Broken material leaving the crusher is raised to the vibrating screen by a continuous bucket elevator, where the oversize is removed before the material goes into the storage hopper.

The lower end of the storage hopper is fitted with a circular open funnel which centers over a turntable feeder. Distance between the funnel and the feeder disk is determined by the angle of repose of the flushing material, and can be regulated by means of a sliding sleeve. Only when the feeder disk is rotated by a worm-gear drive, connected to a 1-hp. motor, can the material start flowing off. Rate of flow can be increased at will by means of several scrapers or knives, set in a tangential direction over the disk. This flexible feeding method allows complete and instant control.

Directly underneath the feeder is the mixing cone, into which the material falls uniformly from the entire circumference of the feeder disk. The upper end of the cone has a diameter of 5 ft. and carries a 3-in. square wire mesh screen to keep large objects out of the borehole. Water to wash the material through and at the same time effect an intimate mixture is fed onto the screen from several jets. Diameter of the lower end of the cone is 6 in., and it is connected by a 30-deg. gooseneck to the vertical pipe line through a borehole into the mine.

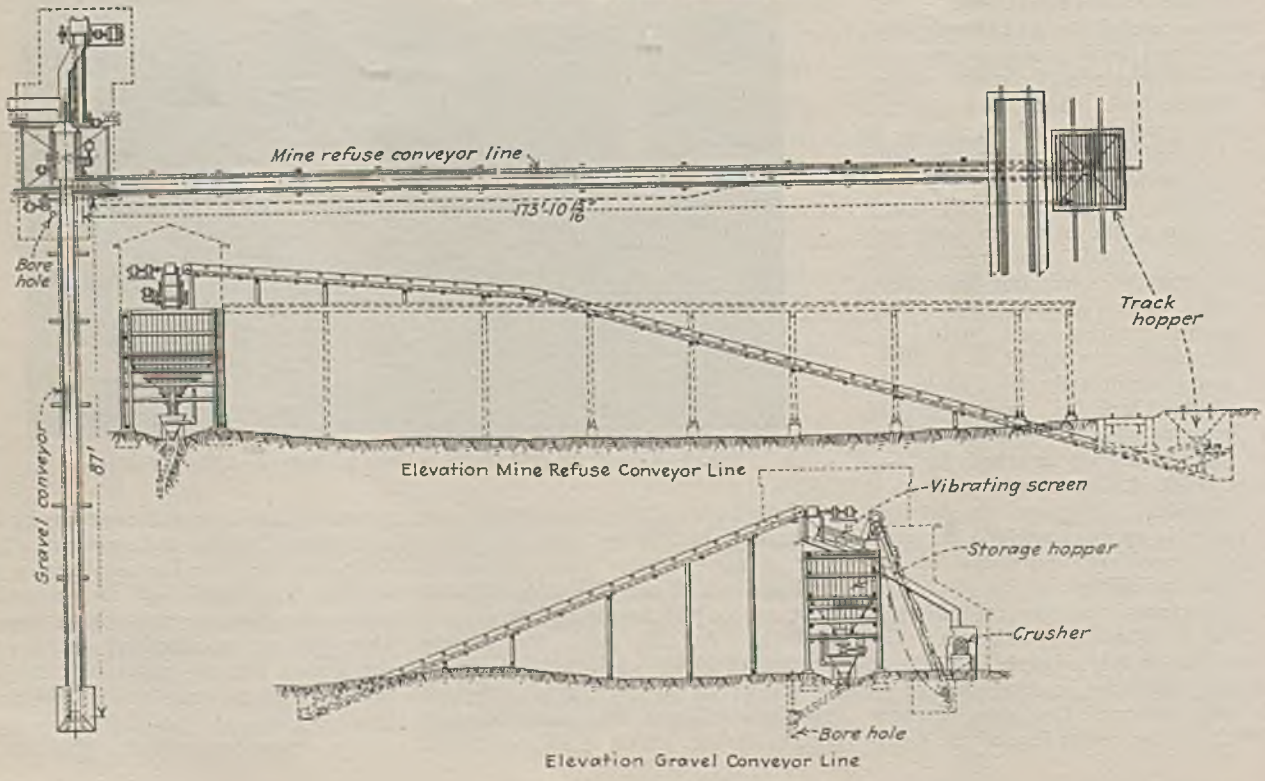
The flush line comprises the borehole column and the two horizontal pipe lines in the veins. The vertical line consists of 6-in. extra heavy steel pipes freely suspended in an 8-in. borehole lined with a steel casing down to the rock. With this arrangement, the column can be replaced in whole or in part when worn out. The vertical line ends at the Clark bed, and at the intersection with the 14-Foot bed is fitted with an 8-in. "Y" and an 8-in. gate for connecting the flush line in this bed.

Horizontal lines in both beds are composed of 8-in. "Universal" cast-iron pipes in standard 6-ft. lengths. Connections are made with iron-to-iron hub-and-spigot-type joints, each held together by two bolts passing through lugs cast onto the ends of each pipe. This type of joint requires no packing, and permits contraction, expansion and unusual deflection without leakage. A standard length weighs 220 lb., and can be handled easily by two men. While it is too early to state definitely the life of this pipe, recent inspection of a certain section showed only slight wear after handling about 60,000 cu.yd. of flushing material mixed with acid mine water. (The life of both the pipe lines and flushing plant is expressed in terms of cubic yards handled.)

Each horizontal flush line ends in a number of branches which are connected to the main line by means of "Y's" and valves, or by breaking the lines and inserting an elbow. Gate valves do not wear well in a flush stream carrying 1½-in. material, and therefore are used sparingly. The cast-iron pipe line is carried into the chamber to be flushed, and conducts the flushing stream to the point of deposit. In flat beds, the flush cannot be allowed to run free if water and air pockets between roof and flush are to be avoided. The pipe line is introduced, wherever possible, at the highest end of a chamber, thus utilizing the small pitch of the vein. As all pillars are to be recovered, great care is taken to backfill tightly to the roof. As the material fills up against the roof, one length of pipe after the other is taken off until the whole chamber is filled. An 8-in. flexible rubber pipe, attached to the end of the flush line, has worked very satisfactorily in directing the flush in any desired direction.

Flushing comprises collecting and preparing the solid flushing material, mixing it with water, and finally depositing it in the underground workings.

Fig. 2—Flushing Plant Construction.



The sand and gravel from the pit and the breaker refuse are mixed in nearly equal parts to make the flushing material. Material from the pit is excavated by a Marion A-450 diesel shovel with a 1¼-cu.yd. dipper, and is deposited in a traveling hopper mounted on a 24-in. rubber belt conveyor 150 ft. long. As

Fig. 3—Mining a Pillar After Flushing.

shown in Fig. 1, this conveyor, which is made with a timber frame, is shifted on wooden skids around a pivot point at the discharge end. The field belt discharges onto the inclined 24-in. belt, which elevates the material to the vibratory-screen feeder chute, where it joins the breaker refuse brought to the track hopper in railroad cars.

Water supply was one of the chief problems of this flushing plant. As the mine water is very acid and the Lackawanna River carries a large quantity of silt and sand, particularly during periods of low water, it was found most advantageous to mix mine and river water, thus offsetting partly the objectionable elements in each. A 1,000-g.p.m., electrically driven centrifugal pump was installed on the river bank close to the shaft, through which the discharge columns of the mine pumps are carried, and furnishes the water for the flushing operation. The 6-in. feed line branches off over the cone into a number of 2-in. pipes.

The ratio between water and solid material varies with the ratio between the vertical drop, or pressure head, and the horizontal flushing distance. For flushing in the 14-Foot bed, with a vertical drop of about 150 ft. over a maximum length of 1,500 ft., a ratio of 4:1 is required, while a ratio of approximately 2:1 is sufficient in flushing in the Clark bed over the same distance, but with a vertical drop of about 325 ft. These different ratios can easily be obtained by changing the feed of solid material by manipulating the knives over the disk feeder and also by changing the water supply by partly closing the supply valves.

The water ratio also is materially affected by the nature and specific gravity of the flushing material. Broken breaker refuse requires considerably more water than sand or gravel, and upon leaving the flush line piles up rapidly in front of it, giving off the flush water instantly. When sand and gravel are mixed with breaker refuse, the mixture runs much more freely with the same water ratio. If sand and gravel are flushed alone, the angle of repose of the flush material from the end of the flush line deviates only a few degrees from the horizontal, permitting a much tighter flush in flat seams. Whenever a change is made from one branch of the flush line to the other, clear water is run for a few minutes to clear the line.

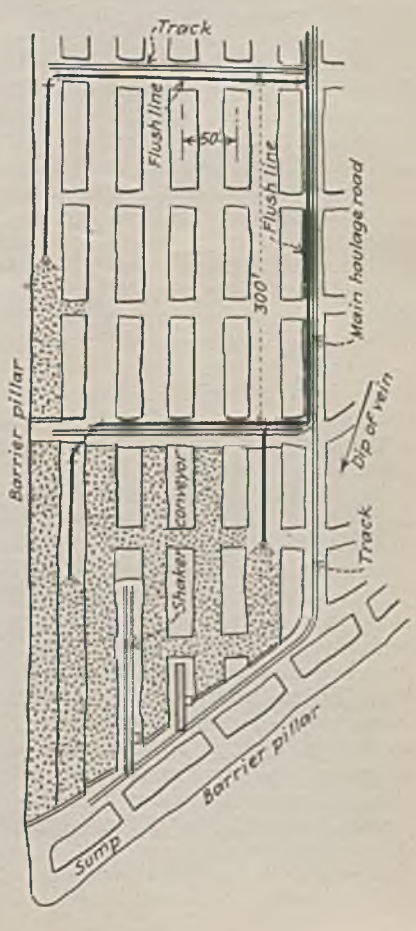
The brattices, or stops, at the end of chambers are built of either loose rock or brattice boards. Necessary development in the Clark bed and cleaning away of falls in the 14-Foot bed produces some rock which has to be gobbed somewhere. Whenever possible, for reasons of economy, it is used to build stop walls. These rock walls, even in the the 14-Foot bed, are built in single thickness, with the smaller rock thrown behind it inside the chamber to form a toe. This type of wall retains the finer particles kept in suspension by the flush water. Water draining away from the chambers is carried in ditches to the sump in each bed, thus permitting further settlement of suspended matter.

Where no rock is available, ordinary brattice boards are used. Thin props with diameters of not more than 4 to 5 in. are sufficiently strong to withstand the side pressure of the backfill. In the 14-Foot bed, stop walls frequently are built of a combination of rock and brattice boards. The rock wall is built by hand to a convenient height, about 6 ft., after which planks are nailed to timbers set on top of the rock wall and wedged against the roof.

That these rather primitive retaining walls are adequate to hold back the flushing material is chiefly due to its nature, the flushing method, the low water ratio and the flat pitch of the beds. The water drains off rapidly as the flushing leaves the end of the pipe line, thus producing a backfill that is in itself stable enough not to exert any appreciable side pressure. As the pipe line is always placed as close to the roof as possible, being carried on wooden horses, the flushing slopes toward the upper end of the chamber, thus forcing the largest quantity of water to run back and filter through previously deposited backfill. Occasional boards placed behind stakes pushed into the backfill act as backstops and prevent the solid material from being carried back too far.

Sand, gravel and broken mine refuse drain so quickly that immediately after flushing ceases, one may step on the newly deposited flush and hardly make an imprint. Several days are required, however, to drain thoroughly a flushed chamber. After this period, the flush, though it still feels moist, has sufficient

Fig. 4—Method of Flushing and Pillar-Robbing Used at Richmond No. 3.



strength to fully carry the roof pressure. Subsequent drying out, however, will not result in the shrinkage so often noticed in flushing with silt.

A very important part of the flushing system is the telephone line connecting various underground points with the surface plant. The freedom from pipeline stoppage so far may be attributed chiefly to the telephone system. The slightest irregularity in the flushing stream immediately is telephoned to the outside, whereupon the feed is stopped and only water is sent through the line for several minutes. Frequent and direct communication between the inside and the outside is necessary in changing flushing from one branch line to the other, or from one vein to the other.

Pillar extraction after flushing differs little from ordinary practice in the Northern Field. In the 14-Foot bed, pillars are recovered as soon as the two adjoining chambers have been completely flushed. A car place is driven up the center of the pillar from the lower end, leaving coal standing on both sides to prevent any of the backfill sliding off, which can easily happen in a place 14 ft. high. The coal on the sides is taken on the retreat, and the newly created voids are flushed immediately, as the quicker flushing follows pillar extraction the less the chance of roof pressure crumbling the sides of the old backfill.

Flushing of newly created voids is done in the same way as the flushing of the original chambers, using brattice or rock walls to retain the backfill. The flush pipe is introduced at the higher end of the void; hence it is essential that the upper end of every chamber pillar or row of pillars remain accessible. In flushing between two previously flushed chambers, care must be exercised that the old flush is not underwashed by the new. This can be accomplished with the aid of a few brattice boards and by keeping the flush stream in the center of the room as far as possible. Pillar extraction always proceeds uphill and on the retreat, thus avoiding many of the difficulties of draining off considerable quantities of water.

In the Clark bed, where crushing has reduced pillar height so much that in most cases the bottom would have to be taken up or the roof shot down, to permit loading directly into mine cars, shaker chutes are employed in pillar recovery. Flushing and reflushing, however, are the same as in the 14-Foot bed. In conformity with good shaker-chute practice, counters are driven 275 to 300 ft. apart at right angle to the chambers. These counters accommodate the mine cars and the flush pipe lines. Crosscuts in pillars generally are flushed like chambers, as it is more economical to handle a comparatively small quantity of backfill than to keep the crosscuts open with brattices or rock walls.

It is very essential in a flushing program, such as that at Richmond No. 3, that all pillars and pillar stumps be extracted as nearly as possible on an even retreat line. This permits the roof to settle gently and uniformly onto the backfill, which, of course, is flexible to a certain extent.

The compressibility of any backfill varies with the material used and the care exercised in avoiding air and water pockets. Ultimately, settlement also varies with the pressure of the strata, which gradually will rest with full force on the backfill. This pressure is a function of the thickness of the overlying strata.

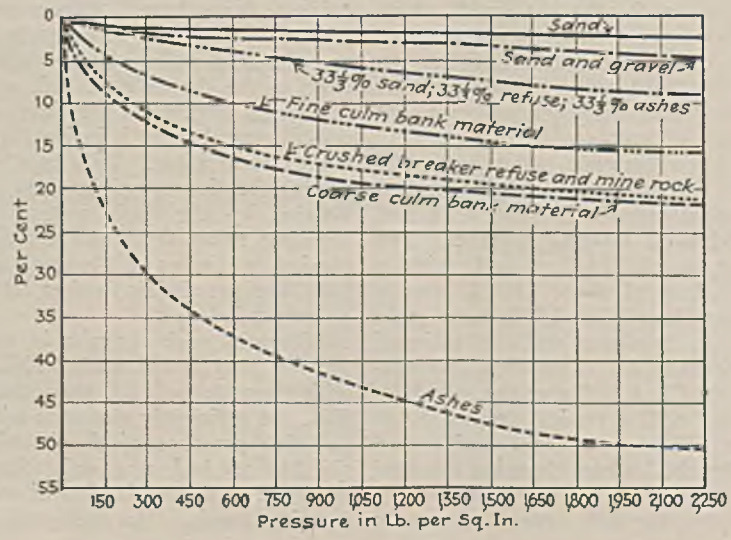
From a great number of tests and measurements made abroad, a chart (Fig. 5) has been compiled to show the merits of various backfilling materials and the corresponding degree of settlement under increasing pressure. The favorable place occupied by sand and gravel is readily apparent. No appreciable settlement of the roof in either bed has been noticed as yet. However, only a comparatively small number of pillars have been extracted. Referring to Fig. 5, it may be expected that the roof in the 14-Foot bed will settle about 2 per cent, while the Clark bed, due to its greater depth, probably will show a 3 per cent settlement. In terms of inches, this would mean about 3 in. in the 14-Foot and 2 in. in the Clark bed.

Based upon general observations in the Northern anthracite field, surface subsidence has been found to be only a fraction of the actual shrinkage in a bed, varying according to the thickness of the rock cover. We may expect at Richmond No. 3, therefore, a surface subsidence measuring only a fraction of an inch, and possibly not noticeable at all in relation to surface improvements. This subsidence will be so slight, gradual and uniform that only after a period of years will it be possible to determine it by actual measurements. Level readings on certain points in the territory of possible subsidence, as well as on points outside it, already have been made to permit a determination of the exact degree of subsidence at a later date.

The cost of backfilling is to a large degree dependent upon the volume of material handled per shift and the quantity of water used for flushing. The Richmond plant has a rated capacity of 100 cu.yd. per hour, which, with a ratio of water to solid material of 4:1, is the practical limit which can be flushed through a 6-in. pipe line with a gravity head of 150 ft. The maximum size of material flushed also greatly influences unit cost of flushing. The larger the flushing material, the higher the water ratio. But, on the other hand, crushing expense is considerably reduced, especially if gravel is the chief flushing material.

Decisive limitations as to the output and operating efficiency of any flushing plant are dependent on underground conditions. It is obvious that in thin and flat seams, flushing requires more handling of pipes and building of brattices and backstops per cubic yard of flushing than in thick or pitching veins. Any statement of actual costs, therefore, would be meaningless unless all factors influencing the cost were stated in detail. It is generally believed that hydraulic backfilling is too expensive for extensive use in pillar extraction under improved surfaces in the Northern anthracite field. Operation at Richmond No. 3 over a period of ten months has demonstrated, however, that the mining cost for complete pillar extraction, including flushing cost, can be kept well within the limits of profitable operation.

Fig. 5—Compressibility of Various Backfilling Materials in Per Cent of Original Vertical Thickness.



BRINGS COAL TO TIPPLE

+ Without Breakage or Admixed Impurity

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BLOCKS of coal of an average weight of 2,500 lb. and sometimes as much as 5,000 lb. are obtained with scow mining, a system in which the coal on a longwall face is undercut and wedged down or permitted to drop, when desired, on a plate or scow. The block is then drawn out to the road head of the longwall face on the scow by an electric hoist, pulled by another electric hoist onto a flat mine car without sides, brought out to the surface, cleaned by air hammers, slid onto a conveyor and broken by air hammers to the required dimensions.

This method of mining can be used only if the coal is hard and regular. It must also part freely at the roof, whether in response to its own weight or to the action of a wedge, though the break may occur in the slate, in which case more material has to be handled, but if the slate fracture is to be the separating level, it must be used all the way across the face or at the loading end only, or it will not be possible to drag the load on the scow to the road head. Bad roof is not a drawback to the use of the scow system, for the roof behind the mining machine can be timbered to within 6 or 8 in. from the face as fast as the machine is moved forward.

At the Poteau mine of the LeFlore-Poteau Coal Co., Poteau, Okla., coal is undercut and entries are brushed during the night shift. The 3-ft. cut is made in the underclay just beneath the coal seam. Each machine crew consists of three men, the runner, helper and mucker, or dirt shoveler. Both the last two shovel dirt, paying out the so-called "empty rope" under the cut and spragging the coal carefully to prevent it from falling prematurely. This empty rope, which is ¾x6x19 plow steel, is carried to the far end of the wall, where it is passed through a sheave and back to the road head. It serves to pull the empty scow back under the coal. The sprags used are wedged wood blocks which are put under the coal at 7-ft. intervals, so as to break it into car lengths.

Another rope of similar size and construction which stays on the hoist all the time is used to pull the loaded scow back to the road head. The scow is a flat steel sheet, ¼ in. thick, 3½ ft. wide and 16 ft. long. It is 6 in. wider than the cutter is long and has all the corners rounded, so that, in going up or down the wall, it will dodge timbers and uneven places along the face.

Four men comprise the day crew. One runs the 20-hp. double-drum Sullivan hoist by which the scow is operated; one man brings the coal down on the scow, and two work at the road head loading the coal onto the mine cars by the aid of a single-drum Sullivan winch hoist with a ⅞x9x19 plow-steel rope.

No rock except what adheres to the coal is hauled out of the mine; what refuse cannot be put in the gob wall is hauled back along the face by the scow pan and shoveled into the gob at a convenient point. The day crew in the morning uses the winch hoist to load the entry coal, a cut 15 ft. in both directions being taken out in this manner.

Then the crew sets up the drum on the side of the entry opposite that from which it is going to draw coal during that day. The ropes are taken off the scow when the wall has been cleaned up, and the scow is dragged into the road so that the cutting machine can pass. Then the scow is placed back under the wall, the end of the empty rope is attached to the scow, and the other end is attached to the empty drum on the hoist. The load rope that is already on the drum is attached to the other end of the scow.

The mine formerly was operated on the circular longwall system, and no less than 30 roads were driven, all of which had to be brushed and maintained. The longwall faces also were of unequal length. Now, the longwall on either side of each road is 250 to 300 ft. long and only five such roads have to be maintained and brushed, as the roads are from 500 to 600 ft. apart. As much coal is now obtained from

Fig. 1—Block at Road Head With Rope Around It Ready to Pull It on Mine Car

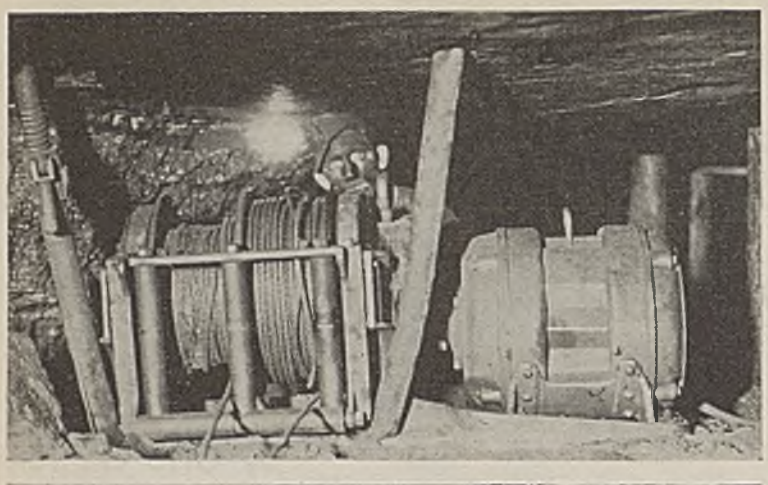

Fig. 2—Double-Drum Hoist for Pulling Scow to Road Head and Returning It for Reloading

Fig. 3—Block of Coal Ready for Pulling on Mine Car; Winch Hoist on Left

these five roads as was formerly obtained from thirty.

The seam is about 27 in. thick. Cars are 3 ft. wide and 7 ft. long with a 30-in. track gage. Their tops, as stated, are flat, and the beds of the cars extend over the wheels. Because of the weakness of the immediate roof, double-track entries cannot be driven, and to make it possible to haul nine cars to a trip, as is customary, the cars are turned over on their side and retracked, one by one, as the loaded cars successively are pushed out beyond the cars which have been detracked. Each wall produces about 70 tons of coal, and one wall in each place is cleaned up each day. Where the roof is good, two tracks could be laid in each entry, in which case two walls could be mined, dropped and loaded in a single day.

When a car is brought to the loading chute at the road head, it is automatically locked in place until the coal block has been pulled on the car. By pressing down on a lever, the car is released and can be pushed out. The winch hoist is fastened to one side of the loading chute.

From 4 to 6 in. of rock adheres to the top of the coal so tightly that it cannot be removed in the mine, so it is brought to the tipple on the top of the block of coal, where it is dislodged by air hammers. When the rock has been removed, the block is dumped onto a conveyor, where it is broken to the desired size by air hammers, a method of sizing which has been found to give a minimum percentage of slack.

Advantages of this system of mining are the large percentage of lump coal, the exposure of only 3 ft. of roof at a time, which promotes safety where the roof is weak and scaly, and the production of coal unmixed with impurity. The method has, of course, also all the advantages of longwall operation.

Fig. 4—Loaded Trip Leaving Mine

Fig. 5—Breaking a 3,800-Lb. Block to the Required Size

LONGWALL, STEEL ARCHES

+ And Posts in Nova Scotia Mines

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Sydney, N. S.

IN a foregoing article on Nova Scotia longwall methods, July, pp. 223-225, was described the manner of removing steeply pitching beds, usually running from 5 to 7 ft. thick and under heavy cover. A somewhat similar installation was tried in a thinner seam dipping at about 9 per cent and under a cover of 450 ft. Two faces, each 300 ft. long, were laid off at approximately the same point, one to the dip and one to the rise of the main belt, to which they were both tributary. The face to the dip is equipped with a 20-in. flat belt, and the coal from the rise is delivered by a shaker conveyor. The walls are retreating, and the main belt, flat also and 26 in. wide, with an initial length of 1,200 ft., operates in a lateral gate driven in the solid, delivering to a similar gate belt (300 ft. long), whence the mine cars are loaded on the haulage level.

Both faces are to the rise of the haulageway, but development is now well along for the operation of a second double unit to the dip of the same level, thus making four faces tributary to the one haulageway. The present double unit, with a 6-ft. undercut in a 4-ft. seam, has produced 530 tons per shift, both walls working on the same shift.

This has afforded an opportunity for making a comparison between the two types of belt: flat and troughed. Whether above or below ground, belt installations must be carefully aligned. Experience in this field shows that in this instance the flat belt needs close attention, lacking which, side wear is rapid. It also seems more difficult to avoid spillage on the flat belt; hence, in this field, preference is shown to the troughed unit.

Mention must also be made of the development of main slopes by longwall. A working 300 ft. wide is carried down the pitch with the face held at such an oblique angle as will afford a 7-per cent gradient for ease in operating the shaker conveyor into which the face coal is loaded. From the shaker, the coal is delivered to a Jeffrey drag-chain sectional conveyor and thence to the mine cars. This conveyor is in 6-ft. lengths, the maximum aggregate length being 250 ft. It operates up a 21-per cent gradient and is, perhaps, the most satisfactory arrangement for this type of development. Naturally, air consumption is high.

In this 300-ft. face four main roads on 70-ft. centers are being brushed and constructed, one of which is the main haulage slope; another the man-trip road and pipeway. All four will serve as intake airways. The minimum, yet adequate, distance between adjacent intake and return airways in the gob has not been fully determined. It would seem, however, as if, under final settlement in a 5-ft. seam, such airways should be at least 150 ft. apart to avoid loss of air.

Fig. 1—Steel Props and Straps Protecting Face Conveyor

Roof control, of course, is absolutely essential. Supports are required for three general purposes: first, to maintain open haulageways, aircourses and other permanent roadways; secondly, to prevent rock falls on the working face; and thirdly, to control areal settlement, though occasionally where roof and floor are sufficiently elastic this last, specifically, is not necessary. However, in most sections of this field it has been found so, and continuous lines of rock packs, averaging 9 to 15 ft. in width and at 40- to 60-ft. intervals, have been found effective.

As roadway supports, the circular steel arch was definitely adopted in this field some five years ago, replacing the square set formed of wooden props and 85-lb. rail booms, which under the great weight met were found both inadequate and too costly because of frequent replacement. Our standard practice is to use 12-ft. diameter arches on main and 9-ft. on subsidiary roadways, the weights being respectively 54 and 32 lb. per yard, and the section resembling an I-beam but of dimensions 2½x4x2 in. and 4½x5x4½ in., respectively. To date more than 3½ miles of roadway has been steel-arched.

The arch has many distinctive advantages over the square set. Maintenance charges are much less, more than compensating for the greater initial cost. Excavation for the same width is less, and the life of the arch is indefinitely long when compared with that of wood. Its resistance to side pressure, too, is incomparably greater than that afforded by timber and, at the same time, it offers less resistance to the ventilating current. Fewer falls occur and when trips run away they usually do less damage.

It would seem also that the characteristics desirable in a road support—strength with resiliency and ductility; durability; reasonably light weight; and ability not necessarily to resist entirely the pressure of subsidence but to regulate it in such a way as to maintain an opening in a settling area—are all inherent in the steel arch to a much greater degree than in any other type of support yet evolved. Instead of stubbornly resisting the forces of nature until destroyed, the arch bends in conforming to these forces, and though it becomes badly distorted, it will, nevertheless, hold the road open and prevent falls. Should it become too greatly deformed, it can be taken down, reshaped and used again, apparently with no loss in strength.

Arches at the face where movement is

Fig. 2—Steel-Arched Roadway With Wood Stilts

still taking place are set on 2 ft. 6 in. to 3-ft. centers. The space between is lagged, especially at shoulders and crown, and this lagging stowed tightly so as to insure as even a distribution of pressure as possible. To avoid premature distortion during initial settlement of the roof, the steel arches are set on stilts, there being two pieces of hardwood of length commensurate with the expected settlement, gripped by clamps to each leg of the arch. As the weight settles on the steel arch, the legs of the latter slide downward, vigorously opposed by the friction between the surfaces of the stilts and those of the legs; thus the steel arch supports the loose rock and prevents it from falling, while permitting the main roof to descend slowly and to adjust itself to progressively changing conditions. Finally, the legs of the steel arch reach the floor, or preferably a hardwood sill, at which point the pressure of the rock arch has been so greatly relieved by its own arching action and its support on consolidated fallen rock and packs that the steel arch is now much less liable to deformation in holding the roadway open to traffic than it would have been had it originally been set on the sill or floor.

Though reference has been made to packwalls as means of areal control, they also contribute greatly to control the roof at the face. However, the immediate means of doing this usually are hardwood chocks and props. Here, too, the desire to find some substitute for the wasteful, and consequently expensive, wood has led to the introduction of steel props. Where chocks are in use, it has been found that, after having taken the roof weight, the ends of the blocks forming the chocks become badly broomed and are often difficult to draw. A device known as the C. Y. Chock Releaser, which permits of two of the blocks resting on the mitered ends of the releasers, has recently been introduced and found helpful. Slipping a catch allows the mitered ends to slide and brings the chock block with it.

On the introduction of the steel prop some three years ago, experiments were made with both yielding and rigid types, but today the rigid prop is used exclusively. The principle of the yielding prop is now thought to be wrong, for the rigid prop affords an easier as well as a safer method of controlling the roof, the object sought being to transfer the fulcrum of the roof cantilever from the coal face to a parallel line of rigid supports.

The prop exclusively used in this field is a seamless steel tube of 3- to 4½-in. diameter and of ¼- or ⅜-in. stock. When fitted with a hardwood core, it is known as a "composite" prop. As protection against falling rock between the face and the prop line, corrugated steel straps, 6 to 7 ft. long, 5 in. wide and ⅛ to ¼ in. thick, are carried as crossbars over the props. The cross-section of the original strap is similar to that of ordinary galvanized corrugated iron and, in its width of 5 in., has three corrugations. A more recent type is that having square-shouldered rather than sinuous folds, and this, for the same weight of metal, is more efficient, as the design affords a higher section modulus. Though not yet so employed in this field, straps also have been used with excellent results as footings under steel props where a combination of soft floor

Fig. 3—Hardwood Chock With Releaser; Man About to Slip Catch

and heavy roof weight caused the props to penetrate the floor. As with the arch, the straps, after having been deformed in service, can be straightened and again put in use with no apparent loss in strength.

Progress indeed, has been made in Nova Scotia toward mechanization, though suitable loading devices for the field, as stated, have not yet been developed. If and when they are, our mechanization will be completed. Nor have the fullest benefits of what has been accomplished yet been entirely demonstrated. Their demonstration awaits the time when Nova Scotia, in common with the rest of the world, can again undertake full-time production. There is this to be said, however: that, in the present times of duress, mechanization and all that goes with it has certainly, in this field, lessened for us the frowns of fortune under which the coal industry universally is suffering.

[On p. 223 of the first of these two articles, Fig. 3 shows offset faces 12 ft. long. These faces were actually 50 to 70 ft. long, though the development arose from the experience acquired in the recovery of a longwall face by extending a 12-ft. cut along it.]

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PREVAILING PRICES, NOVA SCOTIA MINES

Delivered at Shaft

STEEL ARCHES

12 ft., 54 lb. per yard, 8 ft. 6 in. high, 430 lb. total wt.	$13.50 per complete arch
9 ft., 32 lb. per yard, 7 ft high, 205 lb. total wt.	7.00 per complete arch

BOOMS

85-lb. rails—seconds	$15.00 per long ton
12 ft. spruce crossbars (6 in. min. diam.)	0.40 each
14 ft. spruce crossbars (6 in. min. diam.)	0.50 each

PROPS

Tubular steel, 4½ in. outside diameter ..... $97 per long ton

Spruce, in cents per prop

Length	Top Diameter			Length	Top Diameter		
Ft.	5-in.	6-in.	8-in.	Ft.	5-in.	6-in.	8-in
5	9½	...	...	7	14¼	20½	34½
6	12¾	13¾	...	8	18½	24	38½
6½	13¼	...	...	8½	20	...	...
				9	...	27	...

LAGGING

Spruce—7 ft. long, 4 in. minimum diameter ..... 10½c each

WHAT HAS DEDUSTING

+ To Offer Coal Operators

In Preparation and Sales Advantages?

By HENRY F. HEBLEY

Allen & Garcia Co.
Chicago

IN EUROPE, the removal of dust from coal was a practice adopted to improve the art of coal cleaning. American development, however, grew out of a demand for a special fuel better suited to the requirements of small automatic stokers. When attempting to burn slack on automatically controlled domestic stokers, a crust is likely to be formed on top of the fuel bed during periods when the stoker is not in operation. When the coal feed is resumed, this impervious crust causes a ring of "forge fire" in the furnace, increasing excess air and reducing efficiency. To mitigate this condition, minus $\frac{1}{16}$-in. coal was treated in aspirators to remove the minus 48-mesh material. This procedure, especially in the case of the free-burning Mid-Western coals, tended to keep the fuel bed porous, thus evening up air distribution.

It is a characteristic of Illinois coals that the ash content increases as the sizes decrease. As the fusion point of the ash is low, removing the dust decreases clinkering tendencies. In addition, the absence of very fine dust reduces to a minimum the deposition of material in the tubes or flues. Apart from this freedom from operating annoyances, an eight-day test on minus 2-in. screenings and dedusted coal showed a 5 per cent increase in evaporation per pound of coal in favor of the dedusted product.

From the operating standpoint, dedusting may be expected to improve cleaning efficiency and simplify the dewatering of washed coal, the clarification of wash water, and the control of the fusain fraction in coking coal. Due to the difference in specific gravity, it is well known that the efficiency of coal-cleaning equipment, both wet and dry,

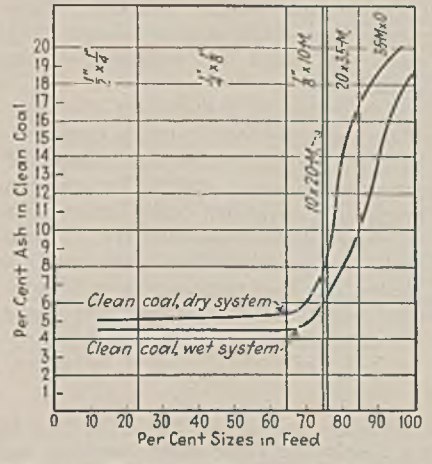
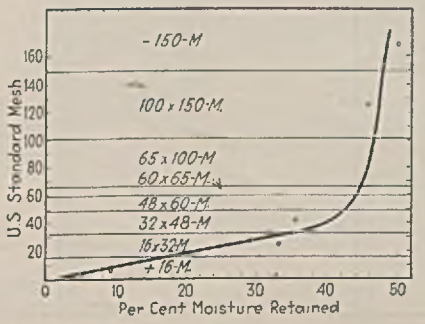


Fig. 1—Illustrating Decrease in Cleaning Efficiency With Decreasing Size.

becomes less as the size of coal treated decreases. Though wet systems maintain their efficiencies to smaller sizes better than dry-cleaning systems, any improvement in coal below 60-mesh is, with few exceptions, negligible. This is illustrated in Fig. 1, based on data given for identical minus ½-in. samples by Mott. The wet system cleaned the coal to 4.5 per cent ash (inherent ash, 3 per cent) down to 10 mesh, after which the ash rose rapidly as the size decreased. The dry-cleaning system reduced the ash to 5 per cent, but began to drop in efficiency below a size of ⅛ in. Removal of the fine sizes would have eliminated that portion of the coal which was little improved by cleaning.

Fig. 2—Drainage Rate Drops as Size is Reduced.



After coal has been washed, dewatering must be as efficient and rapid as possible. Little difficulty is experienced with coal over ½ in., as the voids are large and the ratio of surface to volume of the individual pieces is small. With fine coal, however, due to its close-packing characteristics, capillarity makes gravity drainage practically useless, and where fusain is present in any considerable percentage, its porosity increases the ability of the fine coal to hold moisture.

Fig. 2 shows the moisture retained in various sizes after gravity drainage for 24 hours. Practically no reduction in the moisture content of coal below 48-mesh takes place in this period. Other systems of dewatering include high-speed screens, centrifuges, suction filters and heat dryers, but these are expensive to buy and maintain. The presence of soft shale or clay, which disintegrates quickly in water, adds to the drainage problem. Dedusting removes the troublesome fraction of the feed, and if the dust is low in ash it can be mixed with the fine sizes after cleaning—to increase the yield and decrease moisture. Dedusting also improves the appearance of the coal by removing the fine material which coats the washed product and decreases its luster; eliminates rinsing sprays and reduces the quantity of make-up water.

Where the water supply for washeries is restricted, or where state laws prohibit the discharge of contaminated water into streams, it is necessary to install clarification equipment. If ex-

Abstract of an address entitled "Advantages and Use of Dedusted Coal and its Products," delivered at Chicago section meeting of the A.I.M.E., June 27, 1933.

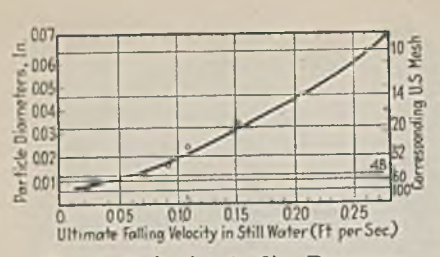


Fig. 3—Reduction in Size Decreases Clarification Rate.

tremely fine sizes are present in the waste water, and especially if it carries clay or shale in suspension, clarification takes on added difficulties. This condition is shown in Fig. 3, based on data by Needham. It will be noted that below 60-mesh the falling velocity is small, even in still water, which is rarely encountered in actual operation. Dedusting leaves only the larger particles, which settle faster. As a result, the specific gravity of the wash water is more constant and washery results are more uniform.

Until recently, it was thought that fusain was a detriment in the manufacture of coke. However, the work of Wheeler and Mott has shown that fusain properly controlled may be mixed with coking coal and that the resulting coke will be quite satisfactory and in some cases improved. Due to its extreme friability, fusain often is concentrated in the fine sizes, as shown in Fig. 4, which is based on data by the same authorities. With coal of this nature, removal of the fine dust and its addition to the cleaned coal in the proper proportion will allow the coking mixture to be controlled. If mixed with washed coal, the resulting reduction in moisture content will permit an increase in coke-oven output.

While dedusting has definite advantages in the operation of cleaning plants, there still remains a definite problem of disposing of the dust, except where the ash content is low and it can be mixed with the cleaned product. In contemplated plants where no cleaning equipment is to be installed and the dedusted coal is to be sold for use in domestic stokers, the inability to find a market for the dust deters the operator from making the installation. There are, however, various potential markets which deserve consideration: briquetting, shipment of the dust in cars to pulverized-fuel plants, colloidal fuel, low-temperature carbonization, and consumption of the dust in furnaces without further grinding. Economic factors will govern in each case, and each must be weighed on its merits.

Briquetting as a means of disposing of the dust has been in use in Germany, Belgium, Great Britain and France for a number of years, and in Germany the briquetting of brown coal (lignite) has developed into a huge industry. Brown coal, fortunately, does not need a binder, but it is necessary with bituminous coal. Of the several bituminous binders, a coal-tar pitch with a softening point of 140-170 deg. F. gives satisfactory results. In the manufacture of briquets, a high proportion of dust will require a large quantity of binder, the requirements varying from 6 per cent with high-volatile coal containing small quantities of dust to 10 per cent for low-volatile coals containing large quantities of dust. Moisture content of coal should be kept below 5 per cent and the ash should be reduced as far as possible to avoid wasting the binder.

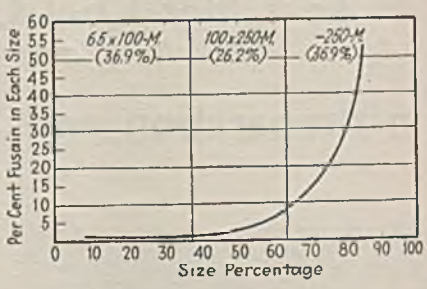
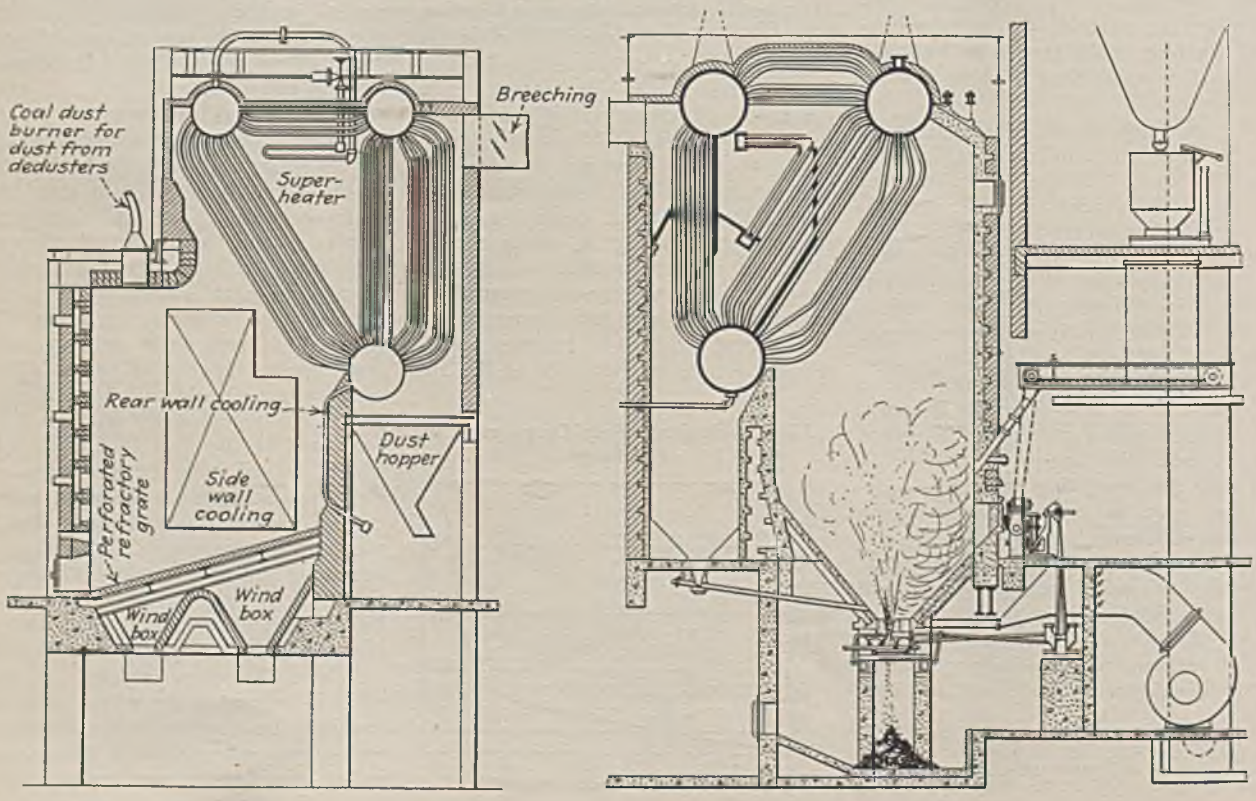


Fig. 4—Illustrating the Increase in Fusain Content as Size Decreases. Sample Consists of ¼x0 In. Coking Slack (¼-In.x65-Mesh, 81.3 Per Cent; 65x0-Mesh, 18.7 Per Cent).

In general, the cost of the pitch is the major item of expense. Consequently, only the smallest quantity consistent with briquet quality should be used.

Pulverized-coal plants will operate quite satisfactorily on a feed composed of dust from dedusting systems; in a test run on such material it was found that the mills had little difficulty in grinding it. However, trouble was experienced in unloading the dust from

Figs. 5 and 6—Furnaces for Burning Unground Coal Dust From Dedusters. Left, a Continental Type; Right, American Stratton Furnace.



the car. In this connection, there are available several designs of tank cars for efficient handling of finely powdered materials.

Recently, there has been a renewal of interest in the manufacture and use of coal-oil mixtures composed of finely ground coal dust mixed with fuel oil with the addition of a small quantity of a stabilizer of lime-resin "soap." This mixture is used as a substitute for liquid fuel, and reduces excess air to a minimum. Another advantage grows out of the presence of solids in the flame, which intensify radiation. For a given volume, colloidal fuel contains more heat units than either coal or oil, and as its specific heat is approximately 25 per cent less than fuel oil, less preheating is required. S. E. Sheppard gives the following results on the U.S.S. "Gem," burning a mixture made up of 30 per cent coal, 70 per cent fuel oil and 1 per cent lime-resin stabilizer:

	Test No.			
	2	4	6	12
Time in hours	2	2.25	0.66	3.17
Pressure on fuel, lb. per sq.in.	131.8	149.5	156.5	101.0
Boiler efficiency, per cent	65.5	70.7	91.5	84.2

L. W. Bates gives the following figures on the settling out of solids in colloidal fuel mixtures used in marine boilers:

	Per Cent	Settling Period, Months	Per Cent Solids Settling
Pocahontas coal	31	6	Trace
Navy fuel oil	69		
Stabilizer	..		
Coal and coke	38	5	2.6
Mexican fuel oil	62		
Stabilizer	..		
Coal	40	9	Trace
Fuel oil	60		

Tests have been carried out on this type of fuel in fireboxes on oil-burning locomotives with satisfactory results.

An enormous amount of research on low-temperature carbonization, covering a wide variety of equipment, has been carried out in the past decade and is being continued. Of the several promising systems, the C.T.G. (Chemisch-Technische Gesellschaft) is directly applicable to coal dust. It has the advantage of being able to coke 1/25x0-in. dust from dedusting units and it is asserted that excellent coke has been obtained from a low-grade dust containing 13.1 per cent ash.

The demand for hydrogen for various chemical and industrial processes has increased greatly in recent years, and as the water-gas method of production is one of the cheapest it deserves consideration. Normally, water-gas manufacture is an intermittent process comprising "blowing" and "steaming" periods. With the Heller process, in semi-commercial operation at the Berlin (Germany) Gas Works, pulverized coal is sprayed into a cylindrical retort, where it comes in contact with jets of superheated steam. The process is continuous in operation, and provides another possible outlet for dust.

Another promising field is the use of the material from dedusting equipment in normal pulverized-coal furnaces modified to handle the raw dust without further preparation. Over twenty installations have been made at German mines where dedusting is practiced. Most of the installations are giving good results even when handling dust containing pieces 0.078 to 1.157 in. in diameter. The majority of the furnaces are similar to the ordinary pulverized-coal units, with the exception that inclined porous refractory grates are placed at the bottom. The coal is blown in in the usual manner, the small dust burning in suspension, while combustion of the large particles is completed either on the grate or in the upward air current passing through it. Table I, based on the data by O. Haller, shows the results obtained with some of these installations.

Table I—Operating Data on Boilers Fired With Raw Dust

	Test No.			
	1	2	3	4
Type of coal	Med. Vol.	Low Vol.	Low Vol.	Low Vol.
Proximate analysis:				
Moisture	3.20	2.17	1.69	1.73
Ash	11.60	6.53	8.60	7.17
Volatile matter	25.23	11.41	21.05	12.57
Fixed carbon	59.97	79.89	68.66	78.53
Calorific value, as received	12,460	13,750	13,540	13,748
Size percentage:				
¼-in.x76-mesh	38.38	55.07	Dust from Aspirator	Dust from Aspirator
76x178-mesh	55.89	25.68		
178x0-mesh	5.73	19.25		
Boiler horsepower	884	315	339	339
Steam pressure	200	200	170	170
Furnace volume, cu.ft.	5,060	3,430	1,766	1,766
Grate area, sq.ft.	248	....	....	....
Heat release, B.t.u. per cu.ft.	12,000	11,300	18,000	18,000
CO_2	13.5	13.3	15.1	16.6
Efficiency, per cent	81.0	80.0	79.93	83.0

It would seem that a steady steaming load is necessary when burning this class of fuel, while coal-mine loads are subject to wide fluctuations. This disadvantage, however, can be overcome by modern design. A study of the proximate analyses indicates that coals containing as low as 12 per cent of volatile matter have been burned successfully. Coals similar to Pocahontas or New River (16 to 25 per cent volatile matter) should therefore give no difficulty. As the ash must be kept in the dry state, furnace volume and water-cooled wall area should be ample.

The Stratton furnace has been developed in the United States for service similar to that of the European installations. This equipment has successfully burned minus ¼-in. bituminous coal with a CO_2 figure of 14 per cent and a combined boiler and furnace efficiency of 80 per cent. A 500-hp. plant of this type has been installed at the Oakfield (N.Y.) paper plant of the U.S. Gypsum Co.

Coal Shows Its Versatility

The Chamber of Commerce Building at Williamson, W. Va., built of 65 tons of coal from the Winifrede seam. O. W. Evans, general superintendent, fuel mines, Norfolk & Western Ry., conceived the building, which was designed by H. T. Hicks, architect, Welch, W. Va. The coal was mined and donated by the Leckie Collieries Co., Puritan Coal Corporation, and the Crystal Block, Sycamore and Winifrede Block coal companies.

NOVA SCOTIA MINING SOCIETY

+ Plans Future Development

HAULAGE and loading with scrapers, and the mining of coal without the use of explosives occupied much of the attention of the 41st annual meeting of the Mining Society of Nova Scotia, which met July 11 and 12 at Sydney, in that province. Another subject under consideration was the limits of the Sydney coal field, an area that can be mapped only on the land side. Its extension under the sea is not readily definable, and the means by which that extent can be approximately defined will throw light on similar, though less difficult, problems elsewhere. Intensive studies into the character of the coals of Cape Breton Island also were outlined, their value for coking and their suitability for storage.

In discussing scraper haulage and loading, at the first session, with A. L. Hay, assistant mining engineer, Dominion Coal Co., Sydney, N. S., in the chair, J. B. Keast, scraper engineer, Holman Bros., Ltd., Camborne, England, whose paper was briefed by W. S. Lecky, the Canadian representative of that company, declared that "30 per cent of the coal, when shot, falls into the path of the scraper. The remainder is not lifted or shoveled in the ordinary sense but simply pushed" into the line along which the scraper travels. He gave the names of seventeen important users of scrapers in Great Britain. In the close of his paper the author described the type of equipment used in tunnels, which embodies a hoe or box scraper with a loading gantry.

In a written discussion, R. D. Hall, engineering editor, *Coal Age*, remarked that British methods of scraping were different from those of the United States, being animated by a desire to keep posts close up to the face. What method was best adapted to Nova Scotia depended on the degree to which British conditions were duplicated in that province. In the United States, the scraper has flaring sides for gathering up coal. It was not only a haulage and car-loading device but also a gathering unit, collecting coal from the face, tearing down shaken but still standing coal and, in narrow places, requiring a minimum of hand shoveling and, in places being slabbed or in true longwall, necessitating no shoveling whatsoever. He described the use of scrapers of 5- or 6-ton capacity.

At the mines of the Dominion Steel & Coal Corporation, said T. L. McCall, chief mining engineer of that company, both the hoe and the box type of scraper had been used. In Springhill, N. S., scrapers had been used in rock tunnels and in coal headings. It might not, he said, break the larger material, but it did create a heavy bed of dust. It had been successfully used also at the Wabana iron ore mines of the company with 60-hp. electric hoists.

From his 500-ft. longwall faces, he was producing with conveyor methods, in Dominion No. 12 mine, 650 tons per shift. This concentration of tonnage resulted in large reductions in cost. Though Mr. Hall had stated that, in the mines of the Pike County Coal Corporation, 450 tons daily had been obtained with mammoth scrapers, that was still less than 650 tons per unit loading operation. Another objection to the scraper was that the dirt in the coal could not be removed at the working face.

In reply, Mr. Hall pointed out that the loading at Dominion No. 12 was entirely on one end of the longwall. With two longwall faces and with scrapers leading to one central loading unit, a larger tonnage could be attained. He added, however, that he was not disposed to declare that better results or worse would be the result if scraper installation were replaced by conveyor methods. Certainly, the scraper should not be required to travel too far for its coal.

Every condition, declared R. S. V. Bigelow, Goodman Manufacturing Co., Chicago, has its own appropriate machinery. No one type of loading mechanism will fit most satisfactorily all conditions of operation. Another stated that, at Dominion I-B colliery, scraper loading in rock tunnels had been a "huge success." Before the advent of the scraper, eight loaders had been able to advance 6 ft. per shift, while later, in the same tunnels, with the scraper, three loaders had advanced 7 ft., the actual loading taking only 2½ hours in each shift.

At the Wednesday morning session, over which Mr. McCall presided, F. W. Gray, assistant general manager of the Dominion Steel & Coal Corporation, Sydney, N. S., presented a paper on the attitude and conjectural shape of the submarine portion of the Sydney coal field, explaining that in most places one can form an accurate estimate of a coal field by drilling, but here is a field, with manifest limits in its seaward extensions, which, being covered by the ocean in its northward and eastern ends, could not be even approximately delimitated by any recognized method. What its future life was remained conjectural, but present-day expenditures made every scrap of information of value.

The coal had most evidently been laid down in a basin with a dished floor which, at first, was neither smooth nor regular. The lower seams were, therefore, of limited area and of uncertain occurrence. As the basin filled up with coal and non-coal material, it became more level, and the area at the bottom of the basin thus partially filled became of greater dimensions. That is, the upper beds became more regular and tended to cover more territory than the lower; but, as the basin had always a definite area, the time must come when the outer limit of even the upper seams must be reached. Fortunate it is that the Nova Scotians, who are put at a disadvantage by reason of the depth of their submarine workings, find the top seams, which have least trouble from excessive cover, probably are those with largest areal development, if Mr. Gray's conjecture holds.

By drilling down from an upper seam to one below it at the face of the former's workings, it will be possible to ascertain if the lower bed is still present. If it is, there is happy augury for the one above, for it probably extends some distance beyond the lower seam. No

longer is it regarded as certain, or even probable, that the coal beds will reach a basin and travel upward toward the north to outcrop beneath the sea. Expectation is that the coal bed will fade away as some have to landward, their bounds being set not by erosion but by failure in deposition. "It seems improbable," declared the author, "that mining operations in the thick upper seams—Hub, Harbour and Phalen—will ever reach the termination of these seams under submarine cover."

In conclusion, Mr. Gray read excerpts from a letter from Dr. W. Nemerovsky, of the Geological Survey of Canada, who has been making microscopic studies of coals from the Sydney field. He found that the western coals of the field had a higher spore content and less pyrite than the more eastern part of the field, where the swamp center probably lay. Mr. Gray drew from that declaration that high spore content and low pyrite content might notify future investigators of an approach to the borders of deposition.

To G. V. Douglas, professor of geology, Dalhousie University, Halifax, N. S., it seemed that the termination of the coal field would give definite indications prior to thinning. From a cursory study of the field, he had satisfied himself that the coal was grown where found (for roots were clearly indicated in the floor of the seam), that the coal was infiltrated with foreign matter and in some cases appeared brecciated and commingled with sand. The sandstone also would indicate a shallowing of the basin. From such indications, estimates might be formed as to the area yet to be mined. He was not in accord with those who believed that subsidence was uniform. To him it seemed that it was intermittent. Much valuable material might be obtained regarding these conditions from E. B. Bailey's paper on the "Paleozoic Folding of the World," delivered in Glasgow in 1928 at the International Geological Congress.

In the afternoon session, Mr. McCall questioned Mr. Gray's statement that the Pictou field was part of the same deposit as the Sydney field. It was, in his estimation, clearly a field into which the peat had drifted. The coals at the Joggins and Springhill mines were laid down much as were those at Sydney and might well be part of the same coal body. As for a decrease in pitch as the beds went seaward, that could be found at one mine but not at others. On this statement, Mr. Gray said others had founded the theory that the mines were not traveling toward a basin the bottom of which lay farther seaward and that, once this was passed, the coal seams would begin to ascend. Assuming the work of Dr. Bell on fossils indicated correctly which was the Phalen seam at the westward end of the field, it would seem that there must have been rapid settlement in that region, the bed being cut up into 12-in. splits with intermediate rocks.

Fresh-water coals seemed, said Mr. Hall, usually to be of limited area. The northern bituminous coals of the eastern half of the United States were deposited close to the sea and from time to time became submarine. He was glad to have Mr. Gray check him in the belief that this was a source of pyritic sulphur. Such coal beds rarely faded away from lack of deposition. Their limits were clearly erosional. Coals in the southeastern fields of the United States, including West Virginia, were largely of the fresh-water type and did thus fade away or discontinue more or less abruptly.

He was surprised to note the uniform volatile content of Nova Scotian

J. P. Messervey
President, Nova Scotia Mining Society

beds, especially as, at places, they were quite sharply folded. It was stated that this folding was from the west and not from the east, as in the United States; that is, the beds were on the opposing side of Appalachian uplift. Granted that, why was the folding most abrupt on the east around Cow Bay? If the pressure came from the west, then there would seem to have been some sort of toe to the east tending to cause these folds, and this toe might form an uplift resulting possibly in erosion, at some distance from the eastern coast.

Shooting coal with carbon dioxide was described by S. G. Naish, eastern district manager, Peacock Brothers, Ltd., Sydney, N. S., who said there were fourteen such installations in Great Britain. Cardox had been used in Dominion 1-B colliery, where the coal was 6 ft. 6 in. thick and the room working was 16 ft. wide, the place having been cut 30 in. from the floor. Large lumps of coal had been dislodged, especially in the top bench, into blocks which could be readily split along natural cleavage lines. Shooting costs of Cardox varied with conditions and could not be determined without test in any case, but the largest shells cost 60 to 63c. per charge. The shearing disk, its gasket and the heating element with its squib were all that was destroyed; the shell would last indefinitely if no one saw fit to use it as coal prop or car sprag.

Alexander McEachern, chief inspector, Dominion Coal Co., Glace Bay, N. S., said he was afraid that, even with all the help from the gentle handling of Cardox, the coal would be broken on its way to market. Undoubtedly, Cardox did break down the coal with minimum fines. With only two holes shot in the top bench, the coal may overhang from the roof in the center, said Thomas Casey, mine manager, Dominion 1-B colliery, New Aberdeen, N. S. It had been difficult to make a sufficiently straight hole to accommodate the long shell, and this had almost doubled the drilling time.

With this, J. C. Nicholson, general superintendent of mines, Dominion Steel & Coal Corporation, Glace Bay, N. S., agreed. The bands in the coal made the holes crooked. He added that large coal could be produced, but the coal was not pushed out; it merely became loosened and fell. He thought that in view of the fact that the shells were often laid down in cars and other dirty places, the hole for the firing pin should be filled by a plug whenever the firing pin was removed.

Asked how one could ascertain that a shell had not lost its carbon dioxide, Mr. Naish said that the shells were rarely tested for leakage, because confidence had been established that it would not occur, but the shell always should be immersed in water, at first at one end and then at the other, to prove its tightness. As the 15-lb. empty shell will hold 21 oz. of dry ice when full, the loss of weight would be evident to a man customarily handling the shells.

If the squib is fired and the heater is deflagrated in a shell void of carbon dioxide, the heat generated is not enough to do any damage to the shell or to ignite the coal. Mr. Naish ignited such a heater within a shell divested of its carbon dioxide, yet paper held on the outside of the shell did not char. He also fired such a heater and showed the ignition was not likely to be dangerous. Repeated blows made with a heavy hammer when the heater was placed on the floor did not ignite or explode it. Though at 88 deg. F., carbon dioxide ice will turn instantly to gas, Mr. Naish said that, if the temperature was reached in the mine or at the surface, the expansion would be slow, because, unless the heat was intense, the evaporation of the dioxide would cool the charge below 88 deg.

"Studies of two seams, the Phalen and Harbour beds," said R. E. Gilmore and R. V. Strong, superintendent and engi-

neer respectively, Carbonization Section, Fuel Research Laboratories, Department of Mines, Ottawa, Can., "revealed that though the freedom from foreign matter and the fusion point vary considerably at different locations, there is less variation between sections than in different horizons of the same seam." The fixed carbon content of coal, dry and free of mineral matter, gives 15,250 B.t.u. per pound. Average carbon content similarly determined is 63.5 per cent, which places the coal as a high-volatile bituminous coal of sub-class A, according to tentative classifications of both the American and Canadian societies for testing materials. Both calorific and volatile matter values are quite uniform.

Fusain, which is present in small quantities in the Phalen seam, will not coke, though it may be beneficial in commercial coking operations, but its tendency to segregate in the fines is to be deplored, for it is thought to promote spontaneous combustion.

Railway locomotive fuel from Sydney, screened and stored at Windmill Point, Quebec, Can., proved remarkably uniform in proximate analysis, sulphur and calorific value and maintained its value in storage. Ventilated slack gained moisture and lost in heating value. Sized Phalen seam coal from Dominion 1-B colliery, large, medium and small sizes down to ¼ in., have approximately the same chemical properties, despite the noticeably higher ash and high ash-fusion temperatures in the extreme fines.

In order to meet with the requirement that the ash-fusion temperature should be 2,600 deg. F. or more, only 15 per cent of coal from Dominion Nos. 12 and 14 collieries could be mixed with Pocahontas and high-volatile Pennsylvania coals, but, after washing, as much as 35 per cent can be used. Ash-fusion temperatures of Phalen seam coal vary from slightly less than 2,000 deg. to above 2,400 deg. F., depending on the position in the vertical horizon of the coal and on the size as mined. Invariably, the ash-fusion temperature of the mixtures was lower than the temperature of ash fusion of most of the horizons.

Iron-oxide content in Pennsylvania and West Virginia ash runs from about 8½ to 10 per cent, whereas with Nova Scotia coals it may run from 33½ to 48 per cent. For burning coals containing high iron content under boilers, the refractory linings should be of basic magnesite or neutral chrome rather than siliceous material.

J. L. Bowlby, analytical engineer, Dominion Coal Co., Sydney, N. S., said that in Montreal less than 10 per cent ash and less than 2,600 deg. F. for ash-fusion temperature were required of coal for coking. As the Nova Scotia coal ran well under 10 per cent, it might be possible to add ash material of a type that would cause the ash to fuse at a higher temperature, which temperature could readily be determined for any percentage of addition. He would recommend that tests be made on washing the coal to remove as much of the ferric oxide, pyrite, calcite and rock dust as possible, adding to the mixture as much clay as might be found necessary, because clay, even more than silica, has the quality of raising ash-fusion temperatures. Mr. Gilmore declared that if the coal were sufficiently freed of ash, there would be little objection to a low ash-fusing temperature. No one would consider, he said, that such a softening temperature for petroleum coke would constitute any disadvantage whatsoever.

Saturating storage piles with water, said Mr. Gray, had been found to prevent spontaneous combustion. Perhaps compacting with a tractor or roller might be better, but it had not been tried on their stockpiles. Water was found to give the necessary compacting action. By spring, the entire water content thus added was found to have been evaporated. Moisture, Mr. Gilmore added, has been found to act as a catalyst, promoting the oxidation of pyrite and its spontaneous heating.

At the opening session, Mr. Nicholson presided and S. E. Muggah, Mayor of Sydney, welcomed the delegates. Mr. Nicholson made a short presidential address, and J. P. Messervey, deputy inspector of mines, Halifax, N. S., described the past year's mining activities in the province.

A joint luncheon with the Rotary Club on July 11, at which Mr. Gray presided, was addressed by Sir Newton J. Moore, president, Dominion Steel & Coal Corporation, Montreal, Que., and by Dr. Charles Camsell, Deputy Minister of Mines of the Dominion of Canada and chairman of the Dominion Fuel Board, who discussed the advantage to the coal industry of the subventions to Nova Scotia coal of close to $2,000,000, or $150 per employee, which has moved into central Canada about 2,400,000 tons of coal that otherwise would have been supplied from United States sources. Labor had received well over $5,000,000 in wages to produce this quantity of coal.

At the banquet that evening, over which Mr. Messervey presided, the speakers were Balmer Neilly, president, Canadian Institute of Mining and Metallurgy, Montreal, Que., and Mr. Hall, representing the American Institute of Mining and Metallurgical Engineers. Mr. Neilly discussed the need of a non-partisan study of taxation to see if minerals were bearing a proper, and only a proper, part of Canada's tax burdens. Mr. Hall spoke of the many notable contributions of Nova Scotia and Canada to the art of mining in America, the former being the first to locate coal on the American continent and by far the first to mine it.

At the morning session of the second day, His Excellency, the Governor General of Canada, Earl of Bessborough, then visiting Sydney, came to the session, received an engrossed testimonial from Mr. Messervey and made gracious response.

Newly Elected Officers of Mining Society of Nova Scotia

J. P. Messervey, deputy inspector of mines, Halifax, President.

A. L. Hay, assistant mining engineer, Dominion Coal Co., first vice-president.

J. R. Dinn, mine manager, Dominion No. 4, Dominion Coal Co., Glace Bay, second vice-president.

EXECUTIVE COMMITTEE

H. J. Kelley, vice-president and general manager, Dominion Steel & Coal Corporation, Sydney.

D. H. McDougall, Stellarton.

Michael Dwyer, Sydney Mines.

T. L. McCall, chief mining engineer, Dominion Steel & Coal Corporation, Sydney.

Karl Marsh, chief engineer, Dominion Steel & Coal Corporation, Sydney.

D. H. McLean, superintendent Acadia Coal Co., Stellarton.

N. T. Avard, general manager, Maritime Railway & Coal Co., Joggins.

R. N. Dickson, superintendent, Nova Scotia Steel Co., Sydney Mines.

A. K. McLeod, superintendent, Cumberland Railway & Coal Co., Springhill.

Harry Hines, resident superintendent, Dominion Coal Co., New Waterford.

D. J. McCuish, mine manager, Dominion No. 2, Dominion Coal Co., New Aberdeen.

A. E. Flynn, professor of mining, Nova Scotia Technical College, Halifax.

S. G. Naish, eastern district manager, Peacock Bros., Ltd., Sydney.

H. M. Wylde, eastern manager, Canadian Industries Ltd., Halifax.

Alexander McEachern, chief inspector, Dominion Coal Co., Glace Bay.

HOW TO START

+ And Regulate a Jig*

By BYRON M. BIRD

Chief Concentration Engineer
Battelle Memorial Institute
Columbus, Ohio

IN this article on the adjustment of a jig, I shall stress particularly the procedure for a slack feed (coal passing a screen 3 in. or smaller), for the washing of slack coal is much more difficult than the washing of sized coal. In jigging a sized feed, if the operator gets the correct speed and the proper length of stroke to produce mobility on the pulsion stroke and keeps the suction down to a minimum, he can hardly go wrong. But in jigging a slack feed, the underlying fundamental principles of which have never been fully worked out, he may easily go wrong and at best he has an almost endless opportunity for study and improvement of his work. However, whenever the conditions for a sized feed differ from those for a slack feed I shall point them out.

In jigging coal, the number of strokes per minute depends to a considerable degree upon the maximum size of particles and the depth of the jig bed. If there are particles of large size, the upward force of the water must be applied for an appreciable interval of time to put them in suspension. If the jig bed is deep, the stroke must be slow for the pulsion stroke to open the bed entirely to the top. It is not sufficient for the bed to lift in a mass; the upward force of the water must be applied for a long enough period so that each particle comes into a state of separate suspension. Then only does true mobility obtain.

The maximum number of strokes that should be used is determined by the physical laws involved in jigging. These show that size as well as specific gravity influences the jig separation; that the upward current sufficient to lift a coarse particle of coal will also lift a fine particle of refuse. However, they also show that the separation of coal and refuse during a short interval at the peak of each pulsion stroke when the bed becomes mobile is entirely according to specific gravity and without regard to size of particle.

Experience with jigs shows that suction is necessary to get the benefit of this period when the jig separates all sizes according to specific gravity. In fact, suction seems to prolong the period. Thus in place of getting a momentary separation according to specific gravity at the peak of the pulsion stroke, the skillful jig operator gets some separation according to specific gravity during most of the suction stroke. This prolonged separation according to specific gravity, though not so complete as that at the peak of the pulsion stroke, plays a very important rôle in effective jigging. If this result is to be produced, the downward currents on the suction stroke must not be swift enough to actually pull the particles of coal and refuse downward; the particles of refuse should fall faster than the water. This requirement limits the maximum speed of the jig.

Only with difficulty can we generalize on the best speed for different depths of bed, but it may safely be said that the tendency is to run jigs too fast. A number of tests on various sizes of feeds with an Elmore jig which was driven through a variable-speed transmission showed in each test that a speed lower than that usually recommended gave the best jig-bed conditions. In addition, numerous tests in washeries verify this conclusion.

In a general way the experience with slack coal may be summarized as follows: With a 20-in. bed, use 40 to 50 strokes per minute. With a 14- to 16-in. bed, use 75 to 85 strokes per minute if the maximum size of particle is 1 in. and 65 or lower if the maximum size is greater than 1 in. With beds shallower than 14 in., higher speeds may be used, even above 100 per minute. However, for reasons given later, shallow beds are not advocated, and 85 strokes per minute probably is the upper limit for jigging slack coal for maximum capacity in the jig. With sized feeds, where conditions need not be under such accurate control, higher speeds may be used, but within limits low speeds are equally effective.

Suppose the speed of a jig is increased gradually from 25 to 175 r.p.m., the plunger stroke being readjusted on each change to give mobility in the bed. As the speed is increased, up to a certain point, the efficiency may be held constant and the tonnage increased, or the tonnage may be held constant and the efficiency will automatically rise. Beyond that speed, either one or the other will drop off. Thus, because of the interdependence of these variables, one finds the anomalous situation of jigs on the same feed and with the same depth of bed having speeds varying from 60 to 120 r.p.m.; and if the capacities of the jigs are adjusted to suit the speeds, it may even be possible that one will find them equally efficient.

Although the effect of too high or too low a speed is the same—that is, a loss either in capacity or in efficiency—experience seems to indicate that it is better to err in the direction of low speed. In general a good maxim is: When every other adjustment has failed and the jig still does not effect the desired separation, try a lower speed, and with it, of course, a longer stroke to keep the bed mobile on the pulsion stroke.

In a jig that is washing unsized coal, dependence must be placed upon the suction stroke to work fine refuse to the bottom of the jig bed, as was stated in the first article of this series. At best, this is a slow process, because the bed tightens up quickly on the suction stroke. For this reason, the jig bed should be as shallow as other factors affecting the operation will permit. A shallow bed is of advantage also in the separation of coarse pieces of bone on the pulsion stroke; these latter also settle slowly, because their specific gravity is close to that of coal.

However, the jig bed should not be too shallow. Theoretically, for ideal stratification, a jig bed should be perhaps 4 in. deep; but after the stratification, the separation of the coal strata from the refuse strata would be impracticable in continuous operation with any such depth of bed. To prevent loss of coal, the bed of refuse must extend well above the top of the opening through which it is discharged. Likewise, to prevent pieces of refuse from getting into the washed coal a certain depth of coal is necessary. Thus a certain minimum depth of jig bed must be maintained.

Suppose the feed is a minus 1-in. slack coal. As the refuse opening must be about 3 in. high to prevent clogging,

*Second of a series of four articles on jigging.

the refuse bed should be not less than 6 in. deep. The refuse bed cannot be allowed safely to be thus thin unless the refuse is a "heavy" shale or the jig screens slope down to the refuse draws, as described in a later article. If the same minimum depth of coal is used, the total depth of the jig bed will be 12 in. This depth should give good results in practice, but actually a 14-in. bed is more satisfactory in most plants. If the maximum size of particle is greater, these figures should be increased, though not necessarily in proportion to the increased size of particle.

In a jig that is washing a sized coal, the discussion just given about keeping the jig bed at a minimum depth applies with less force, because no fines are present to be cleaned on the suction stroke. However, there is little object in making the jig beds too deep, for the only factor involved is a purely mechanical one of withdrawing the coal and the refuse without contaminating the one with the other.

After a decision has been made as to the depth of jig and refuse beds the next problem is to determine what the refuse bedding shall be. In single-compartment jigs where shale is the refuse material, most men are agreed that the bed should be composed of shale. But in the second or third compartments of multiple-cell jigs, where a bone-coal product is the objective, the jig should be bedded with bone. In a jig the intensity of the pulsation of water usually must be adjusted so that the part of the jig bed next to the screen becomes slightly mobile. This means that the upper and lighter part of the jig bed always is too mobile for the sharpest separation. In the second compartment of a jig, where a delicate separation is being attempted between bone and coal, it is of the utmost importance, therefore, to have only bone on the bottom layer, so that the pulsation of water may be no stronger than absolutely necessary.

There also is a further objection to having a shale bed in a second compartment. In the ideal jig operation, shales should be kept in the jig only a short time, in order that they may not disintegrate and contaminate the circulating water system. Of course, no baffles or lips should be used to retain any permanent shale bed in a jig. The refuse and also the bone draws should be set to hold the proper depth of refuse or bone bed on the screen, but the entire bed should be constantly moving out of the jig.

A special bedding problem of some interest sometimes arises when a company puts in single-compartment jigs to prepare a steam coal and later wishes to prepare a coal for coke making. In this case both the bone and the shale must be separated in the one compartment and must be removed through the same refuse draws.

Here, as the important problem is the removal of bone, the compartment should be bedded with that material; consequently some drastic means must be used to keep a shale bed from forming. In one plant where this problem arose, the company sloped the screen plates 1½ in. to the foot toward the refuse draws, and then, in order to keep uniform water distribution over the jig screens, it bored special plates with a small percentage of openings on the high end and a gradually increasing percentage toward the low end, as described in a forthcoming article. With this steep slope the shale moved forward rapidly and formed only a thin layer, leaving the jig bedded with bone.

When a jig is being started for the first time, the length of stroke and the quantity of water must be roughly set to get the jig in operation. For a preliminary setting on minus 1-in. coal the total vertical travel of the plungers per minute may be set at 200 in. This figure divided by twice the number of strokes per minute gives the approximate length of stroke. For example, if 85 strokes are to be made per minute, the travel of the plunger per revolution of the eccentric will be 200 in. ÷ 85 = 2.35 in. and the stroke will be 2.35 in. ÷ 2 = 1.17, or roughly 1¼ in.

For minus 3-in. coal the travel of the plunger should be approximately 300 in. For a nut coal between minus 3 in. and plus 1 in. the travel of the plunger should be about 450 in. These approximate strokes, which will serve for the setting of the jig preliminary to operation, must, of course, be adjusted to suit conditions after the jig has been bedded.

After a jig is in motion and is supplied with water and coal, a period of bedding must follow in which either a layer of shale or bone forms on the screen. During this period the important detail to watch is keeping the bed in a fluid condition on the pulsion strokes. As soon as a bed of refuse of the predetermined depth has accumulated, the refuse draw should be adjusted to hold it at that depth. This is an important point in getting a quick adjustment of a jig, for the length of stroke and quantity of water are materially affected by the depth of refuse bed. After the jig is in continuous operation, refinements may be made in adjusting water and stroke.

In a general way, with a given speed, lengthening the stroke increases both pulsion and suction and increasing the water increases pulsion and decreases suction. Vice versa, shortening the stroke decreases both pulsion and suction and decreasing the water decreases pulsion and increases suction. From this it follows that pulsion and suction must be adjusted simultaneously. If the operative, after feeling the bed, decides that it is too mobile, he has the alternative of cutting down the water or shortening the stroke. If he wishes to leave the degree of suction as it is, he shortens the stroke and reduces the quantity of water somewhat at the same time. If he wishes, instead, to increase suction, he cuts down on the water still more. If he wishes to decrease suction as well as mobility, he shortens the stroke and increases the water. In this manner any degree of pulsion or of suction can be obtained. However, he must in all combinations maintain mobility in the bed on the pulsion stroke. This is necessary, even when strong suction is required to clean fine sizes of coal.

If the speed of the jig is in proper relationship to the depth of bed and size of particle, a skillful operative can readily get correct conditions on the pulsion stroke by feeling the jig bed with his arm. At the same time he can get a rough adjustment of the degree of suction by increasing it until fine coal appears in the hutch product.

So far as the pulsion stroke is concerned, when he has a condition of minimum mobility, he has exhausted its possibility,* and if the coarse sizes are not clean enough, he must draw more bone coal and, with a single-compartment jig, he may be compelled to form a bone in place of a shale bed.

However, he has by no means exhausted the possibilities of the suction stroke with this rough setting. There is great latitude in its use. It may be anything from a gentle suction produced by only a small quantity of water returning to the hutch to a powerful suction produced by the bed acting as a valve to stop the downward flow of a heavy column of water. Apparently the only limit to the strength that may be used with beneficial results under some conditions in cleaning the fines is that the downward velocity of the water shall not be swifter than the falling velocity of the particles of refuse in the jig bed.

There is an alternative to very strong suction that is seemingly equally potent: namely, enlarging the perforations in the screen plates. This scheme seems to have merit, because it cuts the power consumption and reduces the strain on the jig. A number of plants use perforations as large as ⅜-in. diameter successfully in combination with a gentle suction stroke to clean the fine sizes. If the feed happens to contain flaky impurities, such as the "rash" in Alabama coals, large perforations in combination with suction constitute one very effective means of removing these impurities.

*Of course, if he is so fortunate as to have one of the new jigs that permit of changing the type of pulsion stroke, he has almost unlimited possibilities for further work with the pulsion stroke.

(This series of articles will be continued in an early issue of Coal Age)

AUTOMATIC TRAMWAY

+ Solves Refuse Disposal at Fordson

By J. H. EDWARDS
Consulting Editor, Coal Age

MODERNIZATION of refuse-disposal facilities at the No. 7 mine of the Fordson Coal Co., at Stone, Ky., was effected recently by the installation of a completely automatic two-bucket aerial tramway, storage bins for night dumping of rock and a self-dumping disposal car. The equipment replaces a single-bucket system, delivering refuse over a restricted area, which had grown inadequate and obsolete under present operating conditions. By an expenditure of approximately $25,000, the company has substantially reduced operating costs, provided facilities for many years to come and put itself in a position to earn a handsome annual return on the investment necessary to make the system fully automatic.

The tramway carries mine rock and tipple refuse from the tipple for a distance of 680 ft. and up an elevation of 200 ft. The refuse is then dumped into the refuse car and transported on a track around the hill and dumped either parallel to or at the end of the track. To take care of rock loaded out of mine cars at the tipple at night and at the same eliminate the employment of a night operator on the dump car, a 1,000-cu.ft. steel storage bin was erected at the bucket discharge tower at the top of the hill.

Automatic operation was assured by the use of automatic starting equipment on the hoist, volume or material-level switches in the tipple bin and in the hilltop storage bin, automatic batching equipment to load the buckets and an electrical control system for proper sequence of operation and for limiting travel. The sequence of operation is as follows:

When the small dump bin at the tipple is filled, a volume-control switch in this bin starts a reciprocating feeder if a tramway bucket is in loading position. The refuse is fed into a batcher supported on scale beams. When the batcher has been filled to a predetermined weight, the feeder stops and a Thrustor motor opens the bottom gate of the batcher in the proper direction. After an interval to allow the batcher to discharge into the bucket, the tramway hoist—located at the top of the hill—is started. The loaded bucket discharges into the hilltop storage bins. After another interval, the hoist begins operating in the reverse direction, provided feeder and batcher have filled the second bucket. Automatic operation of the tram continues until the hilltop storage bin is full enough to cause the volume switch to act or until the small bin at the tipple is emptied to operate the lower limit of its volume control.

As is shown in Fig. 2, the batcher is so designed that it can load either bucket, even though the buckets come to rest in different locations, by swinging the wide bottom gate of the batcher to one side or the other. Two G. E. Thrustor motor-hydraulic units open and close the batcher bottom.

Buckets are 1½-cu.yd. capacity and dump through the top by tipping caused by the buckets striking against chains stretched across the dump-bin tower. The buckets return to normal position by gravity as they leave the tower. Track ropes from a dismantled tramway were used in the new installation. The refuse is handled from the tipple to the terminal of the tram by the waste bank in a 1½-cu.yd. self-propelling electric car which dumps to either side or to the front. The electric control provides series-parallel starting in the forward direction and dynamic braking in reverse. There is a 7 per cent grade against the load. Dynamic and mechanical braking are hydraulically operated. Journals are equipped with tapered roller bearings.

The tramway equipment was furnished by the Hanson Equipment Co. Fordson engineers worked out certain of the automatic and control features of the system. The double-drum Hanson hoist used to operate the tramway is powered by a 50-hp. 440-volt Type MTC General Electric motor, fitted with a Thrustor-operated brake. Automatic control equipment for the hoist motor, the electric control for the dump car and other interlocked electrical equipment on the tramway were supplied by the Electric Controller & Mfg. Co. Mechanical connection from driving motor to the hoist shaft is through a Foote Bros. reduction gear. The electric dump car was made by the Differential Steel Car Co.

Fig. 1—Indicating General Arrangement at Loading Terminal.

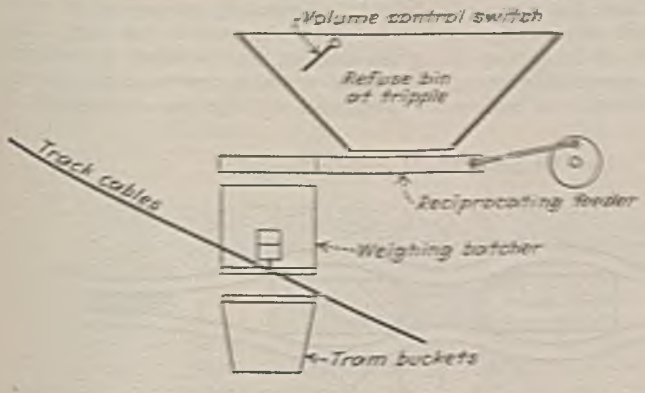
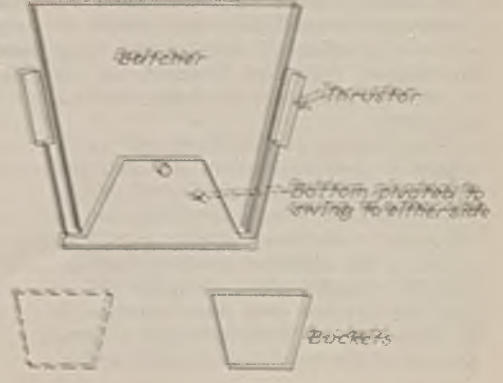


Fig. 2—Positions of Batcher and Bucket Loading Locations.

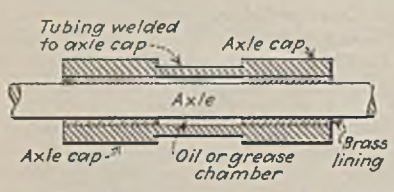


OPERATING IDEAS

From Production, Electrical and Mechanical Men

Revising Locomotive Parts Saves Wear

Normally, the inner ends of each of the two axle caps which make up the several pairs on which mine-locomotive motors are mounted are entirely unprotected against the entrance of dirt. Outer ends, however, are protected on one side of the locomotive by the wheel hub and on the other side by the gear hub. In addition, the axle caps soon become loose, due to the rapid wear growing out of the short dovetail of the motor case and the greater leverage on the axle. To eliminate these



Showing Tubular Connection Between Axle Caps

difficulties, the Pennsylvania Coal & Coke Corporation, Cresson, Pa., connects each pair of axle caps by welding a tube between them, as shown in the sketch. This connection furnishes a rigid support and provides a chamber in which oil or grease can be held for the lubrication of the axle lining.

As the connecting tube is not lined and is of the same bore as the outside of the brass lining, a large oil reserve is available. In addition, motors are kept in proper position with reference to the axle, thus decreasing the strain on the bolts and breakage or stripping of the threads.

To avoid discarding entire thrust brasses after wear, they are made ¼ in. longer than standard, and one ⅛-in. and two 1/16-in. brass collars are placed over them. These collars lie between the thrust surfaces of the brasses and journal boxes, respectively, and are removed as they are worn out, thus avoiding replacement of the brasses themselves.

Frequent trouble also was experienced with the reverse cylinders of drum controllers, due to contactor plates, which were held in place solely by screws in wood, working loose. Constant movement of the contactor plates resulted in enlargement of the screw holes. Consequently, the plates could not be held in place. This was readily corrected by making the diameter of the drums ¼ in. larger than originally designed and sinking the contactor plates flush with the hard maple drum. Thus sunk into place they could not move in any direction, and the screws not being subject to strain, their hold on the contactor plates was not weakened. These drum cylinders are impregnated with hot paraffin at 85 lb. pressure.

Axle suspension brasses should entirely surround the axle, but it is necessary to have an opening through which the oil or grease will pass and in which the lubricant can be held till needed. However, if this opening is too large, the brasses are weakened, thus causing excessive wear. Experience has shown that these openings usually are made four times as large as are necessary. With small openings, the life of the brasses is extended.

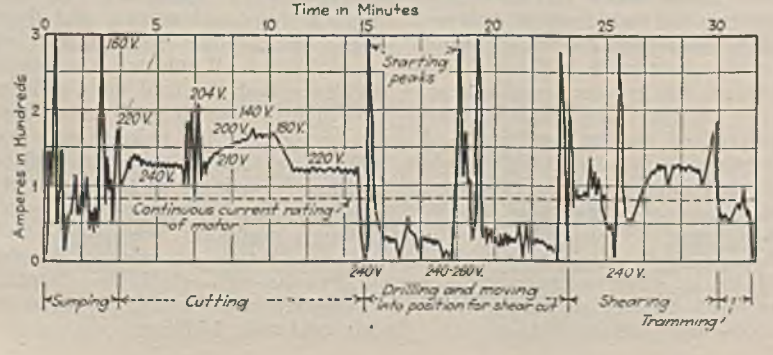
A frequent source of trouble in the past grew out of the passage of the return current from locomotive motors through the bearing, which is always covered by a film of oil. This recognized way of returning the current causes pitting and resistance. To reduce this, steel brushes have been applied to the top sides of the locomotive wheels just below the flange, and the ground lead of each motor has been attached to this brush. This shunts the electric current round the bearings and conducts the return current of the motor directly to the rail.

Protecting Machine Motors

Underground mining machines such as cutters, loaders, room hoists, coal saws, scraper loaders, etc., operate on an intermittent duty cycle ranging from no-load to two or three times full load. Such widely varying motor current makes protection of the motor by conventional methods practically impossible, according to I. H. Coen, coal mining engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. As a result, maintenance is increased.

The irregular nature of the work performed by mining machines requires that current overload relays, when used, be set high enough to allow the motors

Fig. 1—Load Chart for a Track-Type Cutting Machine With a 9-Ft. Cutter Bar, Showing Current Consumption of the 50-Hp., 210-Volt, 1,600-R.P.M. Motor; Calculated R.M.S. Current, 114 Amp. for 32½ Minutes.



to carry high loads for several minutes at a time and at frequent intervals. Motors may be operated safely under these varying load conditions provided the effective heating current (r.m.s.) does not exceed the continuous current-carrying capacity of the motors. The continuous or r.m.s. rating of a motor is the most accurate measure of the amount of work the motor is capable of performing without overheating.

Most mining-machine motors are rated on an intermittent basis of 1, ½, or ¼ hour, the nameplate ratings usually being from 1½ to 5 times their continuous rating. Consequently overload relays set for 1½ or 2 times the nameplate current rating may permit the motor to operate on 6 to 10 times the continuous current carrying capacity of the motor.

It is obvious that current-actuated overload relays on these applications do not prevent the motor from operating continuously on excessive current, which will overheat and damage the motor insulation. Such loads may be imposed on mining machine motors due to low voltage, excessive mechanical friction in the machine, extra hard working conditions, high rate of working due to high voltage, or working on a fast duty cycle requiring more power than the motor is capable of developing without overheating.

The maximum r.m.s., or continuous current load, a motor is capable of operating on safely is that current which will not raise any part of the motor beyond a temperature of 105 deg. C. for Class A insulation or 125 deg. C. for Class B insulation. Low ambient temperatures encountered in mines naturally permit a motor to develop greater loads than when operating in higher room temperatures, such as in industrial plants.

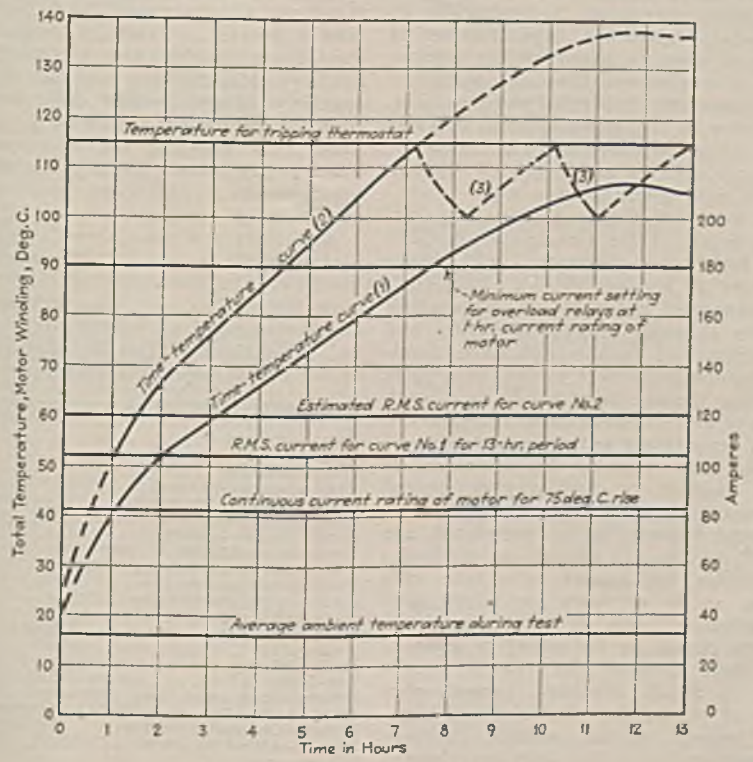
Most mine operators desire to get the greatest production from their mining machines without excessive maintenance cost and will not tolerate an overload relay which trips out on moderate peak loads, thus interrupting production, even though maintenance cost due to overloading increases. A temperature relay will permit the motor to work within the current range of the overload relay setting and at the same time will protect the insulation from excessive heating by stopping the motor long enough to allow the temperature to drop several degrees. This is accomplished by mounting a thermostat inside the motor to open the control circuit or operate a signal when an excessive temperature is reached.

Fig. 2 shows a time-temperature curve for a typical cutting-machine motor when operated on r.m.s. current above its maximum continuous current carrying capacity. Under the normal operating conditions represented by Curve No. 1, the motor will never reach a temperature high enough to trip the thermostat or to damage the motor insulation. However, should the r.m.s. current be increased by any cause, the motor temperature will exceed a safe operating temperature, as indicated by Curve No. 2. The thermostat will then reclose after the surrounding temperature has dropped approximately 20 deg.

Still Going Up

Coal production still continues its encouraging climb from the depths of the depression, bringing in its train increased employment, higher wages and a resumption of operations at many closed mines. Better business, however, does not mean a relaxation of the drive for lower costs and higher efficiency, which makes it necessary for operating men to keep up with the advances made by the industry. These pages will continue to be the clearing house for worth-while material for the use of operating, safety and electrical men, and the editors will continue to welcome suitable ideas. Send yours in. *Coal Age* will pay $5 or more each for those that are acceptable.

Fig. 2—Time-Temperature Curves for a 71SK Cutting Machine Motor (1) Operating on the Load Shown in Fig. 1, or an R.M.S. Current of 104 Amp. for a 13-Hour Period, and (2) on an R.M.S. Current of 120 Amp. Curve No. 3 Shows the Estimated Cooling Time of the Motor.

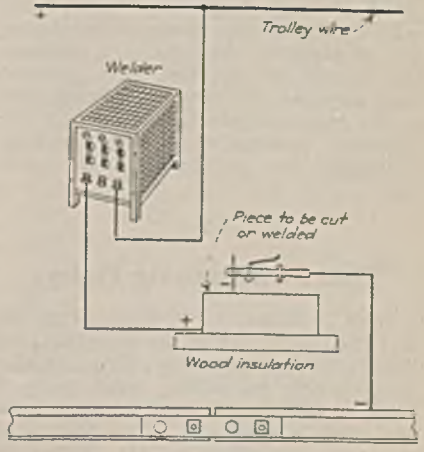


Reversed Polarity Provides Heat For Welding and Cutting

Declaring that it is well known that the positive side of an electric arc is hotter than the negative side, a recent issue of *O-B Haulageways* gives a practical method of hooking up resistance welders for carbon-arc cutting and shop welding. Naturally, then, the work to be welded or cut should be on the hotter side of the line so that the arc penetrates or heats up the larger mass and not the electrode. Ordinarily, when applying rail bonds the electrode is positive because it is connected to a positive trolley wire. For shop welding and cutting, however, it is a simple matter to reverse the polarity, as shown in the accompanying sketch.

When the polarity is reversed, the

Suggested Hook-up for Best Results in Shop Welding or Carbon-Arc Cutting

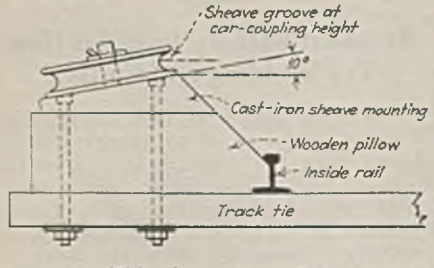


resistance type of welder is connected to the positive side of the circuit and then to the piece to be welded or cut. This piece must be insulated from the ground by placing it on a block of dry wood or a strip of rubber. The electrode holder is then connected to the return circuit. With this type of connection, the electrode switch on the welding machine may be opened when it is necessary to cut off the current to handle or inspect the piece.

Reverse Pitch to Sheaves Avoids Pin Trouble

At a western Pennsylvania mine where a slope is used for handling materials and bringing equipment to the surface for repairs, improvements in the method of setting sheaves has eliminated the rope trouble formerly experienced. The straight track projecting from the slope is raised above the ground level by a ramp, and from this track a turnout and a large-radius curve lead to the supply yard.

Officials found that it was impossible to install the sheaves horizontally be-



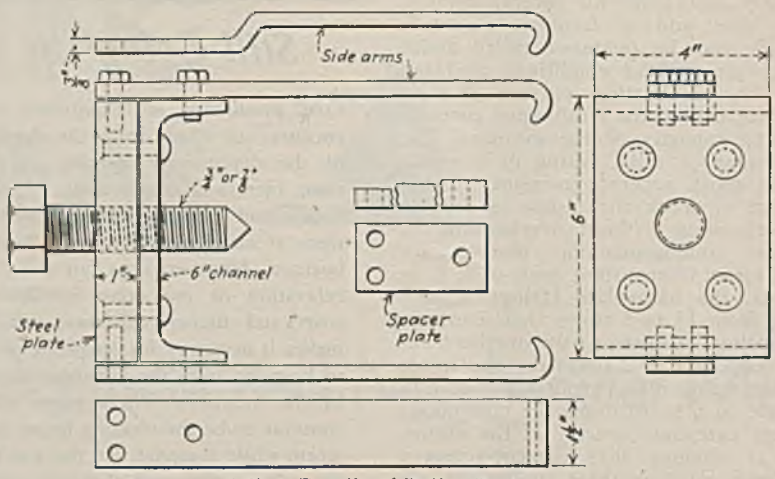
This Sheave Stays Put

tween the tracks, due to the lack of clearance over the ties. Consequently, the sheave was placed outside the inside rail of the curve, as shown in the accompanying sketch. The bevel on the wooden pillow block and the cast-iron sheave mounting guide the rope into the sheave groove without a hitch.

One important detail of design is the reverse pitch given the sheave. Experience has shown that when the sheave was set horizontally or pitched toward the track, trouble was encountered through breakage of the pins, which allowed the sheave to be shifted out of place by the rope. In addition, the outside rail on the curve has not been elevated, the contention being that, at the speed at which trips usually are operated, banking would only result in crowding the car against the inside rail.

Tool for Removing Pulleys

John J. Nolan, Terre Haute, Ind., offers the tool shown in the accompanying illustration for removing pulleys. It also is applicable to pulling small gears if some means of preventing the arms from spreading is employed. One feature of the tool, according to Mr. Nolan, is



Salient Details of Pulley Remover.

the possibility of using one size on a variety of pulley sizes by the addition of the necessary puller arms and spacer plates. For pulleys from 6 to 8 in. in diameter, a 6-in. channel can be used; for greater diameters, a large channel is recommended. A piece of heavy cold-rolled or mild steel is either riveted or welded to the back of the channel, and the assembled member is bored for a ¾- or ⅞-in. bolt of the proper length.

Two types of side arms for handling different sized pulleys are shown. These are attached to the channel and steel backing plate with capscrews. By using spacer plates of various thicknesses and longer capscrews, still greater flexibility is possible. Side arms may be made of ⅜x1½-in. cold-rolled steel for pulleys up to 10-12 in. in diameter, but ¼x2-in. or larger steel is recommended by Mr. Nolan for sizes above this limit.

C. & O. Record System Forestalls Breakdowns And Reduces Maintenance Cost

MAINTENANCE systems devised solely for the purpose of making repairs after equipment breaks down have been abandoned by practically all up-to-date operating organizations in favor of systems based on the prevention of breakdowns through continuous and systematic inspection and servicing. Adoption of the latter system also has as a major objective the elimination of personal injuries and property damage due to equipment failures.

In line with these objectives, operating officials of the Chesapeake & Ohio Ry. fuel mine operations, with headquarters at Eunice, W. Va., base their maintenance program on forestalling repairs through proper inspection and servicing, and to this end have developed a comprehensive system of reports covering the operating condition of each piece of equipment or plant division. On these reports are entered the results of regular inspection by the operatives of each machine or employee designated to inspect plant divisions.

These reports, when completed, are turned to the electricians or mechanics responsible for repairs, who take such action as is necessary or advise why no action is taken, in both cases entering the details on the report in question, and then forward the reports to the desk of H. B. Husband, general manager of operations. Insistance of regular reports serves several purposes. Operatives know that they are charged with responsibility for the proper operation of their equipment and for detecting and reporting conditions which may result in a breakdown, and therefore take a greater interest in both, thus forestalling trouble and increasing efficiency. Maintenance men are advised regularly of prospective difficulties in time for the proper remedies to be applied, thus avoiding the high cost of major breakdowns. Finally, the general manager has a continuous record of the condition of equipment.

Machinery and plant divisions covered by the report system include: headhouse machinery, bottom tipple machinery, incline drums, locomotives, mining machines, pumps, fans, hoisting machinery, and substations. Items included in each of the report forms are as follows:

HEADHOUSE MACHINERY

Conveyor rope
Buttons
Splice buttons
Head sheave—general
Head sheave—segments
Head sheave—rollers
Head sheave—gears
Stove in compressor room
Slate conveyor—general
Slate conveyor—motor
Slate conveyor—starter
Slate conveyor—belting
Slate conveyor—driving gears and sprockets
Main driving gears—general
Tex-Rope drive
Intermediate gears and pinions
Main shaft—driving gears and pinions
Motor—General Electric
Motor—Allis-Chalmers
Brake—solenoid

HEADHOUSE MACHINERY (Continued)

Brake—hand-emergency
Brake—linings
Brake—wheels
Coal feeder—driving gears
Coal feeder—shaft
Coal feeder—conveyor
Panel boards and switches
Electrical wiring
Car feeder
Scales
Dump
Coal bins
Weigh basket
Compressor
Compressor motor
Tracks at tipple
Steps
Telephones
General conditions of headhouse

BOTTOM TIPPLE MACHINERY

Car retarders
Car retarder ropes
Screens
Bottom bull wheels
Bottom portion of conveyor
Shaker arms on screens
Drive shaft to shaker screens
Shaker screen—motor
Coal bin for house coal
Picking table and loading booms
Boom motors
Boom hoist
Boom hoist motors
Remixing cross conveyor
Remixing cross conveyor motor
Slate and house-coal conveyor
House-coal storage bin
Slate and refuse storage bin
Slate and house coal conveyor motor
Clearance under tipple
Starting switches
Electrical wiring
Foundation
Condition of tracks under tipple
Condition of waiting shanty
Lighting fixtures
Telephones
Stoves
Remarks

MECHANICAL LOADER NO. ..

Motor
Wiring
Resistance
Cables
Lights
Controller
Oil and greasing system
Jib shaft
Main drive shaft
Jib crankshaft and bearings
Propelling chains
Jib chains
Front conveyor chains and belt
Rear conveyor chains and belt
Drive chain between axles
Shovel
Guards over jib chains
Journals
Axles and boxings
Jib carriage rollers
Wheels
Hydraulic
King pin
Yoke belt
Jib friction
Traveling friction
Main frame
Buffer springs
All chain sprockets
Main drive bevel gear and pinion
Traveling bevel gear and pinion
Jib bevel gear and pinion
General condition of loader
Power supply—approximate voltage
Remarks

INCLINE DRUMS

Incline ropes
Rope sockets
Track on incline
Incline rollers
General condition of incline
Stoves in drum house
Sheave wheels
Drums—general condition
Brake bands
Brake levers
Brake chains
Brakes—general
Drum laggings
Main bearings
First-aid materials
Telephones
Safety device to derail cars
Remarks

LOCOMOTIVE NO. ....

Field coils
Armatures
Wiring and headlights
Controller
Cable
Cable switch
Resistance
Clutch and reel
Trolley pole
Journal lining and journal boxes
Axles and axle linings
Split gears and pinions
Tires
Axle caps
Intermediate drive shaft for cable reel
Brake rigging
Main frame and bumpers
Greasing system
Sand rigging
Cable pulley and guide
General condition of locomotive
Remarks

MINING MACHINE NO. ....

Cutter-bar motor
Tramming motor
Wiring
Controllers
Cable
Resistance
Reel
Main frame
Gears
Elevating screws
Wheels and axles
Chain sprockets
Drive chains
Cutter-chain drive sprocket
Chain guides
Cutter bar
Brake
Oil system
Ropes
Friction
General condition of machine
Remarks

MINE PUMP AT ....

General condition of motor
Armature
Commutator
Brushes
Resistance
Starting box and switch
Fuse and wiring
Oil wells and greasing system
Bearings
General condition of pump
Packing
Gears
Pinions
Valves
Valve springs
Check valves and petcocks
Gaskets
Oil wells and greasing system
Bearings
Main frame and trucks
Safety guards and shields
Hose and piping

FAN AT MINE NO. ....

General condition of motor
Wiring
Slip rings
Armature
Brushes
Resistance
Controller
Low-voltage release coil
Power disconnects
Oil wells and grease cups
Motor bearings
Fuses
Overload relay settings
Amps.
General condition of fan
Main bearings
Tex-Ropes or belting
Greasing system of fan
General condition of building
Time started.....Time shut down.....

HOISTING MACHINERY

Rope
Rollers
Pinions
Intermediate gear
Main gears
Brake
Friction
Controller
Fingers, etc.
Wiring and switches
Resistance

HOISTING MACHINERY (Continued)

Shafts
Drum
Foundation
Bull Wheel
Telephone
General condition of hoist house
Remarks

OPERATING CONDITION OF SUBSTATION

Substation .....Shift.....
Time started.....
Time shut down.....
General condition of substation
Lightning arresters
General condition of building
General condition of units
Bearings
Date oil was changed
Frame
General condition of a.c. motor
Windings
Brushes
Slip rings
General condition of d.c. generator
Windings
Commutator
Brushes
Connections
General condition of switchboard
A.C. panels
Oil switches
General condition of contacts
Date oil was changed
Overload relays
Relay settings
No-voltage release coil
Main disconnects
Meters
D.C. panels
Hand breakers
Overload settings
No-voltage release coil
Knife switches
Meters
Automatic panel
Main operating coil
Overload relays
Demand line relay
Demand line lights
No. of times breaker kicked this shift
Telephone
Stove
Fire extinguishers
Thermal relays
Remarks

With the exception of reports on the condition of incline drums, hoisting machinery and substations, which must be submitted daily, reports of inspections are turned in weekly with the time sheets. In case a defect is found during examination of the equipment, the man making the inspection is required to call the dispatcher immediately and submit a special report in writing at once.

As a further check on maintenance, particularly the cost of repairs, a system of record cards covering each piece of equipment has been installed. When supplies are issued to repair a machine, a report is forwarded to the office, together with a record of the cost of making the repairs. These items, cost of supplies and labor, are then entered on cards to make a permanent record. These cards show which machines give the most trouble, which particular parts have to be replaced most frequently and, further, serve as a check on the man in charge of the machine covered by a particular card.

The card-record system, like the report system, has been in use since 1924. Supply costs are now two-fifths of the 1924 figure, in spite of the fact that mechanical loading has been in effect since 1926. The total cost of maintaining machinery (supplies and labor) has shown an improvement roughly paralleling that of supply cost.

WORD from the FIELD

Southern Ohio Agency Formed; West Kentucky Incorporates

Southern Ohio operators last month completed the organization of Southern Ohio Coals, Inc., and elected the following officers: president, George K. Smith, president, Sunday Creek Coal Co.; vice-president, E. H. Davis, and secretary, Gilbert K. Mitchell, both of the New York Coal Co.; treasurer, S. Cottingham, Essex Coal Co. The agency will handle coal from the Hocking Valley, Pomeroy, Crooksville and Jackson districts.

Western Kentucky operators reported to control 83 per cent of the tonnage of the district voted to incorporate a regional sales agency named the Kentucky Coal Agency, Inc., at a meeting at Evansville, Ind., July 19. Contracts, it is understood, will be submitted at another meeting in the future, and it is expected that over 90 per cent of the tonnage in the district will come into the organization.

First-Aid Meets Held

The annual first-aid meet of the Pennsylvania Coal & Coke Corporation and its affiliates, held at Cresson, Pa., July 14, was won by the Nanty-Glo team of the Webster Coal & Coke Co. Second and third places went to the Ehrenfeld No. 1 and Arcadia No. 2 teams of the parent company, respectively.

Victor No. 10 team took first honors in the first-aid meet of the Carrolltown, Cherrytree, Springfield, Russel and Penn Run coal companies, held at Emeigh, Pa., July 15. The Emeigh team took second place, while third honors went to the St. Benedict team.

New Preparation Facilities

New contracts for preparation facilities at various coal operations were reported as follows in July:

Block Coal & Coke Co., Mine No. 2, Turley, Tenn.; contract closed with the Morrow Mfg. Co. for a three-track screening installation, including feeder, screens, two loading booms, rescreen and steel structure; capacity, 125 tons per hour; to be completed about Aug. 15.

Johnstown Coal & Coke Co., Portage, Pa.; contract closed with the Link-Belt Co. for screening and loading plant for mine-run, 2x⅜-in. nut and ⅜-in. slack; capacity, 150 tons per hour.

Pardee & Curtin Lumber Co., Webster Springs, W. Va.; contract closed with the Link-Belt Co. for equipment for complete screening and loading plant for shipping 3x1¼-in. and 1¼x⅜-in. nut; capacity, 75 tons per hour.

Pittsburg & Midway Coal Mining Co., Pittsburg, Kan.; contract closed with the McNally-Pittsburg Mfg. Corporation for

Norton cleaning system for treating 5x⅜-in. coal; capacity, 100 tons per hour; also Pittsburg adjustable double-roll breaker for preliminary crushing and new main conveyor. Pittsburg & Midway also let a contract to the Link-Belt Co. for gondola car dumper and electrical equipment for handling fifteen gondola cars per hour.

Shuler Coal Co., Waukee, Iowa; contract closed with the Link-Belt Co. for railroad and domestic coal storage pockets and loading plant to handle 6- and 2-in. lump, 6x2-in. range, 2x1¼-in. nut and 1¼-in. slack; domestic pockets equipped with screening chutes and rescreen loading booms; capacity, 125 tons per hour.

Standard Coal Co., Wheatland, Ind.; contract closed with the Link-Belt Co. for screening, conveying and storage plant with loading chutes to handle 1¼x0-in. coal, screening at ½ in.; capacity, 100 tons per hour.

Susquehanna Collieries Co., Pennsylvania colliery, Mt. Carmel, Pa.; contract closed with the Hydrotator Co. for Hydrotator to clean barley; capacity, 42 tons per hour.

Universal Coal Washing Co., Pinckneyville, Ill.; contract closed with the McNally-Pittsburg Mfg. Corporation for Norton washing system for treating 2x0-in. coal; capacity 100 tons per hour.

Windsor Coal Co., Windsor, Mo.; contract closed with the McNally-Pittsburg Mfg. Corporation for Norton washer to clean 1¼x0-in. coal; capacity 60 tons per hour.

Coal Production Up

Bituminous coal production rose to 29,457,000 net tons in July, according to preliminary estimates by the U.S. Bureau of Mines. Production in June was 25,320,000 tons, and the output in July, 1932, was 17,857,000 tons. Anthracite production was 3,673,000 net tons in July, against 3,928,000 tons in June and 3,021,000 tons in July, 1932.

Total production of bituminous coal in the first seven months of this year was 174,667,000 tons, an increase of 12,222,000 tons, or 7.5 per cent, over the total of 162,445,000 tons in the same period in 1932. Anthracite output in the first seven months was 26,060,000 tons, a decline of 1,123,000 tons, or 4.1 per cent, from last year's comparative total of 27,183,000 tons.

Mine Activity Up

Reflecting the increasing call for coal, resumptions at mining operations throughout the country were increasingly frequent in July. Included in the soft-coal reopenings reported were the following: Nushaft mine, Rockvale, Colo.; Bell & Zoller Coal & Mining Co., Zeigler No. 1, Zeigler, Ill.; Akron Coal Co., Rigby mine, Senecaville, Ohio; Cambridge Collieries Co., Cleveland mine, Senecaville; Ohio Mining Co., Jacksonville (Ohio) mine; Lowber Gas Coal Co., Fayette mine, Fayette City, Pa.; Poland Coal Co., No. 3 mine, Poland Mines, Pa.; Pulaski Iron Co., No. 2 mine, Eckman, W. Va. In addition, it was reported that the following southern West Virginia companies had materially increased operations: Cannelton Coal & Coke Co., Crab Orchard Improvement Co., and the Kanawha & Hocking Coal & Coke Co.

Anthracite resumptions reported in July were as follows: Hudson Coal Co., Delaware and Laurel Run collieries, Laflin and Pine Ridge breakers; Lehigh Valley Coal Co., Exeter colliery; Pittston Co., Underwood colliery (No. 9 scheduled for later operation); Philadelphia & Reading Coal & Iron Co., Reliance colliery; West End Coal Co., West End colliery.

Anthracite Rates Cut

Eastern anthracite carriers were granted permission by the Interstate Commerce Commission on July 22 to file on ten days' notice reduced rates on hard coal to points in Westchester County and on Long Island, New York, and to New England territory. The new tariffs, providing for reductions of from 28c. to $1.24 per ton, will go into effect Aug. 11.

Machinery Group Formed

For handling the common problems of manufacturers of machinery and allied products in the preparation of codes of fair competition and for the promotion of long-term stabilization of the industries concerned, the Machinery & Allied Products Institute has been organized, with headquarters at Chicago. Membership is open only to related trade associations, which will retain their identity. Officers are as follows: president, John W. O'Leary, president, Arthur J. O'Leary & Son Co., Chicago; vice-president, Harry C. Beaver, president, Worthington Pump & Machinery Corporation, Harrison, N. J.; secretary, Paul C. DeWolf, vice-pesident, Brown & Sharpe Mfg. Co., Providence, R. I.; treasurer, Robert H. Morse, president, Fairbanks, Morse & Co., Chicago.

Bituminous Coal Points for Code Hearings

NRA Organizes Board to Halt Industrial Disputes

WITH the submission of codes of fair competition by eighteen groups in July and the early days of August, the bituminous industry began preparations for the expected contest with representatives of the United Mine Workers over the question of non-union operation—a principle of the majority of the measures filed—and hours of labor. Hearings on the several proposals submitted by the various branches of the soft-coal industry were originally set for Aug. 14 before Deputy Administrator Kenneth M. Simpson. Late in the evening of Aug. 2, however, National Recovery Administrator General Hugh S. Johnson advanced the date to Aug. 9—presumably because of spreading labor troubles in Pennsylvania (p. 286 of this issue).

Anthracite operators, on the other hand, refused to break the silence which they have maintained since the passage of the National Industrial Recovery Act, though rumors were current early in August that a code would soon be filed, now that the bituminous rush is over.

In announcing that hearings on the eighteen bituminous codes would begin Aug. 9, the National Recovery Administration pointed out that "these codes in their present form merely reflect the proposals of the bituminous coal industry, and none of the provisions contained in them were to be regarded as having received the approval of the Recovery Administration.

"The associations submitting the codes each claimed to represent from 60 per cent to 100 per cent of the tonnage in their various districts. Their hour and wage provisions differ widely, as follows:

"1. Coal Trade Association of Indiana proposes a 32-hour week, with minimum rates of 50c. an hour for inside labor and 40c. an hour for outside.

"2. Southern Ohio Coals, Inc., proposes 48 hours, with 39c. an hour inside and outside.

"3. Northern Coal Control Association, claiming 60 per cent of the tonnage in Pennsylvania, Ohio, Maryland, northern and southern West Virginia, proposes 40 hours, with 50c. an hour inside and 37½c. an hour outside. Appalachian Coal Association, claiming 70 per cent of the tonnage in eastern Kentucky and Tennessee, subscribes to the same code as regards hours, but fixes wages at from 45 to 32½c. per hour.

"4. Coal Control Association of Georges Creek and Upper Potomac proposes 40 hours and 38 to 45c. inside and 32½ to 33½c. outside.

"5. General code proposed by the joint group of miners and operators of Pennsylvania, West Virginia, Ohio, Indiana, Michigan, Iowa, Kentucky, Arkansas, Oklahoma, Colorado, Montana and Wyoming proposes inside wage rates of 59.4c. per hour to 62.5c. per hour; outside, 50c.

"6. Alabama Mining Institute proposes 40 hours, with 30c. inside and 25c. outside.

"7. Southwestern Coals, covering Kansas, Missouri and Oklahoma, proposes a 40-hour week, with 44c. inside and 41c. outside.

"8. Iowa Coal Operators' Association proposes a 48-hour week, with inside 55.7c. to 58.7c.; outside, 50c.

"9. Tennessee-Georgia code proposes 48 hours, with 25c. an hour inside and outside.

"10. Off-Railroad Coal Mine Operators, of Illinois, propose 30 hours and 50c. an hour.

"11. Coal Producers' Association of Illinois proposes 48 hours, 63.3c. per hour inside; outside as per contract with the union.

Acme

Gen. Hugh S. Johnson

Administrator, National Industrial Recovery Act

"12. Illinois Progressive Miners' code proposes a 30-hour week at 83.3c. per hour.

"Other groups submitting codes were the Rocky Mountain-Pacific group; operators of Appanoose and Wayne Counties, Iowa; Vermillion County Small Coal Operators' Association; Spadra-Clarksville Coal Co.; Preston County Coal Operators' Association of West Virginia.

"There are still other coal associations which have signified their intention of submitting additional codes."

The principal provisions in a number of the codes submitted are summarized on pp. 280-283 of this issue.

Of the bituminous codes filed, the Eastern code, submitted by the Northern Coal Control Association (Ohio, Pennsylvania and northern West Virginia only, in contradistinction of the territories set forth in the announcement of the National Recovery Administration above) and the Smokeless & Appalachian Coal Association (high- and low-volatile mines in southern West Virginia, Virginia, eastern Kentucky and Tennessee) commanded the greatest interest, due to the tonnage involved in the territories covered and the labor provisions included. This code was subscribed to by the Coal Control Association of Georges Creek and Upper Potomac, made up of operators producing 90 per cent of the tonnage in Maryland and in Grant, Mineral, Tucker and Preston (part) counties in West Virginia. The remaining Preston County operators filed a separate code under the auspices of the Preston County Coal Operators' Association of West Virginia.

Only one code filed with the National Recovery Administration—the general code prepared by union operators and the United Mine Workers—was designed for general application over the country as a whole. Not all of the union operators assented to this code, however, Indiana, Iowa and southern Ohio electing to file separate measures, while union operators in Wyoming, Montana and Washington, with some exceptions, joined with non-union interests in Colorado, New Mexico and Utah in the preparation of a code for the Rocky Mountain-Pacific region.

The majority of the codes, either in the preamble or in sections relating to the establishment of minimum wages and minimum prices, particularly stressed the fact that no steps should be taken which would permit further encroachments by competitive fuels and sources of energy. All codes declared that the sale of coal below cost of production is an unfair method of competition, and the majority, carrying this principle, which has been approved by the Recovery Administration, still farther prescribed methods of fixing minimum prices which would yield a reasonable profit. The agencies charged with the determination of prices were either the district sales agency or agencies representing the producers, as in the Eastern and Alabama codes, or by the administrative organizations of the association or associations submitting the codes.

Relations between producers and wholesalers on the one hand and distributors on the other were dealt with in three codes: the general code of the union operators and the Southwestern and Rocky Mountain measures. All three requested some form of control of trucking and condemned the sale of coal to other than established retailers in communities where retail facilities are available.

On the thorny subject of labor relations, the codes submitted by such non-union groups as the Eastern and Alabama operators and the partly union groups, of which the Rocky Mountain-Pacific is an example, while including the mandatory provisions of Section 7a, Title I, National Industrial Recovery Act, contained qualifying provisions designed to insure the continuance of open-shop operation. Alabama operators extended this principle still further to include in their code a provision requiring the establishment of employee-

Code and Sponsors	Maximum Hours of Labor	Minimum Wages	Conditions of Employment
A. Eastern Northern Coal Control Association (60 per cent of the 1932 production in Pennsylvania, Ohio and northern West Virginia). Smokeless & Appalachian Coal Association (75 per cent of the production in the smokeless and low-volatile districts of southern West Virginia, Virginia, eastern Kentucky and Tennessee). This code also subscribed to by the Coal Control Association of Georges and Upper Potomac (operations in Maryland and Grant, Mineral, Tucker and part of Preston Counties, West Virginia). Submitted: July 28.	Per day ..... 8† Per week ..... 40†‡ †Exceptions made for supervisory staff and monthly employees; employees engaged in transporting men or coal, when required; outside employees engaged in the dumping, handling or preparation of coal, when required; all classes of employees when required by accidents or emergencies. ‡Any employee may from time to time work a 48-hour week, provided the yearly average does not exceed 40 hours; also, the 40-hour maximum may be increased to 48 hours in case contracts entered into prior to the filing of the code make it necessary.	Inside, per hour: Pennsylvania and Ohio.. 37½-50c. Northern West Virginia. 34½-47c. Southern mines..... 32½-45c. Outside, per hour: Pennsylvania and Ohio..37½-38½c. Northern West Virginia..34½-35½c. Southern mines .....32½-33½c. Code declares that labor cost of coal must be regulated to preserve normal domestic and export markets in competition with other fuels and sources of energy, thus maintaining employment. (Full details of wage scales established given on p. 284 this issue.)	Recites the mandatory conditions of Section 7a, Title I, NIRA,* with the provision that this section shall apply to each employer in his relations with his employees, but with the following exceptions: no employer shall be required to deal jointly with other employees or their representatives; collective bargaining shall be only with those employees participating therein, the employer being free to deal separately with employees not participating; no person shall be required to join a labor organization to receive employment or benefits under the code; the right of the employee to refuse to join a labor organization or to bargain individually or collectively with his employer free from interference, restraint or coercion by any labor organization or its agents is expressly recognized. No person under 16 shall knowingly be employed at a mine. [*Footnote on mandatory provisions will be found on p. 282.]
B. Union operators Joint code of union operators (Indiana, Iowa and southern Ohio excepted) and the United Mine Workers. Submitted: July 13.	Per day ..... 8† Per week .....32 or 40†‡ †Exceptions made in case of accidents and emergencies and for employees handling man trips or on duty while men enter or leave the mine. ‡For 26 consecutive weeks in any one year, 32 hours per week; for the remaining 26 weeks, not over 40 hours per week; operators also have the option of working 36 hours per week over the entire year. (In a note attached to the code, representatives of the United Mine Workers approved minimum wages and conditions of employment, but disapproved proposed hours of labor).	Inside, per day.....$4.75 and $5† Outside, per day..... $4‡ Existing differentials in favor of higher paid men to be maintained. †Trappers, switch throwers, oilers and couplers excepted. ‡Slate and sulphur pickers excepted. Code declares that working conditions and wages should be uniform within districts, and also between districts as far as necessary for fair competitive costs, and to that end directs the submission of supplemental district codes setting forth minimum rates for tonnage men underground and also for strip and mechanized mining, such rates to conform to the basic rate of $5 per day. Also, where miners are organized and ready to bargain, districts must report what, if any, agreements have been made. Reductions up to 5 per cent allowed in scales east of the Mississippi and south of the Ohio, northern West Virginia included; Arkansas, Oklahoma and Texas differentials to be fixed by joint agreement; existing higher differentials in the Rocky Mountain-Pacific region to be preserved.	Recites the mandatory conditions of Section 7a, Title I, NIRA,* and adds the following: coal mined on the tonnage basis shall be paid for on the net-ton basis; right to have checkweighmen recognized; mines not equipped for weighing shall have a reasonable time to equip themselves; where other than weight methods of payment are used, miners shall be allowed to check accuracy and fairness; wages shall be paid semi-monthly in par checks or lawful money; operators may deduct for rent, house coal, powder, mine supplies, store accounts, union dues and other legitimate items; employees, other than maintenance or supervisory men or those necessary to protect property, shall not be required to live in company houses; employees shall not be required to trade at company stores as a condition of employment; district agreements shall be made not inconsistent with the code to safeguard interests of employer and employee (no specific union named in code); no person under 16 years shall be employed inside a mine.
C. Indiana Indiana Coal Trade Association (85 per cent of the state tonnage produced by companies signing the code). Submitted: July 1.	Per day ..... 8† Per week ..... 32† †Exceptions made for monthly men and in case of accident or emergency or where the safety of men or property is concerned.	Inside, per hour..... 50c.† Outside, per hour..... 45c.† Tonnage rate, cutting, preparing shots, loading and caring for places ..... 48c. Tonnage rate, solid-shooting mines ..... 60c. †Trapper boys in shaft mines and water boys in strip mines excepted. Above rates conditional on the fixing of relative competitive wage scales and the establishment of the same maximum hours in Ohio, western Pennsylvania, West Virginia, Virginia, Tennessee and Kentucky.	Recites the mandatory conditions of Section 7a, Title I, NIRA.* [*Footnote on mandatory provisions will be found on p. 282.]
D. Iowa Iowa Coal Operators' Association. Submitted:	To conform to the terms of the "Des Moines Agreement."	Inside, per hour.....55⅝-58⅜c.† Outside, per hour..... 50c. †Tracklayers, timbermen, cagers, drivers, tripriders, water haulers, drillers and shooters, blacksmiths and machinists, 58⅜c.; helpers and other inside labor, 55⅝c. Other classes of labor to receive the rates set forth in the "Des Moines Agreement"; differentials in favor of higher-paid classes of labor to be maintained.	Recites mandatory conditions of employment set forth in Section 7a, Title I, NIRA,* and declares that, with the approval of the NIRA administrator, the association will comply with the hours, rates of pay and working conditions of the "Des Moines Agreement" (April 1, 1933-March 31, 1935) between the association and District 13, United Mine Workers. This agreement is subject to a joint resolution to the effect that no future scale will be made which will widen the differentials between Iowa districts.
E. Alabama Alabama operators controlling more than 75 per cent of commercial tonnage in the state. Submitted: July 26.	Per day ..... 8† Per week ..... 40† †These hours may be exceeded in case of accidents or emergencies; monthly men and employees engaged in hauling man trips or checking men in and out of the mine excepted, when necessary.	Inside, per hour..... 30c. Outside, per hour..... 25c.† †Slate and sulphur pickers excepted. Differentials in favor of higher paid classes of employees to be preserved. In establishing the wage scales above, members participating in the code emphasize the fact that living conditions and the competition of other fuels and sources of energy must be taken into account in considering the base scale adopted, and reserve the right to withdraw from the code if the scale is increased. Also, the right is reserved to the board of directors administering the code to revise the rates in case equitable adjustment of wage clauses in contracts cannot be secured.	Recites the mandatory conditions of employment set forth in Section 7a, Title I, NIRA,* with provisions that plants shall be open to all capable workmen, regardless of union membership; that employees shall have the right to refrain from union membership free from coercion or restraint by labor organizations or their agents; that the right of employers and employees to bargain individually or collectively as they desire, or the right of employers to select, retain and advance employees on merit, shall not be impaired; and that each member participating in the code shall establish and maintain a system of employee representation. No person under 16 shall knowingly be employed at a mine.

Unfair Practices	Administration	Amendments
(1 and 2) Sale of coal below the fair market value of coal of the same quality or character or below the minimum price established for such coal for shipment to the same consuming territory by the producers of the major portion of the output of any district or districts, such minimum prices to be those established by the marketing agency or agencies acting for the producers of the major portion of the tonnage, membership in such agencies to be open to all producers in the district or districts on the same terms; (3) shipping on consignment, except that unsold coal may be shipped to the producer or his agent at tidewater and/or lake ports and/or docks beyond such ports for bunkering, application against existing contracts or storage; (4) adjustment of claims in such manner as to grant secret rebates; (5) prepayment of freight with the intent or effect of granting discriminatory credit allowances; (6) giving of adjustments, allowances, discounts, credits or refunds with the effect of altering retroactively in a discriminatory manner a price previously agreed on; (7) pre-dating or post-dating of invoices or contracts for the purchase or sale of coal except to conform with a bona fide agreement entered into on the pre-date; (8) failure to adhere to terms of sale, the payments of rebates of any kind and discrimination in the extension of privileges or services; (9) attempts to purchase business or obtain information about a competitor by gifts or bribes; (10) intentional misrepresentation of analyses and/or sizes or the making of false, misleading or deceptive statements about size, quality, character, nature, preparation or origin of any coal bought or sold, or (11) the business policy of a competitor, his product, price and financial, business or personal standing; (12) unauthorized use of the trade names, trademarks, slogans or advertising matter already adopted by a competitor or a deceptive approximation thereof; (13) inducing or attempting to induce a breach of contract between a competitor and his customer.	To be under the boards of directors of the associations, each of which shall establish a "Code Administration Committee" to function for its territory. The latter committees may appoint appropriate administrative agencies and may delegate to such agencies all necessary powers and authorities. District code committees shall each appoint six members to a "Central Code Committee" to handle matters of common interest to both territories. Each producer is required to submit, when required, duly certified reports of wages, hours, output, sales and other activities to their respective associations, and the associations shall have the power to inspect sales contracts, including those entered into prior to the effective date of the code, books and other records when necessary for the appropriate enforcement of the code, provided that information so obtained is not divulged except as necessary for enforcement.	Associations may from time to time, upon a majority vote of the directors, propose amendments to better effect the purposes of Act.
Substantially the same as the Eastern code (A), with the following additions and modifications: sale of coal at a price which will not yield a fair average cost of production and sale, plus a reasonable profit, is an unfair practice, cost to be computed in accordance with standard accounting practice and rules and regulations of the Bureau of Internal Revenue for the determination of income taxes; also shipment in carload lots for resale to anyone not equipped with facilities for storing, weighing and delivering coal in communities in which there are ample retail facilities. Code includes a provision that a committee be appointed to investigate trucking and make recommendations, and condemns incomplete and ambiguous sales contracts.	To be in the hands of a "Bituminous Coal Industry Board" made up of two operator representatives, to be designated by the NIRA Industrial Advisory Board, two labor representatives, to be designated by the Labor Advisory Board, and a fifth member, to be named by the NRA administrator. Code further provides that the soft-coal industry shall be divided into five divisions (Northeastern, Appalachian, Central, Southwestern and Western), each to establish its own administrative agency, with provisions for appeal to the "Bituminous Coal Industry Board." Subdivisions within divisions are provided for, if required. Producers are to submit reports and permit inspection of records as in the Eastern code (A).	Permitted and expected.
Not included. Code declares that prices should return the cost of production plus a fair profit and proposes when authorized by the NIRA administrator to establish fair and reasonable minimum prices based upon cost of production, competition of substitute fuels and other sources of energy and other competitive market factors.	No provisions in code.	No definite provisions included, except for fixing minimum prices from time to time.
Substantially the same as the Eastern code (A), with the following additions and modifications: sale of coal at a price which will not yield a fair average cost of production and sale, plus a reasonable profit, is an unfair practice, cost to be computed in accordance with standard accounting practices and the rules of the Bureau of Internal Revenue for the determination of income taxes; also the making of ambiguous and incomplete sales contracts. In addition, the code recommends the establishment of screening standards in each district.	Same as the union operators' code (B).	No provisions.
Substantially the same as the Eastern code (A), minimum prices to be fixed by Alabama Coals, Inc., subject to approval by the President or the NIRA administrator in cases where code participants are not members of the agency; members subject to a penalty of 50c. per ton for sales at lower prices or on more favorable terms. The code, in addition, provides that opening new mines, except in exceptional cases, shall be deemed a violation.	Under the direction of a board of directors, which shall, in the absence of other action by the members, be composed of members of the board of governors of the Alabama Mining Institute. Board may require reports and inspect producers' records as in the Eastern code (A).	

[*Continued on next page*]

representation plans; while non-union operators in the Rocky Mountain-Pacific region declared that similar plans in their respective districts should be preserved.

One of the features of the Eastern code was the establishment of uniform day wage scales for Ohio and Pennsylvania as a group; northern West Virginia; the Georges Creek-Upper Potomac region; and high- and low-volatile mines in southern West Virginia, Virginia, eastern Kentucky and Tennessee. These scales, summarized on page 284 of this issue, went into effect in central Pennsylvania on July 16 and in the remaining districts on Aug. 1.

In comparison with the non-union codes, the joint union-operator measure reinforced the provisions of Section 7a with clauses guaranteeing the miners the right to checkweighmen, as well as the right to live and trade where they please. The union code also contained a provision that district agreements should be made to stabilize wages and working conditions, and minimum wages should be uniform within districts and also between districts as far as necessary to assure fair competitive prices. To accomplish the latter objective, the code would require that each district submit within fifteen days after its adoption supplementary codes setting forth minimum tonnage rates for underground men and for miners employed in strip and mechanical mining, such rates to conform to the basic day rate of $5, and also, where the miners were organized and willing to bargain, to report what agreements, if any, have been made.

Underwood & Underwood

Kenneth M. Simpson

Deputy Administrator in charge of the hearings on the coal codes. Mr. Simpson, who is a consulting engineer and metallurgist and president of the International Chromium Process Co., also has been assigned the petroleum, iron and steel, wire and wire goods, copper and its products and non-ferrous metals codes.

The hearings at Washington, according to advance indications, will find the miners' representatives ready to fight the open-shop provisions of the non-union codes to the last ditch. These were termed by William Green, president, American Federation of Labor, speaking of the Eastern code, as "as near to a company union as they can get." The possibility that "employee-representation" plans and company unions would interfere with a clean sweep in organization has been a matter of concern to organized labor since the inception of the National Industrial Recovery Act. Plans were laid for a showdown at the hearings on the steel code last month, and only the withdrawal of the industrial relations plan included therein by representatives of the steel industry prevented a long and bitter battle over the company-union question, a byproduct of which was the strike that tied up steel company mines in the Connellsville region (p. 286 of this issue).

This change in the attitude of the employers, however, has only shifted the center of effort to the field, in the opinion of many observers. Confirmatory evidence is seen in the change in the date of the coal code hearings, the miners' representatives having assented to an earlier date on the assumption that any employee-representation plans would be eliminated and therefore that it would not be necessary to delay the hearings in order to complete recruiting and thus present an unbroken front.

The six-hour day and the 30-hour week has long been one of the principles of the United Mine Workers, and it is expected its stand against the longer hours proposed in all the codes, including the one in which it participated, will precipitate another controversy. Also, it is believed that at least one operator group will oppose the

Summary of Principal Provisions in

Code and Sponsors	Maximum Hours of Labor	Minimum Wages	Conditions of Employment
F. Southwestern Southwestern Coals (over 75 percent of the tonnage in Kansas, Missouri and Oklahoma). Submitted: July 28.	Per day..... 8† Per week..... 40† Subject to same qualifications as in Alabama code (E).	Inside, per hour..... 44† Outside, per hour..... 41† †Randolph, Adair and Macon counties, Missouri, 37½c.; McAlester-Wilburton district, Oklahoma, 47c.; trappers, spraggers, couplers and greasers excepted. ‡Randolph, Adair and Macon counties, Missouri, 32½c.; Henryetta and Tulsa districts, Oklahoma, 40c.; McAlester-Wilburton district, Oklahoma, 39c.; slate pickers excepted. (For full details of proposed scales, see Table V, p. 284, this issue.)	Recites the mandatory provisions of Section 7a, Title I, NIRA,* and declares that while both collective bargaining and individual relationships prevail in the field the right of employers and employees to bargain individually or collectively as they desire must not be abridged; that no employee shall be required to join a labor organization to secure or retain employment; and that the right of any employee to refuse to join a labor organization and to bargain with his employer either individually or collectively with his fellow employees free from interference, restraint or coercion by labor organization or their agents is recognized. No person under 16 shall knowingly be employed at a mine.
G. Rocky Mountain-Pacific Participated in by the Colorado & New Mexico, Northern Colorado, Utah, Southern Wyoming, Northern Wyoming, Montana and Washington coal operators' or procers' associations. Submitted: Aug. 1. Washington supplement submitted Aug. 5; not included in summary.	Per day..... 8† Per week..... 48† †Exceptions, in general, made in the case of monthly men; employees engaged in making repairs; employees hauling coal or men; employees who must be on duty when men are entering or leaving the mines; all classes of employees in case of accidents or emergencies; and employees on duty during idle times.	(For wage scales included in supplements offered by the various parties to the code, see Tables VI, VII, VIII and IX, p. 285, this issue.)	General code recited the mandatory provisions of Section 7a, Title I, NIRA.* In supplements to the general code, operators in Colorado, New Mexico and Utah declare that they have been and are now dealing directly with the men, with mutually satisfactory results; that the present method should be maintained; and that the rights of both employers and employees to bargain collectively in accordance with employee-representation plans without interference, restraint or coercion of any sort should be preserved as in the best interests of both parties. In the union districts of northern and southern Wyoming and Utah, relations are to be governed by the provisions of joint agreements with the United Mine Workers.

*The mandatory provisions of Section 7a, Title I, NIRA, are as follows: "(1) That employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection; (2) that no employee or no

Underwood & Underwood

W. L. Allen

Consulting metallurgist and former chairman of the Sheffield Steel Co., was in charge of the hearings on the cotton-textile code, the first code to be heard and the first adopted under the terms of the National Industrial Recovery Act.

non-union provisions of several of the codes. Ben Grey, representing this group —Central Coals Associates—went on record July 31 in favor of the union operator code as the best means of carrying out the purposes of the act.

Perhaps the most important result of the settlement of the Connellsville stoppage, in which the National Recovery Administration took a hand on Aug. 2, was the setting up, at the suggestion of the Industrial and Labor Advisory boards, of machinery for the adjudication of industrial disputes. The Recovery Administration has taken the stand from the first that neither employers nor employees should take any steps which might interfere with its work, and the establishment of the National Industrial Recovery Adjustment Board of seven (three labor members, three industry members and one Presidential appointee) as an outgrowth of the Connellsville strike and other disturbances throughout the country is the first concrete step in this direction.

President Roosevelt approved the plan on Aug. 5 and appointed the following to the adjustment board: Senator Robert F. Wagner, New York (chairman); William Green, president, American Federation of Labor; Dr. Leo Wolman, professor of economics, Columbia University; John L. Lewis, president, United Mine Workers; Walter C. Teagle, president, Standard Oil Co. of New Jersey; Gerard Swope, president, General Electric Co.; and Louis E. Kirstein, general manager, Edward A. Filene's Sons Co., Boston, Mass.

While the Adjustment Board is expected to act generally for all industry, developments in connection with the cotton-textile code last month were expected to supply a precedent for the settlement of disputes within individual industries. The cotton-textile plan provides that in case of a dispute in any plant, employers and employees may establish a committee on which each side will be equally represented to settle the controversy. In case of failure, the question will go to a state board, and from there, in case the board cannot

James H. Pierce

Consulting engineer and president, James H. Pierce & Co., Scranton, Pa., was appointed Technical Adviser on Coal for the National Recovery Administration last month. Mr. Pierce has served anthracite and bituminous producers in executive and engineering capacities for the past 22 years. He is president of the East Bear Ridge Colliery Co.; vice-president, Wyoming Valley Collieries Co., and management and engineering consultant to a number of mining companies.

Proposed Codes of Fair Competition

Unfair Practices	Administration	Amendments
Substantially the same as the Eastern code (A) with the following additions and modifications: Minimum prices to be fixed by the board of directors of the association as there provided, also taking into account the competition of substitute fuels and sources of energy and other competitive market factors; direct sale of coal by a producer or wholesaler to a retail consumer, except where such producer or wholesaler maintains retail facilities, is a violation of the code; also the sale and distribution of coal by motor trucks at prices which will not return the normal rail freight and the retail distributor's cost and profit.	Under the direction of the board of directors of Southwestern Coals. Board may require reports and inspect records as in the Eastern code (A).	Substantially the same as in the Eastern code (A).
Substantially the same as the Eastern code (A), with some additions and modifications. Code provides for the fixing of minimum prices by the several associations, such prices to return a reasonable profit on a fair average cost of production, and to take into account competition from other producing territories and from substitute fuels and sources of energy. Sizing standards were included in supplements filed by the Northern Colorado and Utah groups, and the latter also submitted a basic average sales price of $2.70. On the subject to relations between producers and distributors, the general code declared that distribution in carload lots to other than consumers for use in their own plants, to retailers, and to other producers and wholesalers for resale through the normal channels is an unfair practice. In addition, the code declared that mine prices on truck coal should be high enough to compensate the producer for the added cost of mining and loading operations incidental to truck distribution, to yield a fair return on the investment in equipment, and to permit established transportation and retail facilities to perform their legitimate functions. The general code also condemned splitting fees or commissions or using an agency arrangement to give direct or indirect rebates to purchasers; the sale of coal through any agent of an organization of retailers or consumers, or to such organizations directly, so that said groups receive allowances of any kind; the making of incomplete and ambiguous sales contracts; the opening of new mines unless economically necessary. Producers, however, were granted the right to reopen idle operations or develop new mines to replace those exhausted	Control of matters within the various regions to be in the hands of "District Control Committees," to be chosen as the various associations may determine. Matters of common interest to all fields are placed in the hands of a "Central Advisory Committee," to be made up of two representatives from each district. Producers required to submit reports and to open records for inspection substantially as in the Eastern code (A).	No definite provisions included, except for the fixing of minimum prices from time to time.

one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing or assisting a labor organization of his own choosing; and (3) that employers shall comply with the maximum hours of labor, minimum rates of pay and other conditions of employment approved or prescribed by the President."

agree, to a national board of three members representing the employers, the Labor Advisory Committee of the National Recovery Administration and the NRA administrator.

Retail interests also were represented in the submission of codes last month, the National Retail Coal Merchants' Association offering a measure covering the distribution of solid fuels. As between producers, manufacturers or wholesalers, and retailers, the code declares the following to be unfair practices: direct sale of solid fuel to a retail consumer in trade areas already having retail facilities (this provision does not apply where such sale is through retail facilities maintained by the producer, manufacturer or wholesaler); sale to a wholesale consumer unless such fuel is intended for consumption in the buyer's plant; sale for retail distribution to any but retailers; sale or shipment to any new retailer or wholesaler where existing facilities are adequate (also includes new yards opened up by retailers already in business), unless it has been determined that existing facilities are insufficient; discrimination in prices, terms or conditions by a producer, manufacturer or wholesaler; failure to cause coal to be reweighed at a discharge point en route to the purchaser, and to bill the purchaser on the weight thus determined; and failure to make just and reasonable water allowances where washed coal is loaded wet, or when water is used in loading railroad cars.

The possibility of the passage of legislation similar to the National Industrial Recovery Act in a number of states also attracted the attention of state retail groups in July. The Ohio Coal Conference, for one, busied itself with setting up retail organizations in each county to enforce the provisions of a code of fair competition which it expects to adopt under the terms of an act passed by the Ohio Legislature, and the New York State Coal Merchants' Association is manifesting great interest in

Table I—Minimum Wage Rates for Day Labor Established in Eastern Code*

	Per Hour		
	Pennsylvania and Ohio	Northern-West Virginia	Southern Mines†
Inside:			
Machine runners, motormen, rock drillers	$0.500	$0.470	$0.450
Drivers, brakemen, snaggers, snappers, shotfirers, coal drillers, trackmen, wiremen, bonders, timbermen, bottom cagers	0.480	0.450	0.430
Pumpers; track, wire and timber helpers; other inside labor	0.430	0.400	0.380
Trappers, greasers, couplers	0.375	0.345	0.325
Outside:			
Bit sharpeners, car droppers, trimmers, car repairmen, dumpers	0.385	0.355	0.335
Sand dryers, picking-table labor, car cleaners, slate pickers, common able-bodied outside labor	0.375	0.345	0.325

*Skilled labor not classified above to be paid according to the custom at the mine. Piece rates are to be fixed so that employees working under such scales will have comparable hourly earnings.
†Smokeless and low-volatile mines in southern West Virginia, Virginia, eastern Kentucky and Tennessee: same scale established for the Georges Creek and Upper Potomac fields of Maryland and West Virginia.

Table II—Basic Piece-Work and Dead-Work Scales Established in Eastern Code for Western Pennsylvania Districts

	Pittsburgh District					
	Thin Vein	Intermediate	Thick Vein	Greensburg	Connellsville	Double Freeport
Pick Mining, Per Ton:						
Drawslate, 12 in.	$0.560	$0.535	$0.510	.....	.....	.....
Drawslate, 4 in.	.....	.....	.....	$0.390	.....	.....
No drawslate	.....	.....	.....	.....	$0.370	.....
No bone	.....	.....	.....	.....	.....	$0.450
Dead-Work Scale, Pick Mining:						
Clay veins, 6 to 12 in., each	2.540	2.540	2.540	2.540	2.540	2.540
Clay vein, over 12 in., across place, per ft.	2.540	2.540	2.540	2.540	2.540	2.540
Clay vein, at angle, per yd.	0.620	0.620	0.620	0.620	0.620	0.620
Spar, less than 6 in., per yd.	1.280	1.280	1.280	1.280	1.280	1.280
Spar, at angle, per yd.	0.340	0.340	0.340	0.340	0.340	0.340
Ripping roof, per yd.	0.210	0.210	0.210	0.210	0.210	0.210
Drawslate, over 12 in., per in. per lin. yd.	0.045	0.045	0.045	.....	.....	.....
Drawslate, over 4 in., per in. per sq.yd.	.....	.....	.....	0.023	.....	.....
Hand Loading, Coal Cut by Shortwall or Track-Mounted Machines, Per Ton:						
Hand drilling, wide work, 12 in. drawslate	0.420	0.400	0.380	.....	.....	.....
Company drilling, explosives furnished, 4-in. drawslate	.....	.....	.....	0.290	.....	.....
Hand drilling, "head coal"	0.320	.....	.....	.....	.....	.....
Company drilling and track work, no drawslate	.....	.....	.....	.....	0.260	.....
Hand drilling, handling bone coal	.....	.....	.....	.....	.....	0.365
Hand drilling, entry work, 12-in. drawslate	0.420	0.400	0.380	.....	.....	.....
Additional yardage, entry work, per yd.	0.410	0.420	0.430	.....	.....	.....
Hand drilling, entry work, yardage included in rate	0.490	0.464	0.434	.....	.....	.....
Hand Loading, Coal Cut and Sheared by Track-Mounted Machine, Per Ton:						
Company drilling and track work, 4-in. drawslate	.....	.....	.....	0.290	.....	.....
Company drilling, no drawslate	.....	.....	.....	.....	0.260	.....
Dead-Work Scale, Machine-Cut Coal:						
Clay veins, 6 to 12 in., each	1.140	1.140	1.140	1.140	1.140	1.140
Clay vein, over 12 in., across place, per ft.	1.140	1.140	1.140	1.140	1.140	1.140
Clay vein, at angle, per yd.	0.290	0.290	0.290	0.290	0.290	0.290
Spar, under 6 in., per yd.	0.660	0.660	0.660	0.660	0.660	0.660
Spar, at angle, per yd.	0.110	0.110	0.110	0.110	0.110	0.110
Drawslate, over 4 in., per in. per sq.yd.	.....	.....	.....	0.230	.....	.....
Undercutting, Shortwall Machine, Per Ton:						
Wide work	0.070	0.065	0.060	0.060	0.055	0.055
Entry work	0.070	0.065	0.060	.....	.....	.....
Additional yardage, entry work, per yd.	0.140	0.150	0.160	.....	.....	.....
Cutting, Track-Mounted Machine, Per Ton:						
Undercutting	.....	.....	.....	0.037	0.035	0.035
Cutting and shearing	.....	.....	.....	0.045	0.042	0.042
Dead-Work Scale, Shortwall or Track-Mounted Machine:						
Clay veins, 6 to 12 in., each	0.290	0.290	0.290	0.290	0.290	0.290
Clay vein, over 12 in., across place, per ft.	0.290	0.290	0.290	0.290	0.290	0.290
Clay vein, at angle, per yd.	0.070	0.070	0.070	0.070	0.070	0.070
Spar, under 6 in., per yd.	0.120	0.120	0.120	0.120	0.120	0.120
Spar, at angle, per yd.	0.030	0.030	0.030	0.030	0.030	0.030

Conditions and remarks — Explosives to be furnished by miner except as otherwise stated; operators to determine type. Methods of paying for piece work other than the above may be continued, but shall be arrived at so as to offer comparable earnings. The term "head coal" applies to those mines in the Pittsburgh district where the top 8 or 10 in. of coal are left up and the usual drawslate is not handled.

Table III—Basic Piece-Work Rates Established in Eastern Code for Central Pennsylvania Districts

	Gross Ton	Net Ton
Pick mining, solid work	$0.770	$0.680
Hand loading	0.500	0.445
Cutting and scraping, shortwall machines	0.080	0.070

Table IV—Basic Piece-Work Rates Established in Eastern Code for Pittsburgh No. 8, Cambridge and Bergholz Fields, Ohio

Shortwall Machines:	Net Ton
Cutting, wide work	$0.070
Cutting, narrow work, and extra per yd., 8 ft. wide	0.165
And extra per yd., 10 ft. wide	0.145
And extra per yd., 12 ft. wide	0.120
Loading:	
Wide work, hand drilling and shooting	0.420
Narrow work, hand drilling and shooting, and extra per yd., 8 ft. wide	0.540
And extra per yd., 10 ft. wide	0.475
And extra per yd., 12 ft. wide	0.420

Table V—Wage Scales Included in the Southwestern Code

Cherokee and Crawford Counties, Kansas; Barton County, Missouri:	
Shooting and loading pick-mined coal, per ton	$0.800*
Minimum day rates:	
Inside, per hour	0.440†
Outside, per hour	0.410‡
Lafayette County, Missouri:	
Loading machine-cut coal free of slack and impurities and taking care of place, per ton	0.700*
Wheeling to mule or motor junction, per ton	0.100
Minimum day rates:	
Inside, per hour	0.440†
Outside, per hour	0.410‡
Ray and Clay Counties, Missouri:	
Pick mining, per ton	1.210
Loading machine-cut coal, per ton	0.726
Wheeling, per ton	0.090
Minimum day rates:	
Inside, per hour	0.440*
Outside, per hour	0.410*
Shaft mines — Randolph, Adair and Macon Counties, Missouri:	
Loading, solid-shooting places, per ton	0.600
Loading, machine-cut coal, room and pillar work, per ton	0.420
Loading, machine-cut coal, longwall, per ton	0.500
Minimum day rates:	
Inside, per hour	0.375†
Outside, per hour	0.3275‡
Strip Mines — Bates, Henry, Randolph and Vernon Counties, Missouri:	
Minimum day rate, per hour	0.410‡
Shaft Mines — Henryetta and Tulsa Districts, Oklahoma:	
Loading machine-cut coal, rooms, per ton	0.500§
Loading machine-cut coal, entries, per ton	0.600§
Cutting, rooms, per ton	0.100
Cutting, entries, per ton	0.120
Minimum day rates:	
Inside, per hour	0.440†
Outside, per hour	0.400
McAlester and Wilburton Districts, Oklahoma:	
Loading, solid-shooting, per ton	0.770
Loading, machine-cut coal, per ton	0.580
Cutting, crew, per ton	0.120
Day rates:	
Inside, per hour	0.470
Machine runners, per hour	0.4938
Outside, per hour	0.390

*Present rate for yardage and dead work to be continued. †Except trappers, spraggers and greasers. ‡Except slate pickers. §Includes yardage and dead work.

the passage of a measure now before the State Legislature, and foresees material benefits in its enactment.

Motor Fuel From Coal Aided By Great Britain

Faced with the fact that the coal industry of the country has failed to respond to the rising tide of recovery, due to the decline of the export trade, more efficient utilization of coal and the growing use of fuel oil, particularly for bunkering, the British government is recognizing that new uses is one method of aiding the industry and increasing employment, and therefore has decided to subsidize the manufacture of domestic motor fuel by the hydrogenation process. The subsidy is in the form of a reduction of one-half in the gasoline tax of 8d., to be in effect for ten years from April 1, 1934.

As a result of this move, Imperial Chemical Industries will erect £2,500,000 plant to treat 350,000 tons of coal per year, producing 30,000,000 imperial gallons of motor spirit. In all, it is expected that direct employment will be given to 2,500 men; other units are contemplated to insure national self-sufficiency in motor fuel. The government's move also is expected to strengthen the position of producers of benzol from coal gas, now being used for blending with foreign gasoline; several municipal gas works are reported to be considering additions for this purpose.

Table VI—Outside Day Rates for Utah, Montana and Northern and Southern Wyoming Included in the Rocky Mountain-Pacific Code

	Utah	Union Scales Montana	Union Scales Wyoming*
Hoistmen	$6.00	....	....
Engineers	....	$5.94	$6.00[1]
2d Class	....	5.49	....
Water tender	....	5.31	....
Firemen	....	5.31	4.92[2]
Fan firemen	....	5.31	....
Blacksmiths, head	5.92	5.90	5.80
Others	5.44	....	5.40
Helpers	4.80	4.97	4.68
Tool sharpeners	5.44	5.75	....
Car repairmen	5.28	5.50	4.76
Helpers	4.96	4.96	....
Carpenters	5.60	5.85	5.50
Helpers	4.80	....	....
Plumbers	5.60	....	....
Masons, bricklayers	5.60	....	5.40[3]
Painters	5.44	....	....
Machinists, mechanics	5.60	5.90	5.56
2d Class, assistants	5.28	5.49	....
Helpers	4.96	....	4.84
Electricians	5.60	5.90	5.56[3]
2d Class, helpers	....	5.49	....
Armature winders	5.76	....	....
Welders	....	....	5.56
Boilermakers	....	....	5.88
Pipemen	5.44	....	5.40
Helpers	4.48	....	....
Teamsters, truck drivers	4.80	5.09	4.68[4]
Cart drivers	4.48	....	....
Barn men	....	....[5]	....
Miners (taken from face)	....	....	5.48
Prop sawyers	4.80	....	....
Helpers	4.48	....	....
Rope riders	5.44	....	....
Car droppers, head	4.96	....	....
Assistants	4.80	....	....
Dumpers	4.98	5.11	....
Weighmen	5.60	....	....
Tipplemen	4.96	4.98	4.76
Picking labor, men	4.00	4.82	....
Boys	3.52	3.50[6]	3.48
Couplers, men	4.48	4.15	....
Boys	3.52	....	3.48
Greasers, men	4.48	4.15	....
Boys	3.52	....	....
Oilers and wipers	....	5.04	....
Box-car loader runners	5.20	....	5.16
Box-car shovelers	....	5.16	5.00
Shaker and spiral runners	5.20	....	....
Coal inspectors	....	5.04	....
Motormen	....	5.70	....
Brakemen	....	5.23	....
Assistants	....	4.98	....
Heater firemen	5.12	....	....
Check and lampmen	5.04	....	....
Timber framers	....	5.04	....
Night watchmen	....	....	4.40
Rope cutters	....	5.11	....
Drill boys, minimum	....	3.68	....
Unclassified labor, men	4.48	4.82	4.44
Boys	3.52	....	....
Shovel operators	5.60	....	....

*Northern and southern districts, respectively.
[1]Eight-hour day; engineers may work up to ten hours, additional time to be paid at same rate. [2]Northern Wyoming, $5.02. [3]In and around the mines. [4]Northern Wyoming, $4.73. [5]Fifteen or more horses, $152.40 per month; less than fifteen, $140; assistants, $131.50. [6]Minimum.

Table VII—Inside Day Rates for Utah, Montana and Northern and Southern Wyoming Included in the Rocky Mountain-Pacific Code

	Utah	Union Scales Montana	Union Scales Wyoming*
Miners (taken from face)	$5.52	....	$5.48
Miners (by the day)	....	$5.80	5.42
Cutting machine runners	5.76	5.86	6.80
Helpers	5.52	5.43	6.00
Machine repairers, mechanics	6.50	5.75	....
Timbermen	5.60	5.80	5.42
Helpers	5.28	5.43	....
Timber puller	....	....	6.00[1]
Trackmen	5.44	5.80	5.42
Helpers	5.28	5.43	....
McGinty repairer, rope splicer	....	5.75	5.42
Drillers	5.76	5.70	6.00
Helpers	....	5.43	....
Shotfirers	6.00	5.70	6.00
Motormen, engineers, hoistmen	5.60	5.63	5.42
Brakemen and nippers	5.28	5.43	5.28
Drivers, men	5.44	5.63	6.00
Boys	4.08	....	....
Rope riders	5.44	5.43[2]	5.42
Rollermen, men	5.44	....	....
Boys	4.08	....	....
Parting and connection men	....	5.43	....
Bratticemen	5.44	5.75	....
Wiremen	5.60	....	....
Helpers	5.28	....	....
Rail bonders	....	....	5.42
Masons	5.60	....	....
Rockmen	5.28[3]	....	....
Pumpmen	5.28	5.73	5.28
Pipemen	5.44	5.43[4]	....
Sprinklers, men	5.28	....	....
Boys	4.08	....	....
Pulley repairers	....	5.60	....
Barnmen	....	5.47	5.08
Greasers, boys	....	4.15	3.48
Switchmen and couplers, boys	....	4.15	3.48
Flaggers, pick carriers	....	4.15	....
Trappers	3.48	3.50	3.48
Dummy makers	3.52	....	....
Shaft sinkers	....	5.85	....
Head cagers	....	5.75	....
Gas watchmen, firebosses	6.40	....	6.40
Unclassified labor, men	5.28	5.43	5.28
Boys	3.52	....	....
Shovel operators	....	6.80	....
Assistants	....	6.00	....
Mechanical Loading Scale:			
Mobile loading machine operators	....	7.30[5]	7.20
Helpers	....	6.30	6.00
Scraper loader hoistmen	....	7.30[6]	7.20
Ropemen, scoopmen	....	6.30	6.00
Duckbill operators	....	6.60	6.40
Cutting machine operators	....	6.78	6.80
Helpers	....	6.78	6.00
Operator, arcwall machine or combination cutter and drill	....	7.40	....
Shearing machine operator, helper	....	6.78	....
Drillers, shotfirers, facemen; shoveling onto conveyor or conveyor-loader	....	6.20	6.00
Brushers or trimmers	....	....	6.00[1]
Handling rock or material	....	....	5.28
Greaser and repairman	....	5.62	....

*Northern and southern districts, respectively.
[1]Southern Wyoming only. [2]Main rope, $5.75. [3]Head rockmen, $5.60. [4]Head pipemen, $5.73. [5]Operators, Jeffrey loader combination, $6.60; helpers, $6.20. [6]Small scrapers, $6.20.

Ohio Coal Lands Sold

The Pittsburgh Coal Co., according to an announcement on July 7, has sold its coal lands in Jefferson and Harrison counties, Ohio, to the Somers Coal Co., Port Clinton, Ohio.

Table VIII—Utah Contract Rates Included in the Rocky Mountain-Pacific Code

	Per Ton
Hand mining after machine or pick mining on pillars, including drilling, loading, track work, timbering and explosives, coal over 5 ft.	$0.550
Same, coal under 5 ft.	0.590
Hand loading only into cars	0.400
Machinemen and helpers, coal over 5 ft., including disposal of the bugdust	0.080
Same, coal under 5 ft.	0.100
Machinemen, 12 ft. or less	0.690
Motormen and nippers	0.055
Drilling and shooting	0.100
Drilling	0.050
Shovel operation	0.110
Yardage:	Per Yard
Miners, entry, 12 ft. or less	$0.930
Miners, wet places	1.410

Table IX—Wage Scales for the Louisville and Erie-Frederick Districts of Northern Colorado Included in the Rocky Mountain-Pacific Code*

	Louisville	Erie and Frederick
Inside Day Labor:		
Basic scale	$5.000	$5.000
Firebosses	5.000	5.000
Helpers	5.000	5.000
Trappers	3.400	3.400
Oilers	3.500	3.500
Outside Day Labor:		
Basic scale	4.000	4.000
Engineers, 1st and 2d Classes	5.000	5.000
Engineers (3d Class), firemen	4.000	4.000
Blacksmiths, box-car loaders, weigh bosses, carpenters	4.500	4.500
Car repairmen	4.000	4.000
Miscellaneous outside labor	3.750	3.750
Mining Rates:	Per Place	Per Place
Cutting, C.L.U. machine, wide	$1.800	$1.800
Narrow	1.600	1.600
Cutting, shortwall machine	2.000	2.000
	Per Ton	Per Ton
Cutting, C.L.U. machine wide or narrow	$0.060	$0.060
Shortwall machine	0.085	0.085
Sullivan machine, wide	0.126	0.09 & 0.08
Narrow	....	0.115 & 0.10
Jeffrey machine, wide	....	0.10 & 0.09
Narrow	....	0.11 & 0.10
Punchers	0.186	0.140
Pick mining	0.690	0.660
Loading after machine	0.550	0.550
Shovelers only	0.450	0.360
Yardage, per ft.	0.480	0.420
Rock, per car	0.250	....

*Wage rates were established for southern Colorado districts and New Mexico as follows: Inside—basic scale, 53c. per hour; minimum rate for unclassified labor, 50c. per hour; outside, basic scale, 45c. per hour; minimum rate for unclassified labor, 38c. per hour. These rates are predicated on the theory that relatively similar rates will be established in the Southwest.

NRA Takes Hand in Pennsylvania Strike; Additional Wage Increases Posted

ALARMED at the possibility that the strike at the steel-company mines in the Connellsville region over the question of union recognition would spread to all the mining regions east of the Mississippi and thus endanger progress under the National Industrial Recovery Act, General Hugh S. Johnson, National Recovery Administrator, took a hand on Aug. 2. As an outgrowth of his efforts, supplemented by those of members of the NRA Industrial and Labor Advisory boards, a truce was declared by both the operators and the United Mine Workers on Aug. 4, pending a final decision on the coal codes now before the administration. Under the terms of this truce, which was approved by the President on Aug. 5, the miners were to return to work Aug. 7, and all further disputes were to be settled by a board composed of Gerard Swope, president, General Electric Co. (chairman); Louis E. Kirstein, general manager, Edward A. Filene Sons Co., Boston, Mass.; and George L. Berry, president, National Pressmen's Union. The majority of the western Pennsylvania strikers, however, defied union instructions and continued picketing on Aug. 7. As a result, some doubt existed as to the future course of the stoppage.

The union drive originally was directed at the operations of the H. C. Frick Coke Co., a subsidiary of the United States Steel Corporation, but spread to take in all operations in Fayette County, Pennsylvania, as well as a number of mines, mostly producing coking coal, in Westmoreland, Greene, Washington and Allegheny counties, culminating in the dispatch of the National Guard to Fayette County and the death of one man and the wounding of fifteen others in pitched battles at three Frick mines on Aug. 1. Operations of the Pittsburgh Terminal Coal Corporation, which operates under a union contract, also were affected by the strike movement, which was taken up by several thousand miners in central Pennsylvania early in August.

The settlement followed a series of stormy conferences at Washington, which ended with the adoption of two truce agreements, the Frick company and its affiliate, the National Mining Co., electing to treat separately due to a division over the question of recognizing the jurisdiction of the United Mine Workers over the strikers. Both agreements are shown elsewhere on this page, the Frick document being in the form of a letter signed by Thomas Moses, president.

Aside from the Connellsville strike, the outstanding development in the East was the posting of uniform wage scales at the mines of operators participating in the Eastern code of fair competition. These scales, shown in detail in Tables I, II, III and IV, p. 284 of this issue, went into effect in central Pennsylvania on July 16, and in the remaining districts on Aug. 1. They are said to represent increases at all but approximately 10 per cent of the operations. Earlier in the month, increases also were announced, according to reports, by the following operations: Virginia & Pittsburgh Coal & Coke Co., Fairmont, W. Va.; Riverseam Coal Co., Booth, W. Va.; Duquesne Coal & Coke Co. and Avella Coal Co., Avella, Pa.; Valley Camp Coal Co., Parnassus and Van Voorhis, Pa.; Weirton Coal Co., Isabella, Pa.; W. J. Rainey, Inc., all mines in Fayette County, Pa.; and the Powhatan Mining Co., Powhatan, Ohio.

A number of operators in northern West Virginia, at a conference with representatives of the United Mine Workers last month, adopted the wage scale set forth in the accompanying table. Base rates in the new scale are 30c. per ton for loading machine-cut coal and 45c. an hour for day labor. The old union scale was 22½c. per ton for loading and 33⅜c. per hour for day work. So far, there have been no labor difficulties of importance in the field, though some operators profess to foresee attempts to force the large non-union companies into the fold, which they feel will result in trouble.

A renewal of the warfare between the Progressive Miners of America and the United Mine Workers in Christian County, Illinois, resulted in the bombing of the homes of three Progressive officials and the shooting of a watchman at Taylorville, July 23. Earlier in the month, the Progressives attempted to enlist the National Recovery Administration's efforts in a campaign to force the Peabody Coal Co. to

New Union Scale in Northern West Virginia

	Per Ton
Inside:	
Loading, machine-cut coal	$0.30
Cutting	0.05
	Per Hour
Motormen, brakemen, drivers, trackmen, timbermen	0.45
All other inside labor	0.40
Mechanical loading crews:	
Cutting, loading-machine operators	0.55
Facemen	0.50
All others	0.45
Outside:	
Mechanics	0.65
Carpenters, blacksmiths, engineers on coal hoists	0.55
Dumpmen, engineers on man hoists	0.45
Tipplemen, other outside labor	0.35
Picking-table labor	0.30

Truce Agreements Adopted in the Settlement of the Pennsylvania Strikes

General Agreement*

The Pittsburgh Coal Co., W. J. Rainey, Inc., the Rochester & Pittsburgh Coal Co., Peale, Peacock & Kerr, Jamison Coal & Coke Co., South Union Coal Co., and other coal companies, the Governor of Pennsylvania, John L. Lewis, president of the United Mine Workers, each agree with the Administrator of the National Recovery Act, acting for the President of the United States, but not with each other:

1. The United Mine Workers agree to send all the striking miners back to work.

2. The coal companies agree that all of the men employed immediately before the strike are to be returned to their former positions in the mines without prejudice or discrimination.

3. The companies agree to the employment of checkweighmen by the miners when desired by the miners. The wages of these checkweighmen shall be deducted by the company from the pay of the men.

4. Pending hearing and determination by the President on the coal codes now filed with NRA, all matters in dispute between the companies and their employees shall be settled, not by any aggression at the mines, but by the following board, selected by the President: Gerard Swope, chairman; Louis E. Kirstein and George L. Berry.

JOHN L. LEWIS, President, U. M. W. A.
PHILIP MURRAY, vice-president, U. M. W. A.
HENRY WARRUM, general counsel, U. M. W. A.
GIFFORD PINCHOT, Governor of Pennsylvania.
PEALE, PEACOCK & KERR, by Charles O'Neill, vice-president.
JAMISON COAL & COKE CO. and SOUTH UNION COAL CO., by R. E. Jamison, secretary.
PITTSBURGH COAL CO., by J. D. A. Morrow, President.
W. J. RAINEY, INC., by Scott Stewart president.
ROCHESTER & PITTSBURGH COAL CO., by B. M. Clark, president.

*Memorandum accompanying General Agreement:

Aug. 4, 1933.

At the request of the Administrator of the NRA and in the interests of the President's reemployment program, John L. Lewis, president of the United Mine Workers of America, agrees for the United Mine Workers, with the Administrator of the NRA, acting for the President of the United States:

To call off the coal strike with the understanding that agreements of even date by and between the Frick Coke Co., the National Mining Co., and other coal companies, with the Administrator of the NRA, acting for the President of the United States, will be carried out.

JOHN L. LEWIS, president, United Mine Workers of America.
PHILIP MURRAY, vcie-president, U. M. W. A.
HENRY WARRUM, general counsel, U. M. W. A.
GIFFORD PINCHOT, Governor of Pennsylvania.

Frick Agreement

H. C. FRICK COKE CO.,
Pittsburgh, Pa.
Aug. 4, 1933.

General Hugh S. Johnson,
Administrator, National Recovery Act,
Washington, D. C.

Dear Sir:

The H. C. Frick Coke Co. and the National Mining Co. agree with the Administrator of the National Recovery Act, acting for the President of the United States:

(a) If the strike in the coal fields is called off, that all men employed before the strike are to be returned to their former positions in the mines without prejudice or discrimination.

(b) That pending hearing and determination by the President of the United States on the Coal Code now filed with NRA a complete truce be declared.

(c) The companies agree to the employment of checkweighmen at the mines; the election of checkweighmen to be held and all miners employed be given an opportunity to vote under rules prescribed in paragraph (d). Wages of these checkweighmen shall be deducted by the company from the pay of the men pro-rata and paid to such checkweighmen.

(d) That if in the meantime any matters in dispute arise from the mines, that they be settled, not by any aggression at the mines, but by a board of three selected by the President of the United States.

Yours very truly,
H. C. FRICK COKE CO.,
NATIONAL MINING CO.,
by THOMAS MOSES, president.

reinstate the original force at its No. 43 mine, Harrisburg, which joined the Progressives Feb. 14. Also, early in the month, the members of the United Mine Workers employed at this mine, according to reports, went into self-imposed exile at the colliery, resulting in the granting of a temporary injunction restraining Saline County authorities from permitting picketing by the Progressives.

The organization drive in the McAlester-Wilburton district of Oklahoma, the scene of a number of clashes last year, was reopened by the United Mine Workers in July. Organizers declared their reliance on the terms of the National Industrial Recovery Act in picketing work at non-union mines.

Missionary work in Virginia in July was featured by the instigation of an investigation by Governor Pollard into labor charges that the companies were preventing their employees from organizing locals.

In a decision looked upon by most authorities as of far-reaching importance, the right of the Lehigh Navigation Coal Co. to operate its No. 8 breaker, Coaldale, Pa., two shifts a day was upheld by the Anthracite Board of Conciliation on July 29. The board rejected the contention of the officers of Local 1537, District 7, United Mine Workers, that the practice was contrary to the agreement.

Signs of a recurrence of the strife between factions in the anthracite union became apparent late last month. On July 27, the executive board of District 1 warned members that expulsion would be the penalty for attendance at the rump convention called at Scranton, Pa., Aug. 7. On July 30, administration officers of Local 1084, Exeter colliery, Lehigh Valley Coal Co., were ousted by insurgents, who elected delegates to attend the rump convention.

Industrial Notes

GEORGE L. DRAFFAN, formerly secretary, has been elected vice-president of the Ohio Brass Co. and subsidiaries. Mr. Draffan's connection with the company began seventeen years ago, and prior to his election to the secretaryship in 1930 he was general sales manager for a number of years.

ROBERT LAMBIE, Charleston, W. Va., has been appointed Southern manager for the Liberty Powder Co., Pittsburgh, Pa.

L. W. GROTHAUS, for some time general representative in charge of the sales organization, has been appointed assistant to the president of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., and will direct the company's interests as they relate to the National Industrial Recovery Act. WALTER GEIST, with the company since 1909 and lately assistant manager of the milling machinery department, succeeds Mr. Grothaus.

ALLEN & GARCIA CO., Chicago, has opened a New York City office at 120 Wall St. This office will be conducted by McCrossin & Co., engineers, which is headed by E. F. McCrossin, whose connection with the mining industry began with a number of construction jobs at metal and coal mines in the Birmingham (Ala.) district several years ago. Allen & Garcia, in turn, will represent McCrossin & Co. in the Middle West.

General Rate Reduction Denied by I.C.C.

The general reduction in commodity freight rates requested in the joint action of the National Coal Association and farmers' and lumbermen's organizations was refused by the Interstate Commerce Commission in a decision handed down Aug. 5. By a majority of 7 to 3, the commission held that a general reduction would not stimulate traffic volume in the aggregate, that such a reduction "would threaten the continuance of adequate railroad service," and that it would tend to increase unemployment by preventing the continuance of necessary maintenance work and other activities.

In making its decision, however, the commission recommended that the carriers should consider the possible benefits of rate reductions on bituminous coal for export, lumber shipments, grain in the Western district and for export, and other commodities, and declared that "Any industry may bring the rate levels on its commodities to our attention with a view to bringing about such readjustments in the rates thereon as may be warranted by changed conditions which appear to have sufficient permanency to be used as a basis for readjusting rates."

Associations

L. T. Dee, vice-president, Lion Coal Corporation, Ogden, Utah, was reelected president of the Southern Wyoming Coal Operators' Association at the annual meeting held last month. Other officers were chosen as follows: vice-president, Forrest Richardson, president, Megeath Coal Co., Omaha, Neb.; treasurer, V. J. Facinelli, Rock Springs, Wyo.; executive secretary, L. W. Mitchell, Rock Springs (reelected). The new executive committee is composed of A. N. Fancher, president, Colony Coal Co., Denver, Colo.; T. J. O'Brien, vice-president, Gunn-Quealy Coal Co., Salt Lake City, Utah; and Mr. Dee.

G. C. Davis, manager, Stag Canon Branch, Phelps Dodge Corporation, Dawson, N. M., was elected president of the Colorado & New Mexico Coal Operators' Association last month. H. C. Marchant, president, Pinnacle-Kemmerer Coal Co., Denver, Colo., was elected vice-president, and F. O. Sandstrom, Denver, was again chosen secretary-treasurer and traffic manager.

Coming Meetings

National Safety Council; twenty-second annual safety congress and exposition, Oct. 2-6, Stevens Hotel, Chicago, Ill.

American Institute of Mining and Metallurgical Engineers, Coal Division; Oct. 27 and 28, Columbus, Ohio.

Coke Rates Prescribed

The Interstate Commerce Commission handed down in July a decision in I. & S. Docket 3511 and related cases covering rate on coke, coke breeze, coke dust and coke screenings between points in central and Illinois territories, and from Alabama points north and west. The commission cancelled proposed rates between the central and Illinois territories, and modified the findings and order in 155 I.C.C. 70, *Indiana Coke & Gas Co. v. Ahnapee & Western Ry. Co.* Present rates between points in central territory and Illinois territory, and from Ashland, Ky., and Ironton and Portsmouth, Ohio, to points in Illinois, Wisconsin, Iowa, Missouri, Nebraska, South Dakota and Minnesota were found unreasonable, as were rates from Dolcito Junction, Alabama City, Holt and Woodward, Ala., to destinations in Illinois, Indiana and the southern Peninsula of Michigan. Reasonable rates were prescribed. Rates from Birmingham, Ala., to Omaha, Neb., were found not unreasonable.

Gas Drive on in Chicago

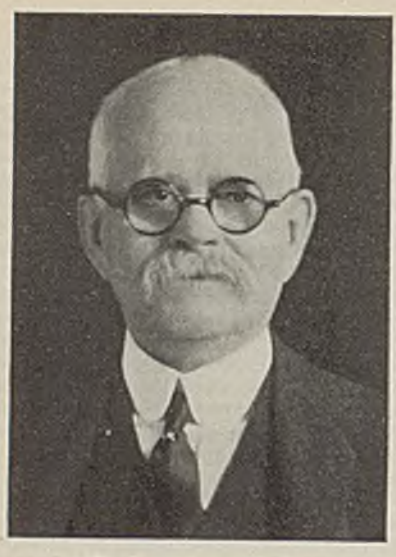
A determined drive for the Chicago heating market, both domestic and industrial, was launched by the Peoples Gas Light & Coke Co., last month. This company's product consists of a mixture of manufactured and Texas natural gas, and the drive is being backed up by generous advertising schedules in the Chicago newspapers. Reduced rates are offered which bring the cost of gas heating in the domestic field down to approximately that of anthracite or coke, while the industrial rates make the heating cost comparable with that of bituminous coal. Sixty thousand home-heating installations during the current year is reported to be the goal of the drive.

Ohio Rate Cuts Stand

Overruling the decision of the Interstate Commerce Commission in Docket 25,566 and related cases, the federal court at Columbus, Ohio, allowed for an indefinite period the 29-cent rate reduction on coal from eastern and southern Ohio to destinations in the northern part of the state, and also relieved shippers from paying the surcharge of 6c. per ton. The action of the court confirms the reduced rate of $1.45 from the Pittsburgh No. 8 district to Cleveland and Lorain, as well as the related rates to other points.

C.F.&I. in Receivership

With the consent of its representatives, the Colorado Fuel & Iron Co., operating ore and coal mines and steel plants in Colorado, was placed in an equity receivership Aug. 1, following a default on bond interest. Application for receivership was filed in the federal court at Denver by the Bankers Trust Co., New York, and Arthur Roeder, president of the company, was appointed receiver. The interest default was voted by the board of directors on July 31, which declared that its payment would unduly deplete the working capital of the company.



The Late John Markle

Personal Notes

HENRY M. O'BLENESS, vice-president, Central Industrial Service Co., Pittsburgh, Pa., has been appointed public relations representative for the Berwind-White Coal Mining Co., New York, with headquarters in Washington, D. C.

P. H. BURLINGHAM, formerly president of the Hardy-Burlingham Mining Co., Hardburly, Ky., and for the past two months associated with Appalachian Coals Inc., has been appointed general manager of the Middle West Coal Co., Cincinnati, Ohio. Mr. Burlingham succeeds the late Burke H. Keeney.

ERNEST L. BAILEY, who was appointed chief of the West Virginia Department of Mines early in March, has resigned that office to accept an appointment to the State Road Commission.

CARL B. METZGER, Philadelphia, Pa., for many years secretary-treasurer of the North East Coal Co., Paintsville, Ky., and vice-president, Glogora Coal Co., Huntington, W. Va., has been elected president of the North East company. Mr. Metzger succeeds A. D. W. SMITH, Philadelphia, who continues as president of the South East Coal Co. W. F. PIOCH, general manager, Glogora Coal Co., takes over the position of general manager for the North East properties as well. ALAN J. SMITH, Norristown, Pa., becomes secretary-treasurer of the South East company, with headquarters in Cincinnati, Ohio, while HENRY LAVIERS, Paintsville, advances from general manager to vice-president, relinquishing the position of general manager for the North East Coal Co., which he also held. HARRY LAVIERS, Paintsville, for some time assistant general manager, becomes general manager for the South East properties.

WILLIAM ROBINETT, labor commissioner and Ohio inspector of mines and mining under previous administrations and a former president of Ohio Subdistrict No. 1, United Mine Workers, has been named labor commissioner for the southern Ohio operators. Mr. Robinett took office Aug. 1.

D. A. REED, for some years connected with the company in various capacities and recently manager of the Elkhorn division, has been made general manager of operations for the Consolidation Coal Co., with headquarters at Fairmont, W. Va. F. F. JORGENSON, for some years manager of the West Virginia division, Fairmont, has been appointed to the position of manager of production. WILLIAM J. WOLF, manager of the Maryland division, succeeds Mr. Jorgenson in the West Virginia division, while B. H. McCRACKIN, divisional electrical engineer, succeeds Mr. Wolf in Maryland.

Obituary

JOHN MARKLE, 74, pioneer anthracite operator and, until his retirement in 1926, president of the Jeddo-Highland Coal Co., died July 10 at his home in New York City. Mr. Markle received his degree as a mining engineer from Lafayette College in 1880, whereupon he became general superintendent of his father's coal-mining organization, G. B. Markle & Co. Upon his father's retirement, Mr. Markle, with his brothers, George and Alvin, assumed control of the Jeddo-Highland Coal Co., which had taken over the original firm, and later became president. One of his outstanding achievements was the construction of the Jeddo water tunnel, completed in 1884 at a cost of $1,000,000. After losing a bitter struggle over union recognition in 1902, Mr. Markle turned his attention to other interests, and in the latter part of his life devoted his time largely to philanthropic work.

GRANT HOLMES, 68, president of Robert Holmes & Bros., Inc., and a leader in the design of equipment for both shaft and strip mines, died at his home in Danville, Ill., July 3.

FRANK R. LYON, vice-president in charge of operations and one of the receivers of the Consolidation Coal Co., Fairmont, W. Va., died suddenly of heart failure, July 13, while attending a code meeting at the offices of W. J. Rainey, Inc., New York City. Mr. Lyon, who was born in Bradford, Pa., in 1872, was graduated from the Pennsylvania State Normal School in 1889, and after holding a number of positions with coal mining companies in Pennsylvania, West Virginia and Indiana, was made assistant general superintendent of the Maryland division of the Consolidation Coal Co. in 1904. He became general manager of operations, with headquarters at Fairmont, in 1913, and in 1919 was elected vice-president in charge of operations.

The Late F. R. Lyon

Mine Fatalities Increase

Coal-mine accidents caused the deaths of 70 bituminous and 13 anthracite miners in June, 1933, according to information furnished the U. S. Bureau of Mines by state mine inspectors. This compares with 49 bituminous and 5 anthracite fatalities in May. Based on a production of 25,320,000 tons, the bituminous death rate in June was 2.76 per million tons, against 2.18 in May, when 22,488,000 tons was produced. The anthracite death rate rose from 1.69 per million tons in May, based on a production of 2,967,000 tons, to 3.31 in June, when the output was 3,928,000 tons. For the two industries combined, the June death rate was 2.84, against 2.12 in May.

Comparative fatality rates for the first half of 1933 and 1932, by causes, are given in the following table:

FATALITIES AND DEATH RATES AT BITUMINOUS 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-June, 1932						
Falls of roof and coal	217	1.501	70	2.897	287	1.701
Haulage	63	.436	17	.704	80	.474
Gas or dust explosions:						
Local explosions	3	.021	2	.083	5	.030
Major explosions	54	.374	—	—	54	.320
Explosives	7	.048	8	.331	15	.089
Electricity	19	.131	4	.166	23	.136
Machinery	10	.069	1	.041	11	.065
Surface and miscellaneous	35	.242	14	.579	49	.290
Total	408	2.822	116	4.801	524	3.105
January-June, 1933						
Falls of roof and coal	191	1.315	54	2.412	245	1.462
Haulage	66	.455	13	.581	79	.471
Gas or dust explosions:						
Local explosions	10	.069	8	.357	18	.107
Major explosions	—	—	—	—	—	—
Explosives	10	.069	3	.134	13	.078
Electricity	18	.124	2	.089	20	.119
Machinery	7	.048	—	—	7	.042
Surface and miscellaneous	24	.165	16	.715	40	.239
Total	326	2.245	96	4.288	422	2.518

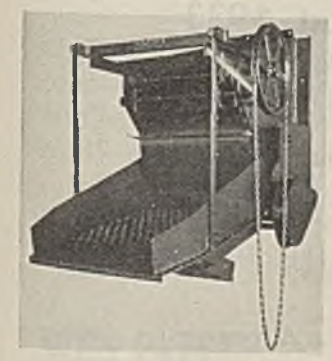
*All figures are preliminary and subject to revision.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Degradation Screen

For removing dust and fines from coal as it is loaded into trucks, Robert Holmes & Bros., Inc., Danville, Ill., offer the "Dust-o-lator," a self-contained unit combining a withdrawal gate, screen and automatically controlled power equipment. The "Dust-o-lator," according to the company, can be adapted to any type of bin, and is furnished for either side or bottom delivery. Adjustable hangers provide for varying the slope of the screen, and the company stresses the fact that the equipment is built for long, hard service.

Two sizes are available—No. 1, for handling coal up to egg, is equipped with an overcut gate and a shaker screen with a surface area of 5 sq.ft.; No. 2, for lump, has 15 sq.ft. of screening surface and an undercut gate. Motor control is automatic on both machines, a pull on the hand rod or chain-and-toggle mechanism operating the gates starting up the motor. Releasing the hand rod or chain closes the gates and shuts down the motor. The No. 1 "Dust-o-lator" may be equipped with a bagging attachment if desired.



Holmes "Dust-o-lator"

New Shovel

Northwest Engineering Co., Chicago, announces the Northwest Model 80 gasoline-powered shovel with a capacity of 2 cu.yd. Boom and dipper sticks are welded, and the former is slightly cambered for maximum operating ranges. Other features noted by the maker are: patented independent crowd for speed, simplicity and extra digging power; shock-resisting, heavy-duty power plant with exceptionally low fuel consumption; special crawler design giving positive traction on both crawlers even while turning; "Cushion Clutch," which transmits full engine power and reduces shocks 50 per cent; "Feather-Touch" control for shifting main clutches faster and easier. Operation of the clutch is in direct proportion to the pressure on the lever.

Northwest Model 80 Shovel

Steam Generating Unit

Combustion Engineering Corporation, New York City, announces the C-E steam generator unit, a standard design built in a range of sizes for capacities of 8,000 to 40,000 lb. of steam per hour. Principal features pointed out by the company are: low first cost, economical operation, compactness, and suitability for firing by pulverized fuel, oil or gas. It comprises an assembly of standard equipment, without radical departures from established practice. Low headroom and small floor space requirements make it particularly suitable for the limited space conditions found in many plants, it is said.

The unit comprises a two-drum vertical boiler and a furnace of solid brick walls, the top and front of which are water-cooled by tubes connecting into the upper boiler drum and terminating in a header in the lower front wall. A water screen across the furnace bottom connects this header with the lower boiler drum. Pulverized fuel is fired horizontally by a natural draft burner to which fuel is supplied by a Raymond impact pulverizer mill, located either in front or to one side of the unit. The boiler can be arranged for either two or three gas passes and may be equipped with a superheater.

Carbon Monoxide Antidote

Declaring that repeated use of methylene blue in a 1-per cent aqueous solution in doses up to 50 cc. has demonstrated its effectiveness as an antidote for carbon monoxide and cyanide poisoning, William H. Rorer, Inc., Philadelphia, offers a 50-cc. sterile ampule of methylene blue of this particular solution strength for use in industries and hospitals and by physicians.

Inclosed Motor

U. S. Electrical Mfg. Co., Los Angeles, Calif., offers the "Doublenclosed" explosion-proof motor (Types SD and SE) carrying the seal of the National Board of Fire Underwriters. Two inclosing frames are provided, with an unusually large fan between them. The inner frame incloses the windings, stator, rotor, anti-friction bearings and bearing chamber and prevents the entrance of dust or other foreign matter with the cooling air. The outer frame completely incloses and protects the entire unit. Other features pointed out by the company are: one-piece, die-cast aluminum rotor; cast-steel inner shell; bearing support with an extra long, self-lubricating sleeve bushing of graphite bronze; and a cast-metal terminal chamber machine-fitted to the motor frame.

"Doublenclosed" Explosion-proof Motor

Electrical Controls

General Electric Co., Schenectady, N. Y., offers the Type SM direct-acting reclosing device, which it declares is an inexpensive piece of equipment for use with oil circuit breakers. This attachment will reclose a breaker one, two or three consecutive times, with equal time intervals between reclosures, when the breaker is tripped by overload. If the overload disappears after any reclosure, the attachment will return to its normal position and the breaker will remain closed. If the overload still exists after the last reclosure, the breaker will remain locked open until it is closed by hand. The attachment consists of a mercury-tube device in which timing is obtained by running mercury through an orifice into a reclosing contact chamber. It is directly connected to the breaker mechanism, and is available with both solenoid and motor-operated breakers, both outdoor and indoor.

A new meter which combines in one device a watthour meter and a recording demand meter is announced by the General Electric Co. The demand mechanism of the new meter (Type DG-1) is of the "block-interval" type, recording on a strip-chart the demand over a definite time interval. A hook at the end of the ink line indicates the exact value of the demand, and as the chart is advanced continuously, the slope of the line indicates the variation in magnitude of the load during the time interval. The watthour register is separated from the demand mechanism, allowing either one to be changed independently to take care of changes in the ratings of instrument transformers.

A line of fractional horsepower gear-motors with the characteristics and construction of the latest designs of general-purpose motors is another Gen-

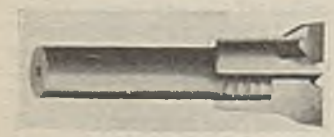
eral Electric development. Connections to driven machines can be made directly or through the use of gears, belts or chains. These motors are available in two types, both in ratings from ⅛ to ¾ hp., the concentric-shaft type in speeds from 500 to 98 r.p.m. and the right-angle-shaft type in speeds from 200 to 11 r.p.m.

General Electric also offers a small, hand-operated starting switch for fractional-horsepower motors, which is said to provide complete protection against stalled-rotor current and injurious overload conditions. The single-phase a.c. switch is available in single- and double-pole forms. Designated as CR-1061, the switch is available in the following forms: open-type switches where the purchaser furnishes the inclosure; inclosed-type switches for general purpose applications; and switches for Class 1, Group D hazardous locations.

Another new General Electric product is a cable insulated with Glyptal-treated cloth and capable of resisting oil and high temperatures. It is available in all types, according to the company, and also features unusual flexibility and toughness. The new cable is recommended by the company for low- and medium-voltage leads, apparatus cable, leads for coil and control devices, transformer leads, and other applications where oil- and heat-resisting characteristics are desired.

Detachable Bit

Ingersoll-Rand Co., New York City, now offers "Jackbits," or detachable rock drill bits to replace the conventional bits forged onto the ends of drill steel. The bits, according to the company, are secured directly to the end of the drill rod by means of a shallow, reverse buttress-type thread of a carefully determined angle,



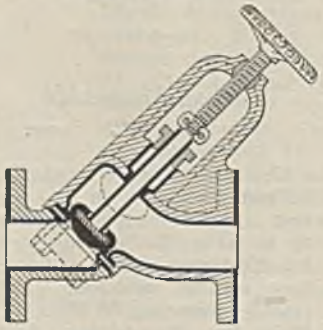
Ingersoll-Rand "Jackbit"

which keeps the bit tight, makes it easy to change, and transmits the maximum hammer blow through the end of the rod close to the cutting edges. There is no pressure on the threads. Other features emphasized by the company are: large clearance grooves to pass cuttings, a countersunk hole in the center of the cutting edge which guides the bit, and cadmium plating to prevent rusting.

Rubber-Lined Valve

For handling corrosive and abrasive fluids under conditions of fairly high or pulsating pressures, either throttling or suction, B. F. Goodrich Rubber Co. offers the new "Vulcalock" valve, which may be lined with any of the standard "Acidseal" rubber compounds, hard or soft, depending upon service conditions. Action of the valve does not depend upon a flexible diaphragm, the company says. A resilient, rounded disk snaps over a circular plate at the lower end of the valve stem and provides what is said to be an absolute seal in contact with the molded rubber seat. Other features pointed out by the company are: inexpensive, easily replaceable disk and ring; steady, uniform flow with positive shutoff; nearly straight line of flow, insuring suitability for fairly high pressures and abrasive service; easy changing from straightaway to angle valve by reversing lower body section; and adaptability to easy dismantling without special tools.

Goodrich "Vulcalock" Valve



Rotary Compressors

A complete line of new ro air compressors and va pumps of the multi-ce sliding-vane type, both w and air-cooled, is offered by t Allis-Chalmers Mfg. Co., Milwaukee, Wis. The line covers a range of volumes from 50 to 2,000 c.f.m. at pressures up to 150 lb. per square inch, and vacuums up to 29.85 in. of mercury. Air-cooled units are suitable for pressures up to 10 lb. per square inch gage, and vacuums up to 18 in. of mercury. Advantages cited by the company include: smooth operation, small dimensions, continuous delivery, low maintenance cost, totally inclosed working parts, elimination of valves and complicated motions, and, normally, belts and pulleys.

Expansion Joint

Yarnall-Waring Co., Philadelphia, Pa., has developed the Yarway "Gun-Pakt" expansion joint for power, heating and industrial applications. This expansion joint, according to the company, features the use of a fixed gland ring with special attachments by which the packing may be forced into the stuffing box while the joint is under pressure. Packing is forced into the joint through guns consisting of small bronze cylinders in which threaded stainless steel plungers operate, and the joint may be repacked without removing either the gland or the old packing. The joints are made in both double and single-end types in sixteen standard sizes from 2 to 24 in., and for working pressures of 150, 300 and 400 lb. per sq.in.

Yarway Flanged, Double-End "Gun-Pakt" Expansion Joint

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