COAL AGE

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

SYDNEY A. HALE, Editor

New York, October, 1933

NRA MEMBER U.S. WE DO OUR PART

Under the Blue Eagle

THE GREAT EXPERIMENT in tripartnership of industry, labor and the federal government in bituminous coal mining is now under way. By the terms of the code of fair competition, effective October 2, trade practices against which leaders in the industry have inveighed for years are specifically outlawed. Machinery is set up for compelling the dissident minority who put personal advantage or necessity above the good of the industry as a whole to abide by the published rules of the game.

No section of the code, printed in full in this issue of *Coal Age*, can be dismissed as window dressing. Two interdependent features, however, dominate, and the many separate clauses embodied in the document serve to give these closely related principles living force. First, and inherent in the purposes of NIRA, is the establishment of minimum wages. In the majority of cases, these minima represent not only substantial increases over the rates prevailing prior to the enactment of the law but also carry with them the understanding that customary differentials and relationships for other classifications of labor will be preserved.

Definitely pegging wages puts an end to that particularly vicious form of competition under which the wage earner was the chief victim of a frantic scramble for tonnage at any price. Excellent as this prohibition is, standing alone it is no curb upon the minority of producers so obsessed with the fever for volume that they will sacrifice profits and capital assets as ruthlessly as they will sacrifice wages. So the second major feature of the new code provides for the establishment of "fair market prices" below which no seller may drop without creating a *prima facie* presumption of destructive price cutting and unfair competition.

Meticulous critics and others less microscopically minded doubtless can and will find many details in the code fair targets for adverse comment. Some of the divisional boundaries, for example, offend well-grounded ideas on natural trade lines; but here, fortunately, establishment of subdivisional units will cure the defects of too broad initial grouping. Where experiences indicate the advisability of further changes which will not weaken the fundamental objectives of the code, there is no reason to believe that change will not be forthcoming.

The positive benefits implied in the code so far outweigh its possible minor disadvantages and hardships that every interest in the industry should work whole-heartedly to insure its successful operation. Too much credit cannot be given to the groups of coal men who labored through the hot Washington summer, frequently surrendering cherished opinions and prerogatives in the cause of cooperation, that this great experiment might be possible.

Management Unchained

IN PUTTING a bottom under wages and prices, the NRA bituminous coal code restores management to its proper functional plane in industry and gives fresh incentives to efficiency in operation. During the dreary years of cutthroat competition, while the pressure for lower costs was ever present, progressive management lived under the constant threat that any capital investment it might make in equipment to modernize production methods and so

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reduce costs could be wiped out overnight by a competitor across the hill who posted a notice at the mine mouth reducing wages. Under such a threat, more than one company postponed the investment.

Today the picture is changed. Management which invests capital in modernization to reduce production costs is protected in that investment by the code terms fixing minimum wages in every producing field. Elimination of the wage chiseler means that progressive management again can win the full rewards of efficiency. It means, too, that the company which thoroughly modernizes equipment and methods will be in a position to absorb freely a larger share of the competitive business because it will be able to hug closer to the minimum prices and still realize a reasonable profit than will the competitor who clings to older and higher-cost methods of operation.

Millstone or Milestone?

THREE MONTHS AGO, recognition of the United Mine Workers in the bituminous fields east of the Indiana-Ohio state line was confined to southern Ohio, a few scattered operations in Pennsylvania and several companies in northern West Virginia: today, thanks to the new freedom granted organized labor by NIRA and to direct Presidential intervention, operators throughout the great Appalachian region have signed wage agreements with the Lewis organization. The sheer drama of this swift revival and expansion of union power needs no theater; the task of consolidating these gains and of making the new contracts effective instruments for the betterment of the whole industry, however, is much less spectacular but infinitely more important.

Achievement of this goal is beset with difficulties and demands the highest degree of industrial statesmanship upon the part of both management and labor. Readjustment of human relations seldom is easily made, and where, as in the present instance, the readjustment involves an entire change in traditional viewpoints, minor frictions and irritations in the early stages are almost inevitable. There may be pit committees who feel their new and strange authority too strongly and supervisory officials who feel their jurisdiction cramped by the new order. Dealing with these situations, when and if they arise, will require real patience and sympathetic understanding of the temperamental and congenital frailties of human nature.

Carried out in this spirit by both parties to the contract, the agreement should fulfill the hope of its sponsors that "it marks the beginning of a new era in the task of stabilizing and modernizing the basic processes" of the industry. Carried out in a spirit of resentment or reprisal, with either or both sides digging in for the next war, it would be nothing but a prelude to industrial hell.

It Acquires Strength by Moving

WHEN Vergil coined the sentence *Vires acquirit eundo,* he did not have the arch stones, or voussoirs, of the arch in mind, but the dictum holds as truly, nevertheless, as if he had. When voussoirs are laid up over a falsework, they will not support themselves so long as the falsework holds them from any downward movement. When the falsework is removed, the arch begins to fail, the joints close up and the arch action begins. Thus strength is derived from the downward motion.

Similarly, with broken roof in the mines, while the coal is there, the coal bed supports the overburden. When an opening is made, the roof descends a little, its vacuities close up and the roof arches or tends to arch itself. The rough edges of the broken fragments spall, the blocks come closer together and the falling action is arrested. If a stiff support, such as a steel set, is placed below the roof, that movement is prevented, the support has to carry most of the weight and, if not adequate, will fail; but if the support is flexible, it gives way and permits the roof to come down and the cracks close, so that the arching action of the roof asserts itself. The spalling of the roughened surfaces is slow but inevitable. The descent of the arch is slow, therefore, and it may be some time before it is completed. Other mining may increase the strain, making further spalling necessary, and the flexible arch must give once more till the roof develops its full strength from further motion.

This is the principle of the flexible arch. It is not intended to hold the roof in place. It lets the roof adjust itself to its loads till it will carry its own weight. Meantime, it keeps the loosened material in place and bends enough to permit the roof to acquire strength by its movement.

BITUMINOUS COAL

+ Flies the Blue Eagle

Under Code of Fair Competition

USHERED IN against a background of strikes, the code of fair competition for the bituminous coal-mining industry under NIRA went into effect on Oct. 2. By supplemental agreement effective the same day, captive mines in the steel industry, which had not participated in the long negotiations leading up to the adoption of a single code for the 30-odd separate codes and supplements originally submitted to NRA by representatives for various commercial mining interests, accepted the conditions of the NRA code. At the same time, wage contracts between commercial operators in the great Appalachian region and the United Mine Workers also became effective.

As told in greater detail elsewhere in this issue (see p. 354), the strike movement first started in the Connellsville region several weeks ago ostensibly to force union recognition by the H. C. Frick Coke Co. and the election of checkweighmen at the operations of that organization. When this strike spread to other captive and commercial operations in western Pennsylvania, the government intervened, set up machinery for the election of checkweighmen and persuaded the men to return to work. The settlement was short-lived, however, as the men went out a second time, declaring that they would not return to the pits until the coal code was signed and union recognition accorded.

Approval of the code by President Roosevelt on Sept. 18 failed to bring peace to the affected area. Instead, the ringleaders in the first walkout extended their activities. On the day the code and the Appalachian wage agreement—hailed by its sponsors as marking "the beginning of a new era in the task of stabilizing and modernizing the basic processes of this great industry"—went into effect, most of the workers in western Pennsylvania and large numbers in central Pennsylvania were still on "a holiday." For good measure, a number of mines in the Pocahontas and Tug River fields also were forced to shut down. In the Southwest, workers expressed their dissatisfaction with the incorporation of existing union contract rates as the code minima for that region by a number of wildcat strikes. The first major break in the Eastern situation came on Oct. 3, when approximately 21,000 workers in central Pennsylvania, yielding to the advice of conservative union leaders and the exhortation of Washington, decided to return to work.

The code as finally drafted after a conference between NRA officials and the joint committee of operators appointed Sept. 12 (see *Coal Age*, September, 1933, p. 292), while modeled along the lines of the draft made public on Sept. 7, was modified in several important sections to meet the storm of objections which greeted the publication of the original draft. Among the more important modifications were:

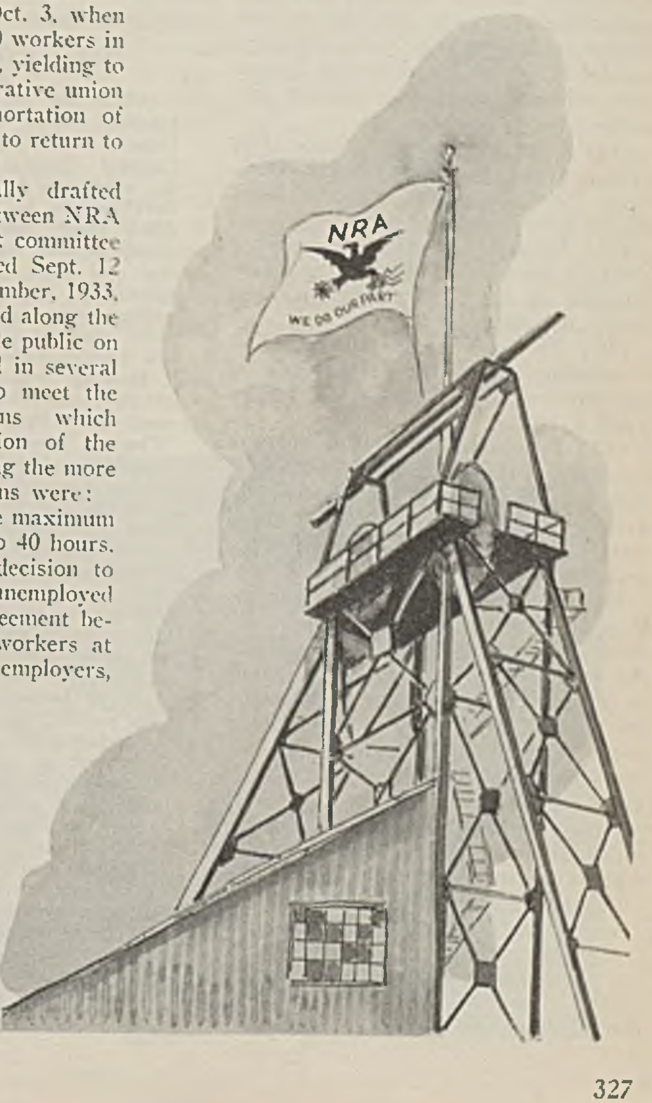
(1) Increase in the maximum work-week from 36 to 40 hours.

(2) Limiting the decision to share work with unemployed miners to mutual agreement between the employed workers at the mine and their employers, thereby eliminating the provision for appeal to a district adjustment committee.

(3) Elimination of occupational specification in setting up minimum wages.

(4) Elimination of provision requiring Divisional Code Authorities to submit supplemental schedules covering minimum piecework rates.

(5) Increase in the minimum age for



employment inside the mine or in hazardous occupations outside from 16 to 17 years.

(6) Postponement of date for review of wages and differentials from Nov. 30, 1933, to Jan. 5, 1934.

(7) Limitation of application of maximum hours, minimum rates and differentials to April 1, 1934, unless revised by mutual agreement as a result of the January conference.

(8) Elimination of the provision that a sales agency must represent two-thirds of the commercial tonnage of a district by numbers as well as by volume.

(9) Substitution of the Presidential appointee on the Code Authority for the National Recovery Administrator as primary approver of price changes.

(10) Elimination from the unfair practices division of the code of the sections dealing with false or deceptive statements concerning a competitor and with an investigation into trucking coal from the mines.

(11) Elimination from this same division of authorization of prices below the fair market bases established to meet competition of imported coals.

(12) Provision for setting up subdivisions and Subdivisional Code Authorities, subject to limitation by the Administrator on the number of such subdivisions so created by the industry.

(13) Provision for financing cost of code administration by tonnage assessments.

(14) Enlargement of membership, with greater representation for Divisions I and II, of the National Bituminous Coal Industrial Board.

(15) Material revision of sections covering labor relations and the establishment of the National Bituminous Coal Labor Board.

(16) Provision for the withdrawal as a voluntary subscriber to the code of any producer upon 30 days' notice after April 1, 1934.

(17) Provision that the differences in districts in the minimum rates under Schedule A are not to be considered as fixing permanent wage differentials or establishing precedents for future wage scales.

When the code was submitted to the President for his approval, he made three important changes before signing the document. He removed any doubt as to the right of the government under the code to demand freely any data it might desire from the industry by adding a second sentence to the first paragraph of Sec. 3, Art. VII.

Under the code as submitted, the National Bituminous Coal Industrial Board was to consist of fifteen members. The Divisional Code Authority for Division I was to name four men; Division II, two members; and each of the remaining three divisions, one each. The other six members were to be the Presidential appointees on the Divisional Code Authorities and the National Recovery Administrator, who was to act as ex-officio chairman of the board. In approving the code, however, acting on a suggestion made by Deputy Administrator Kenneth M. Simpson in transmitting the code to General Johnson, the President reserved to himself the right to name three additional members to the board.

The third important change involved the hotly argued point of "qualifications" of Sec. 7 (a) of NIRA. Following the acceptance of the automobile manufacturing industry code, with the so-called "merit" clause as a substitute for a declaration on the open shop and permitted to remain in that code, as the General subsequently admitted in a press conference, because he had "spoken out of turn" in his earlier negotiations with the automobile manufacturers, there was a rush of proposed modifications and amendments by industry generally to have their codes carry the same clause. The National Recovery Administrator met this flood with the flat announcement that such "qualifications" would not be permitted in any future code.

Possibly, as a last face-saving gesture to those interests which rebelled against the announcements of the American Federation of Labor that it was out to completely unionize all industry, when the coal code went to the President it carried a Schedule A, covering minimum wages, and a Schedule B, which was the famous "clarification" statement on Sec. 7 (a) made by General Johnson and approved by Donald Richberg, general counsel for NRA, announcing that the section in question meant just what it said—nothing more nor nothing less—and that the provocative phrases "open shop" and "closed shop" were forthwith erased from the bright lexicon of NRA.

But the President, who had signed the automobile code without following the suggestion of the NRA Labor Advisory Board that he should state that such approval was in no sense to be considered as a precedent for approval of other codes submitted with "merit" clauses, would have none of it. "Because," he said, "it is evident that attempts by those submitting codes to interpret Sec. 7 (a) of the National Industrial Recovery Act have led to confusion and misunderstanding, such interpretations should not be incorporated in codes of fair competition. Therefore, paragraph b of Art. V must be eliminated, without by this exclusion indicating disapproval in any way of the joint statement of the Administrator and general counsel of the National Recovery Administration, which has been attached to the code as Schedule B and was incorporated by reference in said paragraph b of Art. V."

At the time the code was submitted to the White House, no wage rates were named in Schedule A for the Panhandle of northern West Virginia; Somerset County, Pennsylvania; Preston County, West Virginia; northern Tennessee; Bell, Harlan, Whitley and McCreary counties, Kentucky; Vanderburg and Warrick counties, Indiana; Appanoose and Wayne counties, Iowa; Texas; western Kentucky; Alabama; Georgia; and southern Tennessee. By the time the supplemental Executive order of Sept. 29 was made public, every district except Alabama and Texas had accepted minima proposed by NRA. Texas was eliminated from consideration on the ground its business was entirely intrastate. Alabama, which technically had a minimum of $3.40 per day for skilled inside labor and $2.40 for outside common labor "imposed" upon it, was holding meetings in an effort to reach agreement among the operators in the state for the acceptance of these rates. Western Kentucky, which had proposed rates of $2.64 and $2.24 and violently objected to the proposal that its base rate for skilled labor be set at $3.84, came in under the wire with rates of $4 for skilled inside labor and $3 for common outside labor.

With the code approved by the White House, every major producing district started meetings to consider preparing the

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Behind the Scenes

While the spotlight shone most brightly upon General Johnson, Deputy Administrator Simpson and General Counsel Richberg during the weeks the bituminous coal code developments held the center of the NRA stage, behind the scenes a group of men were literally toiling day and night examining the data submitted by various operating groups and working up additional basic material for consideration by the Administration.

Heading this group was James H. Pierce, technical adviser. He was assisted by Prof. Waldo E. Fisher, Wharton School of Business Administration and Finance, who specialized in differentials, hourly rates and earnings; Wayne Ellis, veteran of the Fuel Administration, who devoted his time to the economic and marketing sides of the industry; Fred Berquist, loaned by the Bureau of Mines, who was busy on general industry statistics; with Carl E. L. Rosenberg functioning as an assistant to all members of the group. Fred E. Tryon, although not officially part of the staff, cooperated in formulating the outlines of the basic inquiries to be made. Howard Eavenson also played a part in the early days, acting as technical consultant until the formal appointment of Mr. Pierce.

Tribute also is due to the members of the fair sex who served as secretaries, stenographers and clerical assistants to the technical staff. They, too, worked cheerfully and uncomplainingly as long, each and every day, as the job required.

LUMP COAL—THE GOAL

+ In Mechanical Loading

At Old Orient

By ALPHONSE F. BROSKY

Consulting Editor, Coal Age

"WHATEVER our mining methods, they must maintain a high standard in the production of lump coal," declares Harry Treadwell, general superintendent of the Chicago, Wilmington & Franklin Coal Co. This statement explains the chief aim in the mechanization of Orient No. 1 mine, sister plant of New Orient, in Franklin County, Illinois. A high tonnage per machine shift is desirable, of course, but its economic attractiveness can be paled by high machine cost and depreciation of marketing value of the coal produced when the aim of high productivity is placed before size quality. There may be a place for this latter method, but not at plants which send much of their tonnage into the channels of domestic consumption.

Mechanization of Old Orient began in earnest during the summer of 1931. Equipment of a kind expected to meet most closely the demand for quality coal under conditions encountered in this mine has since been installed. As is generally known, the coal of the seam worked, the No. 6, is hard, massive, single bedded, and has little semblance of vertical cleavage. However, the horizontal bedding is quite marked.

When the coal is blasted, it tends to hold together in large horizontal slabs unless well shaken, which practice is not allowed at this mine. The management believes that the machine best suited to these conditions is one with gathering mechanism which moves largely in a horizontal plane. With this motion, that gathering device can dig under the coal, and in doing so move in the path of least resistance. It also is necessary that a machine under this operating condition have its loading head provided with a quick-acting vertical adjustment, one which can be raised and maintained at a level higher than the normal loading position, in order to turn over the cut, which may hang even after some degree of snubbing-loading.

Due to the large amount of gas and the high explosive quality of dust found in No. 6 seam in southern Illinois, the inclosed panel system of mining is used at this mine. Therefore, the development work is important and requires a very mobile machine which can move quickly from one panel to the other. As the entries are driven only 12 ft. wide, the coal generally is tight when shot lightly, as is required at this mine to obtain a high percentage of lump coal. A machine required to meet these conditions on development work was one which would not take an undue number of steps in loosening the coal for loading and one that could move on the road as rapidly as a haulage locomotive. The management of Orient No. 6 believes the Clarkson loading machine possesses these operating characteristics, and a number of these machines have been installed. In addition, it was felt that the vertical adjustment of the Clarkson machine would at the same time enable the operative to keep the loading nose ad-

Working to the Back of the Cut Along the Center Shear. Note That Blasting Is Not Intended to Turn the Coal Over.

justed to the floor line and eliminate any tendency to dig into the fireclay bottom.

This loader was developed with the conditions above outlined in view. Besides performing the task of undermining and rolling over the standing coal, the machine is required to withstand a fall of coal, which may come down at times in a mass weighing 10 to 15 tons. To meet this heavy service requirement, a 24-in. I-beam was adopted as the frame and trough of the front conveyor. About this member was built the gathering head mechanism swung on a kingpin. The gathering is performed by two-prong arms, each prong 10 in. long, attached to driven chains. When these arms meet unusual resistance, as in striking a tight cut of coal, the head plays back and forth in a cushioning arrangement which absorbs the shock and prevents it from reaching the truck of the machine.

The coal seam averages about 9½ ft. in thickness, but as a rule only 8 to 8½ ft. of this thickness is mined, the remainder being left as roof. If coal were not left to seal it, the roof rock would give so much trouble from falls that it would be impracticable to mine it. About 2 ft. from the bottom occurs the blue-band parting, which varies in thickness from a knife edge to 1½ in. This impurity is loaded out with the coal and separated in the preparation plant. A rolly bottom, with grades up to 4 per cent, makes cutting and loading difficult in places.

Both rooms and entries are undercut and center sheared by Jeffrey 29 LE and Sullivan CLU track-mounted machines. The first named machine is designed to shear on curves and, therefore, is used for making the first three cuts in room necks and entry turnouts. Holes are placed with Jeffrey A-6 and Dooley Brothers No. 700 coal drills. One gathering locomotive is assigned to each loading machine, and one relay locomotive to every four loading machines.

Rooms are driven 22 to 25 ft. wide on 40-ft. centers and to a depth of 250 ft. These are laid out in panels, sixteen rooms on each side of the panel entries. Cuts are made to a depth of 9 ft. and in rooms each cut yields 48 to 55 tons of coal. Entries are driven 12 ft. wide and yield 27 to 30 tons per cut. Timbers are kept up as close to the face as is necessary to keep the place safe. When a timber interferes with the loading operation, it is removed and reset.

A high yield of lump coal is demanded and, although shearing is practiced, blasting of the faces must be light. Four shotholes are used in entry places and six in room places. All holes in a face are placed radially from one set-up of the drill post. In both narrow and wide places two snubber shots are employed. These are started about 4 ft. from the bottom, midway of the shear cut and rib, and are angled outward and downward. Usually ¼ lb. of permissible powder is charged into each snub hole. Approximately 8 ft. from the bottom is a natural parting which has been adopted as the plane dividing the portion of the seam that is taken and that which is left for holding the roof. It is a few inches below this parting that the breaker shots are placed, two in narrow places, and four in wide places. These holes are equally spaced between rib and shear cut and are drilled horizontally and turned toward the rib. One-half to one pound of explosive is placed in each breaker hole.

By dint of this light blasting, which leaves a certain amount of mining-out to the loading machine, the company has been able to get practically the same percentage of domestic coal from the loading machines as from hand methods. With its short, stocky gathering arms, the loader feeds its way to the back of the cut, following the line of least resistance, which is in the shear cut. This opening having been made, the standing coal on both sides can be turned and rolled over in masses, after which little digging is required.

In entry work a loading-machine crew generally is composed of ten men and in room work of twelve men. A crew in a wide place is composed of a motorman, a triprider, two trackmen, one timberman, two drillers, two cutters, a loading-machine runner, a helper and a third man, who prepares the place before the loading machine goes in and makes it ready for the cutting machine after the loading machine moves out, and in his spare time works around the loading machine cleaning up the spillage. Each two machines in room work are supervised by a panel boss. In development work, however, one machine is assigned to one boss, as the work is scattered and there is only one development machine in a cross-entry.

In the old development, inherited from hand-loading days, turnouts into rooms and crosscuts were developed on a radius of 25 ft. This radius naturally has been found to be too small for loading-machine operation, tending to crowd and throw the machine off balance when loading out corners. Consequently, in the new development these turnouts are projected on a 35-ft. radius. Track is extended to within 4 ft. of the solid coal before cutting. This arrangement is ideal, both for the cutting and for the loading machines. Considerable trouble was experienced with track extensions when these were made by inverting rails in a sliding fit, caused chiefly from creeping of the extension rails because sufficient friction between rails was not present. For this reason it was found necessary to go back to extensions by the use of jumper rails.

At the present time there are five Clarkson loaders in operation in Old Orient. Two Clarkson loaders are on development work and three in room work. The development machines are loading the same tonnage as the room machines. The maintenance cost per ton of the Clarkson loader, including greasing, is low, due to its simple, rugged construction and the accessibility of its working parts.

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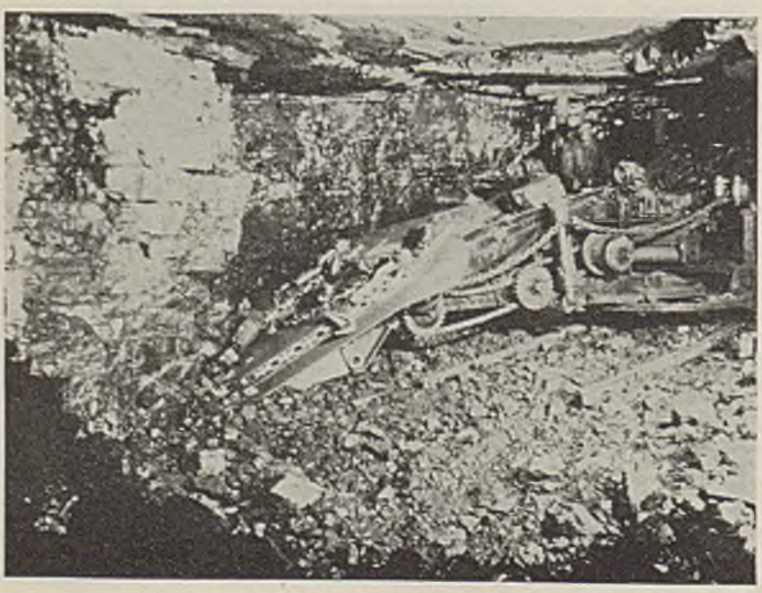
With the Coal Along the Shear Cut Removed, Two Wings Remain Standing. Here, One of Them Is Being Pulled Down by the Machine.



BITUMINOUS CODE

+ Brings Up New Problems

In Describing Coal Quality

By G. B. GOULD
President
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SEC. 13, Art. IV, of the bituminous code of fair competition declares "the intentional misrepresentation of analysis and/or sizes or the intentional making, causing or permitting to be made, or publishing, of any false, untrue, misleading or deceptive statement . . . concerning the size, quality, character, nature, preparation or origin of any coal" to be a violation of the code. While the labor clauses and their probable effect on costs and selling prices may obscure the fundamental importance of this section for the moment, it, nevertheless, gives to high-quality coals a definite sales advantage not hitherto enjoyed, and at the same time brings up new problems in selling.

In the pre-NIRA era, the merchant who overpraised the quality of his goods ran little risk of serious penalty, aside from the loss of good will when a customer, already accustomed to some degree of misrepresentation, found him out. Furthermore, it was difficult to call a merchant guilty of misrepresentation to account, thus giving him plenty of latitude short of outright fraud. Lastly, the merchant was subject only to civil action and the customer had to show that misrepresentation was practiced, that he was induced to buy as a result and that he had suffered specific damage. All in all, the merchant was largely free from restraint by competitors or any one else.

Now, under Sec. 13, Art. VI, which has the force of law, the making alone of a false, misleading or deceptive statement of quality is a violation, and is subject to specific penalties. The coal merchant, therefore, must be prepared to defend himself against complaints which may be lodged against him by competitors, prospective (not actual) customers or a government agency acting on its own initiative. Nor is the qualification "intentional" a complete defense against charges of misrepresentation. The law generally assumes that any person engaged in a particular business is an expert therein, and places upon him the burden of justifying the accuracy of his representations.

Bituminous coal is a commodity difficult to describe truthfully and accurately. The problem is not wholly one of honesty of purpose but rather the proper use of technical measurements to convey a true picture of the commodity. It is a well-recognized fact that coal from any mine varies somewhat from time to time, and reasonable allowance should be made for such variation by both producer and consumer. But how great an allowance? And should it be the same for every mine and kind of coal? Through good fortune, good management or good equipment, coal from some mines is more uniform in quality than similar coal of substantially the same *average* quality from others. Would not a strictly truthful representation of quality require that the extent and frequency of the variations be given in each case as a guide to the consumer?

Average quality is important to the buyer, but its importance should not be allowed to overshadow uniformity. If the latter is accepted as a standard in measuring value, sales letters including the phrase "a recent analysis made by a customer is as follows," or any similar expression will have to be used with great care. Such a statement may be absolutely true but still misleading, due to the fact that the indicated quality may be representative of only the best 10 per cent of the shipments, the prospective customer being left to infer that all shipments will equal that quality.

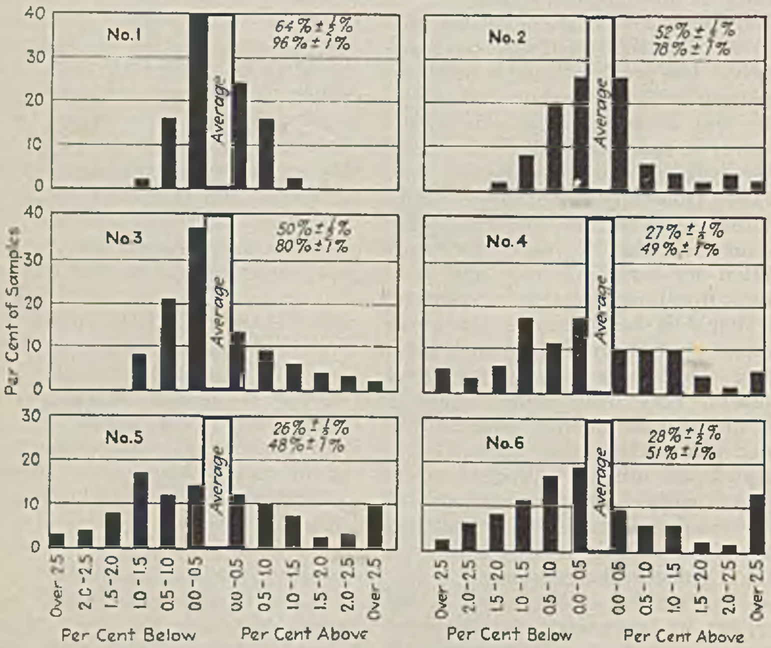
Individual coal analyses should not be used unless they can be supported by an adequate series. And even then the example should be close to the average. Also, individual analyses or averages should represent only actual shipments. Face samples are worthless as a means of representing commercial quality, and even when plainly designated as such should not be used in sales literature, as the typical coal buyer is not in a position to make proper allowances. If any figures are used to represent coal character or quality, the only safe procedure, from a technical standpoint, is to confine them to averages of series of samples of actual shipments, preferably supplemented by some indication of the extent and frequency of variations.

Barring a radical change in coal character or in mining and preparation, experience has shown that the average of a series of samples furnishes an accurate basis for predicting the average quality of another series of shipments from the same mine. This is illustrated by a study of the ash percentages from the last twenty tests made on coals from approximately 100 mines throughout the country by the Fuel Engineering Co. of New York. Both high- and low-ash coals are represented and preparation facilities range from none to elaborate modern installations. Each series of twenty was divided into two groups of ten in the order of receipt. Separate averages were made for each group and were compared with the average for the whole twenty samples. Exactly half of them were within 0.2 per cent; 84 per cent were within 0.5 per cent; and 92 per cent were within 0.7 per cent of the average.

If a buyer is to judge quality by the average of a series of shipments, an average of another series will provide a reasonably accurate index of what may be expected in the majority of cases. The longer the two series are, the closer they will agree. But both buyer and seller should clearly distinguish between the use of the average of one series of shipments as a basis for forecasting the average of another series and as a basis for forecasting the exact quality of an individual shipment. In the latter case, the tolerance should be greater, because the inevitable but usually infrequent deviations toward poor quality will be counterbalanced over a number of shipments by more frequent but less marked deviations toward high quality.

The coal producer should strive not only for a high average quality but also to reduce to a minimum occasional extreme departures from that average. The latter is subject to practical limits, of course—at some mines more than others. As a matter of prudence, however, and to prepare purchasers for deviations, it would seem best for the producer to face this situation frankly and make available to his customers a record of individual variations from average quality.

As an example of the deviations which may occur, the accompanying figure shows the individual variations from the average ash percentage for six low- and medium-volatile coals, the vertical bars in each case representing the number of samples out of a hundred falling within various limits above and below the average. Obviously, the average does not indicate with complete accuracy what the buyer can expect. Coal No. 1 comes the nearest to being truly represented by its average, two-thirds of the samples coming within 0.5 per cent of the average and only two exceeding the average by more than 1 per cent. This is a naturally clean coal helped by good preparation.



Graphic Representation of the Variations Above and Below Average Ash Percentages for Six Different Coals.

Coals Nos. 2 and 3 are not naturally as clean as No. 1, but have been carefully prepared. In both instances, half the samples come within 0.5 per cent of the average; in one case only twelve and in the other only fifteen samples out of a hundred exceed the average ash by more than 1 per cent. If complete and accurate descriptions of coals are to be expected, coals like these have nothing to lose by frankly admitting these occasional variations. In fact, producers have much to gain through increased buyer-confidence and some competitive advantage over coals like Nos. 4, 5 and 6, the quality of which is not as accurately represented by their averages.

The use of a range, such as 7 to 9 per cent ash, might be offered to cover the natural variation in coal quality, but this system raises the question of whether the majority of the shipments will be just under 9 or just over 7 per cent. There is no advantage to be gained for the really high-grade well-prepared coal by vague descriptions of quality. If the buyer is concerned with uniformity, or if he is buying only one or a small number of lots occasionally, he may not understand the chance he runs of meeting with one of the extreme variations and thus be misled by representations of quality based only on an average. Complete presentation of the facts, as given for the six coals above, enables him to make an intelligent choice and avoids in advance any unpleasant misunderstandings arising out of lack of knowledge as to the nature of coal.

This does not, however, relieve the producer of the responsibility of making an adjustment in case of an extreme variation in quality any more than a manufacturer can avoid responsibility for an inferior article which slips through the inspection system. Otherwise, it would be easy to use the infrequent but unavoidable extreme variations at one mine to justify careless or incompetent preparation at another. Complete and accurate representation of quality helps both the buyer and seller, but under pre-NIRA conditions it has been difficult for some producers to conform to this standard in the face of free-and-easy use of fragmentary data by others, aggravated by the fact that many coal buyers are not equipped with sufficient knowledge of the true facts to determine what variations in quality might be expected or what tolerance should be allowed in given cases.

Variations From the Average Ash Per Cent for Two of the Coals Shown Graphically in the Accompanying Figure

	Per Cent of Samples — Coal No. 1	Coal No. 4
Per Cent Below Average Ash:		
More than 2.5	..	5
2.0-2.5	..	3
1.5-2.0	..	6
1.0-1.5	2	17
0.5-1.0	16	12
0.0-0.5	40	17
Per Cent Above Average Ash:		
0.0-0.5	24	10
0.5-1.0	16	10
1.0-1.5	2	10
1.5-2.0	..	4
2.0-2.5	..	1
More than 2.5	..	5
	100	100

For a reasonably reliable average on which to base sales representations, it would seem desirable to use a series of not less than twenty samples. These samples should not be hand-picked from an accumulation of miscellaneous tests, as this practice is just as likely to yield unrepresentative results as incorrect sampling in the first instance. The best system would be to provide for a series of some predetermined length and arrange for the sampling and testing to cover shipments at random over a period of one or two months to take care of possible variations in mining. A vital prerequisite would be a firm determination not to exclude any individual test. While it is easy to assume that a relatively poor test is not typical, such a condition may occur at the best-regulated mine, and it is important for the producer to avoid fooling himself and thus inadvertently misleading a buyer. With a series started, accuracy and self-protection make advisable the systematic addition of supplementary tests to the basic series in order that revisions can be made in the light of any changes that occur.

Complete representation of quality would show the extent and frequency of variations from the average of ash, sulphur and B.t.u., dry basis, in particular. Variations in volatile matter at a given mine have no commercial significance, and moisture variations are more likely to be due to weather conditions while the coal is in transit. Averages for the two items, however, are important.

The fusing point of the ash should never be represented by an average. If that determination is important to a customer, it is the variation below standard that counts. Some coals might show an arithmetical average of 2,600

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WHY AND WHEN

+ To Use Flotation Process

By DR. ERWIN W. MAYER
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COAL flotation, hitherto America's neglected Cinderella, for a decade has found much favor in the eyes of Europe, though, for obvious reasons, it has never cut as large a figure as the flotation of ores. With an abundance of excellent coal in America which could be worked without the assistance of any cleaning process, it was natural that such coal should be given preference, making the development of the flotation process in the United States accordingly slow and halting.

In Europe, however, some way had to be found to turn to profitable account the low-quality and often unusable dusts and slimes from coal washing, in part to save fuel values but also because piles of such material were likely to be a source of danger. As mechanical dressing was not, in general, suitable for the cleaning of such fine material, flotation was eagerly adopted and its use has constantly grown.

The Trent process is to be regarded as the forerunner in the adaptation of the flotation process to coal; this process has been sporadically employed in the United States and may still be in use at isolated plants. It is an application of the old Elmore extraction process to coal and consists in intimately mixing very fine crushed coal in a watery pulp with a mixture of oils, which constitutes from 30 to 40 per cent of the weight of the coal. In general, petroleum, benzol and viscous tar oils are used for this process.

When coal, either anthracite or bituminous, is mixed with oil a thick paste, or "amalgam," forms and rises from the pulp. This product, only 5 per cent of which is water, can be used without further treatment for direct heating under ships' boilers and for similar purposes. By this process, about 80 per cent of the ash is eliminated, but the large quantity of oil used in such bulk flotation is the main obstacle to its wider use.

E. Bury, W. Broadbridge and A. Hutchinson were the first to propose, for the preparation of coal, the use of flotation as that term is generally understood. In that same year, 1920, H. Jones, of the Minerals Separation, Ltd., erected the first industrial plant at the Antolin mine of the Sociedad Minera y Metalúrgica of Peñarroya, in Spain. Favorable results obtained by this plant soon led to the erection of similar installations in that country and in France and Germany.

Today, Europe has about 60 plants for coal flotation, of which Germany and Spain have each over twenty and England six, the yearly capacity of all the plants being probably over three million tons. In contrast, America has had only one flotation plant on a commercial scale, the Champion No. 5 washer of the Pittsburgh Coal Co., Pittsburgh, Pa., and an experimental plant of the Colorado Fuel & Iron Co. at Pueblo, Colo.

Coal flotation presents no problems basically different from those of the flotation of ore and thus makes use of similar machinery. Its much lower specific gravity favors the flotation of coal over that of ores and renders possible the floating of substantially larger sizes of the former. If the limit of size for the flotation of ores is 10-mesh (1.65 mm., or 0.064 in.) the limit for coal is 6-mesh (3.32 mm., or 0.13 in.). Although this size of grain is never reached in practice, in suitable machines, coal of 2.5 mm., or 0.098 in., floats without difficulty, a size which in ores, other than laminated graphite and molybdenite, will not float.

Another contrast is that the lighter portion of the pulp—namely, the coal—is floated, whereas with ores the lighter portion, the gangue, remains behind in the pulp, and the heavier portion is floated off. Whereas, with coal, most of the material is made to float, with ores, the larger percentage is found in the tailings. Thus, in adapting flotation processes to coal, changes must be made in dimensioning the flotation equipment and in designing the machines used for the ultimate treatment of the concentrate. Because, preliminary to treatment by flotation, the coal is never crushed by machinery, no problems like those involved in the comminution and crushing of ores arise to trouble the flotation-plant operator.

On the other hand, the dewatering of the coal-flotation concentrate and its further processing presents a more difficult problem. Thus the flowsheet of a coal washery takes on an entirely different aspect from that of an ore-flotation plant, as will be seen in further studies.

Flotation technique of coal is less varied than that of ore flotation, because in general the purpose of coal treatment is much alike: namely, the separation of incombustible material and the removal of sulphur, and also because the incombustible materials to be removed are, from a flotation viewpoint, of a similar character: namely, clay, shale, iron pyrite, gypsum and similar substances.

For the dressing of coal, which is cheap in comparison with ores, only inexpensive processes can be used, and as flotation is a relatively costly process, it can never be used to treat the whole of the coal but only that portion that cannot be cleaned effectively by any other method. Coal flotation will always be merely an adjunct to other mechanical processes.

Not only will flotation separate combustible constituents from incombustible but it also will separate dull from bright coal, that is attritus (*mattkohle*) from anthraxylon (*glanzkohle*). This kind of coal flotation may be compared to the differential separation of ores, as it accomplishes the separation of constituents which are closely related mineralogically and chemically and which are not greatly dissimilar in their surface properties.

An important constituent, the removal of which is one of the tasks of coal washing, is sulphur. It appears in the coal either as a sulphide of iron (iron pyrite) or as a sulphate of lime (gypsum) or in an organic compound. If it is as the last of these, no mechanical process will remove it.

Reasons for the removal of the ash from coal are to increase the calorific value of the coal and to lessen the ash content, thereby saving the transportation and other handling expenses of the ash as much as possible. According to R. Lessing, in Great Britain the needless expense in the transportation of coal due to the presence of ash during 1925 was $2,500,000, and to this must be added the expense for handling the ash, which would be at least twice that amount. In a far greater degree, the coal washery justifies the expense of its construction and operation by lowering the percentage of ash and sulphur where these are detrimental to the product, as in smelting. A further advantage of coal washing is the separation of those constituents which are detrimental to coking from those that are helpful thereto.

Flotation deals only with the smallest sizes of grain, those of about 1-mm., or 0.04-in., size. These dusts or slimes from coal washing, by reason of their high ash content, had frequently to be wasted. Thus large quantities of utilizable combustible material were lost. As these slimes are fine and, when unwashed, generally have a high clay content, they are extremely difficult to dewater and must be allowed to settle in ponds, from which they can be removed only at an expense which their commercial value often will not justify.

In many European coal districts, this constituted one of the most serious problems of coal cleaning, and the mine operators sought to turn these losses into gains by converting the waste products to profitable account. Only by reducing the ash content as much as possible could this be accomplished. After this was done the cleaned slimes could be mixed with the larger sizes of washed coal without increasing the ash content above the limit prescribed. No longer do any of the companies regard as worthy of consideration the suggestion that the middlings from coal washing be disintegrated so that the combustible and coking-coal values can be recovered from them.

Mechanical flotation is suited to sizes ranging from 2.5 mm., or 0.098 in., downward. Pneumatic flotation can handle such sizes as are less than 0.5 mm., or 0.02 in. As sizes of 2.5 to 1 mm. (0.098 to 0.039 in.) can often be treated more economically by other processes, however, the general practice is to float only the portions under 1 mm., or 0.039 in., unless their separation by screening is too difficult. In any case, however, a percentage of oversize will do no harm.

Whether to incorporate flotation in an existing washer and what quantity of the coal can be floated profitably must be decided in every case after careful study, and the conclusion reached must depend not only on the composition of the raw coal but also on the purity of the product after flotation, the purpose for which it is to be used and its marketability.

Moreover, the fluctuations of the market for the different kinds of coal, the requirements of the mines themselves and other local conditions have frequently to be considered. In any event, flotation can, and should, be introduced where the resulting dust and sludge is so impure that in unwashed condition it cannot be added to coking coal. In such cases, flotation adds considerably to the quantity of high-class coal and thereby makes it possible to obtain greater profits from the coal mined.

Another good reason for floating coal dust or sludge is that these finest portions of the coal, which usually have the highest ash content and one that cannot be removed by wet mechanical treatment have, in certain cases, an unfavorable influence on the quality of the fine washed coal. Therefore, sludge and dust should be removed from the wet mechanical plant, a process that would facilitate cleaning, because the specific density of the material washed would then be lowered and the action of the washer improved. Moreover, no or fewer uncleaned fine sludge coal particles would be delivered with the washed coal. Consequently, many European coal-washing plants have changed their practice and now try to reduce the quantity of sludge in the small coal to as small proportions as possible by aspiration and by dry or wet preliminary screening, thus obtaining products suitable for flotation.

Where coal contains much iron pyrite, the sludge frequently contains a higher percentage of that impurity than the larger coal, and thus is unserviceable for coking. In most cases, flotation is the only means by which such coal can be made of value.

Bituminous Code Brings New Problems In Describing Coal Quality

(Concluded from page 332)

deg., while half of the shipments would still be too low to meet the requirements of the consumer's plant. A complete statement of fusing-point characteristics should take the form of a tabulation showing the percentage of samples with a fusing point over a certain figure, as follows:

	Per Cent of Samples
Over 2,800 deg.	None
Over 2,700 deg.	None
Over 2,600 deg.	40
Over 2,500 deg.	80
Over 2,400 deg.	98
Over 2,300 deg.	100

With such a table before him, the customer would have a true picture of the coal he is buying and would be able to determine the exact chance (if any) of receiving a shipment below standard. Also, the plan would protect the seller against complaints growing out of normal variations in his product.

Under the terms of the bituminous code, there would seem to be only one practical alternative to a really accurate and complete description of quality based on characteristics capable of laboratory determination, such as the above. That alternative would be to confine representations to very general terms, such as district, seam or trade names, size and point of origin. Assuming that they were not used in a misleading way, such representations could not be challenged. Use of this system, however, would still leave the consumer with the burden of determining coal quality by such means as are at his disposal. Continuance of this condition while producers provide themselves with more complete data than is now available is hardly to be avoided, but it would be very unfortunate if the opportunity offered to raise permanently the level of technical statements of coal quality were not accepted by the industry. Protected from reckless statements by competitors, there is a splendid opportunity for those operators who care to do so to take the lead.

WHAT METALS TO USE

+ In Anthracite-Breaker Chutes

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SEEING that information relative to the behavior of materials other than plain carbon steels or manganese bronze for use as coal chutes in anthracite breakers is relatively meager, a number of alloys were investigated to determine whether a test conducted in a full-scale plant would be desirable.

Review of the literature throws little light on the problem, mainly because tests of this nature such as have been made are locked up in company files. Many investigations have been made dealing with the comparative corrosion of various metals and alloys, and many tests also on the abrasion of metals, but the action of a combination of corrosion and abrasion conditions met with in the operation of coal chutes remains practically unstudied.

The problem in itself is unusual both in theory and practice because of the peculiar conditions under which a coal chute operates. These conditions, as usually found in an anthracite breaker, are a combination of more or less continuous corrosion by acid mine water, assisted by oxidation, with rather severe abrasion caused, at regular intervals, by coal sliding down the chute.

An investigation dealing with one phase of the problem[1]—that is, the corrosion by acid mine water—found that all alloys of the brass type corroded extensively, bronzes being slightly more resistant. Cupro-nickel alloys behaved like brasses, whereas aluminum alloys showed a tendency toward pronounced pitting. The alloys which showed a marked resistance to this type of corrosion were: a high chromium steel, two highly alloyed chromium-nickel-silicon steels, a high-silicon cast iron, and a nickel-chromium-iron alloy.

Speller[2] attributes the corrosion-resistant properties of various alloys to a surface film which is deposited by the action of the acid and which effectively resists further reaction. However, in the case at hand, as soon as a film is formed, it is removed by the abrasion of the sliding coal, and so cannot be expected vitally to reduce further corrosion.

In regard to abrasion, Norris[3] concludes that nickel, chromium and vanadium increase the resistance of steel to wear. A low-carbon, 1.5 per cent manganese steel likewise has excellent abrasion resistance. Fink[4] states: "The essential characteristics of wear are (1) mechanical removal of small particles, (2) cold deformation and cold hardening of the metal, and (3) wear oxidation.

The results of a combined corrosion-abrasion test cannot be predetermined by the results of either corrosion or abrasion tests taken separately, as the action of these two factors is neither independent nor additive. In view of this fact, it was the primary purpose of this investigation to devise an apparatus that would closely approximate conditions in actual practice and with it to obtain data that would at least indicate the advisability of continuing the work on a large scale.

The main factors that have been considered are:

1. Relative wear of a series of alloys compared with that of materials now in use.

2. Relative cost of alloys compared with that of materials now in use.

The field of available alloys for testing was limited only by a desire to eliminate duplication as far as was possible. From a table published in *Chemical and Metallurgical Engineering*[5], twenty-eight alloys listed as having good mine-water corrosion and abrasion-resistant qualities were selected. Consideration of the form in which these were supplied by the manufacturer—that is, rolled or cast—eliminated many of these, and a comparison of analyses resulted in a final choice of eleven standard alloys. The data on these alloys will be found in Table I.

The alloys were supplied by the manufacturers as flats about ¼ in. thick and were sawed to approximately 6x2 in.

Table I—Manufacturers' Data for Materials Tested

Specimen Number	Compoltion	Weight Lb. Per Cu. In.	Cost Per Lb. Under 500 Lb.	Cost Per Standard Sheet (1932 prices)
Standard Steel......	C. 0.10/0.15, Mn. 0.30/0.50	......	.....	$2.15
1	Cr. 27/30, Mn. 0.50	0.275	$0.39	40.54
2	Cr. 16/18, Mn. 0.50	0.275	0.295	30.67
3	Cr. 12/14, C. 0.30	0.280	0.45	47.60
4	Cr. 20, Cu. 1, C. 0.30	0.278	0.34	35.80
5	Cr. 18, Ni. 8, C. 0.10	0.279	0.39	41.15
6	Cr. 12/14, C. 0.10	0.280	0.28	29.68
7	Cr. 16/18, C. 0.10	0.280	0.295	31.20
8	Cr. 17/19, Ni. 8/10, C. 0.18	0.283	0.37	39.50
9	Cr. 12/16, C. 0.12	0.267	0.31	31.30
Manganese Bronze..	Cu. 60, Zn. 39, Sn. 0.75, Mn. 0.15	.....	.....	35.55
10	Cu. 95.5, Sn. 4.3, P. 0.20	0.322	0.48	56.30
11	Cu. 89.9, Sn. 10, P. 0.10	0.325	0.52	64.00

Abstract of a thesis for degree of Bachelor of Science in Metallurgical Engineering, Pennsylvania State College, 1932.

[1]Results of Tests of Various Metals in Mine Waters, by Selvig and Enos, Coal Mining Investigations Bulletin No. 4, Carnegie Institute of Technology.

[2]Recently Discovered Facts about Corrosion—F. N. Speller. *Metal Progress* 1, 48, September, 1930.

[3]Resistance of Steels to Wear in Relation to their Hardness and Tensile Properties, by G. L. Norris, Transactions, American Society of Testing Materials, 13, 562 (1913).

[4]Wear Oxidation—A New Component of Wear, by M. Fink, Transactions, American Society for Steel Treating, 18, 1026 (1930).

[5]Table of Corrosion and Abrasion Resistant Alloys, by the American Society for Testing Materials Committee, *Chem. and Met. Eng.* (1924).

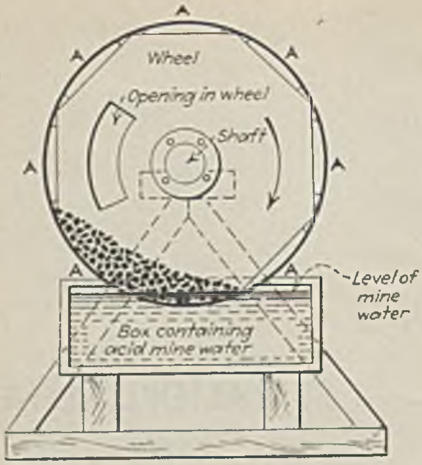

Fig. 1—Corrosion-Abrasion Apparatus. A—Location of Specimen Plates.

Surface areas were computed after drilling and cleaning. Weights were carefully recorded. Other physical properties were determined for possible correlations.

The apparatus for ascertaining corrosion-abrasion losses consisted essentially of two half shells of sheet metal, which when placed together formed a hollow wheel 8 in. through and 2½ ft. in diameter. This wheel was mounted on a shaft with flanges and suitably supported on oak bearings, lubricated with graphite, which, although not strictly permanent, served every purpose throughout the length of the test run. The bearings were fastened on top of heavy wooden tripods.

At one end of the shaft was fastened a pulley which was connected by a belt to another pulley on a worm-gear speed reducer, operating through a small gear attached to the drive shaft of a ¼-hp. motor. This hook-up reduced the original motor speed of 1,750 r.p.m. to a wheel speed of 34 r.p.m. The two half shells were bolted together to form a wheel, care being taken to leave a small circumferential opening through which the finest coal would wash out, thus avoiding the accumulation of a sludge which would hinder the larger particles from sliding. A watertight, rectangular box filled with acid mine water was placed below the wheel. Anthracite, of pea and egg sizes, was placed inside the wheel, as indicated in Fig. 1. As the wheel revolved slowly, it ran through the acid water, which was kept at a predetermined level. As the wheel was not watertight, the water maintained a constant level inside the wheel, and the fine sizes of coal, caused by abrasion, dropped into the box, while the larger sizes continued sliding.

Alloy specimens, suitably cleaned, drilled, measured and weighed, were fastened with small wax-insulated stove bolts on the inside periphery of the wheel at such intervals as to prevent electrolytic contact. Boltholes were countersunk so that the specimen presented a smooth surface to the sliding coal.

This apparatus was run for three weeks with only an occasional shutdown to replace the coal. During this time, the wheel container made 850,000 revolutions. The previously weighed alloy specimens were then removed, cleaned with a stiff brush to remove loose corrosion products from the under side, rubbed with a light oil and reweighed. The loss in weight was calculated to grams per square centimeter for each specimen. Data obtained from a large breaker gave the life of standard steel chutes as nine months' actual service and the life of the manganese bronze chutes, 27 months. Using these figures, an indirect ratio was established between loss in weight and life as estimated, the latter being recorded in months. For example, the standard steel test piece lost 0.2130 gram per square centimeter and normally would last nine months. No. 6 alloy lost 0.0100 gram per square centimeter and should last approximately 213 months.

The current cost of the alloys per pound for a 36x96 in. x No. 12 gage hot-rolled annealed sheet (a size commonly used in the breaker) was obtained from the manufacturers. From this, the cost of each standard sized sheet was calculated, using the factor 378 cu.in. per sheet and the known weight per cubic inch. To present an example:

36 × 96 in. × 0.109375 in. (No. 12 gage) = 378 cu.in.
378 cu. in. × 0.280 lb. per cubic inch = 106 lb.
106 lb. × $0.28 per lb. = $29.68 per standard sheet.

By dividing the cost by the number of months of calculated life—e.g., $29.68 divided by 213 months = $0.139—the unit cost per sheet per month was obtained. These figures form the basis of ultimate conclusions and comparisons.

Cost data of the alloys were taken for quantities less than 500 lb., because this was the only complete set of data available at the time. A partial analysis of the mine water used in the test was: Free acid, 4 grams per gallon; total acid, 6.5 grams per gallon.

Two series of comparisons were made: the stainless alloys against the standard steel, and the two phosphor bronzes against the manganese bronze. The latter are used for fine-coal sizes. The alloys tested against the standard steel as a basis of comparison were all chromium steels, ranging in chromium content from 12 to 30 per cent. There were two specimens of the 18 per cent Cr., 8 per cent Ni. type, and one 20 per cent Cr., 1 per cent Cu. special alloy. The loss of weight of all these alloys was considerably less than that of steel. The list in order of decreasing weight loss is as in Table III.

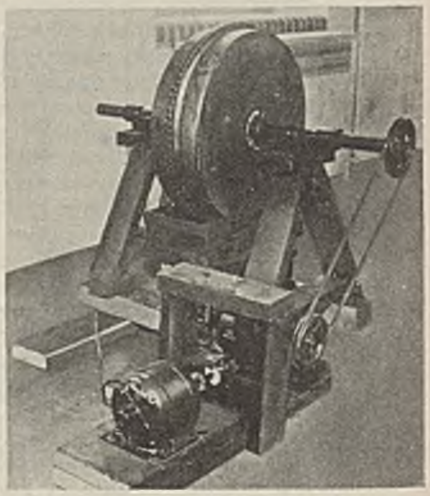

Fig. 2—Apparatus for Measuring Losses of Chute Plates Subject to Corrosion and Abrasion.

Table II—Experimental Results for Materials Tested

Specimen Number	Wt. Loss grams	Area sq. cm.	Loss Per sq. cm.	Relative Life Months	Hardness Brinell Number	Unit Cost
Standard Steel........	16.30	76.6	0.2130	9 mo. actual	128	$0.236
1	0.33	76.6	0.0035	550 calculated	307	0.074
2	1.30	79.3	0.0163	120 calculated	182	0.256
3	0.83	72.8	0.0114	170 calculated	512	0.280
4	0.09	76.6	0.0012	1600 calculated	512	0.002
5	0.16	78.0	0.0021	910 calculated	512	0.005
6	0.65	65.2	0.0100	210 calculated	203	0.141
7	0.47	82.1	0.0057	340 calculated	221	0.092
8	0.25	76.5	0.0033	580 calculated	192	0.068
9	0.37	77.4	0.0048	400 calculated	182	0.078
Manganese Bronze.....	0.96	71.0	0.0135	27 actual	146	$1.32
10	0.57	83.5	0.0068	54 calculated	174	1.09
11	0.74	83.5	0.0089	41 calculated	221	1.57

Table III—Loss of Weight of Alloys

Specimen Number	Weight Loss Grams per Sq. Cm.	Specimen Number	Weight Loss Grams per Sq. Cm.
Standard Steel	0.2130	9	0.0048
2	0.0163	1	0.0035
3	0.0114	8	0.0033
6	0.0100	5	0.0021
7	0.0057	4	0.0012

Undoubtedly, these data show the superiority of certain of the stainless alloys over ordinary carbon steel when exposed to these specialized conditions. Samples Nos. 4 and 5 were used in the annealed condition, for they are not susceptible to hardening by heat-treatment. The other alloys were hot-rolled sheets, Nos. 6, 7, and 8 also being annealed.

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GLEN WHITE

+ Prepares for Future

With New Preparation Plant

By J. H. EDWARDS
Consulting Editor, Coal Age

EARLY in January, 1932, the C. C. B. Smokeless Coal Co., which was merged with other Koppers interests early this year to form the Koppers Coal & Transportation Co., started up a new preparation plant at its Glen White mine, in the Winding Gulf field of southern West Virginia. With a capacity of 400 tons per hour, six loading tracks and equipment for preparing and loading six separate sizes, including a unit-type Rheolaveur washer for the 4x¼-in. fraction of the output, the new plant completely modernizes the topworks of a mine that has been in operation since 1909.

Glen White operates in the Beckley seam, which varies from 30 in. to 8 ft. over the territory worked and averages 54 in. In this district, the Beckley seam generally is separated into two splits by a parting varying from 0 to 100 ft. in thickness, and only one other mine operates extensively in both splits. The lower split is 30 to 42 in. thick and usually is clean, while the upper split contains a 3-in. streak of bone resting on 12 in. of coal. Overlying the seam is the Lower Raleigh sandstone with a usual thickness of 80 ft. or more. As a rule, both splits are mined as long as the thickness of the parting does not exceed the thickness of the bottom split. Where the parting exceeds this thickness, only the top split is worked.

Over certain areas of the seam, the coal and the sandstone top are separated by a layer of slate varying in thickness from 2 in. to 20 ft. The cleaning problem, as a result, consists of removing any of the parting or top slate which may be loaded out, as well as the 3-in. bone streak, which runs approximately 20 per cent in ash. One favorable characteristic is the fact that locally the ash content decreases from the coarse to the fine sizes. Another feature which had a direct bearing on the cleaning problem was the presence of a steam power plant. This plant furnishes steam for hoisting, fan operation and the generation of electricity for two mines. Consequently, its boiler room offered a profitable outlet for pickings, washery middlings and sizes difficult to market.

All-steel construction and an Armco galvanized-iron covering feature the new preparation plant, which was built by the Fairmont Mining Machinery Co. and the Koppers-Rheolaveur Co. Excluding the boom hoists, total connected motor horsepower is 312. Coal is hoisted on self-dumping cages through a 309-ft. shaft, and on its way from the receiving hopper to the main shaker screens is passed through inspection baskets, where it is checked for impurities for which the loader is held responsible. Ordinarily, the main shakers separate the raw feed into 7½-in. lump, egg larger than 4 in., 4x¼-in. coal for the washer feed and ¼-in. slack. Separation of the last-named size from the 4x¼-in. coal is not completed on the shakers, however, 50 per cent being left in at this stage.

The lump and large egg sizes go from the main shakers to picking tables and from there to their respective loading booms, while the 4x¼-in. size is fed to a battery of Fairmont vibrating screens, where the remainder of the ¼-in. slack is removed before it goes to the washer. The ¼-in. slack is accumulated in a bin equipped with a gravity chute for loading it on the slack track.

Cleaning Results, Glen White

	Shipped Product			
	Egg	Stove	Nut	Pea
Float 1.45, per cent.	95.97	94.50	93.48	94.89
Ash, per cent.....	4.29	4.06	4.34	3.63
Sink 1.45, per cent..	4.23	5.50	6.52	5.11
Ash, per cent.....	18.82	25.06	24.95	22.50
Aggregate ash.......	4.90	5.22	5.68	4.59

	Intermediate Product	
	Weight, Per Cent	Ash, Per Cent
Float 1.45..........	23.64	9.48
Sink 1.45-Float 1.60	24.99	21.34
Sink 1.60...........	51.37	38.88
Total and average.	100.00	27.55

	Refuse	
	Weight, Per Cent	Ash, Per Cent
Float 1.45..........	6.94	10.16
Sink 1.45-Float 1.60	15.95	27.04
Sink 1.60...........	77.11	50.04
Total and average.	100.00	43.61

The washer for the 4x¼-in. coal is a compact, rectangular unit with primary and secondary launders mounted in the same general plane and set but a few feet apart. Two pairs of double-compartment elevators encircling the launders handle the refuse and transfer materials from one to the other. Actual metered demand of the washer unit, including pumping, is 56 kw. The washing operation requires approximately 0.45 kw.-hr. per ton of coal washed, or approximately 0.2 kw.-hr. per ton on the basis of the total tonnage shipped.

One unusual feature of the washery is the fact that one of the final products is a middling boiler fuel, which also takes in certain fractions of the coal and refuse that approach it in specific gravity. The middling product from the washer is mixed with the bone pickings from the tables and, after crushing, is carried on an overhead belt conveyor to the boiler house. At the present normal operating capacity of 2,850 tons per day, approximately 25 tons of crushed boiler fuel is made. Any extra fuel which may be required is obtained by diverting washed pea and slack.

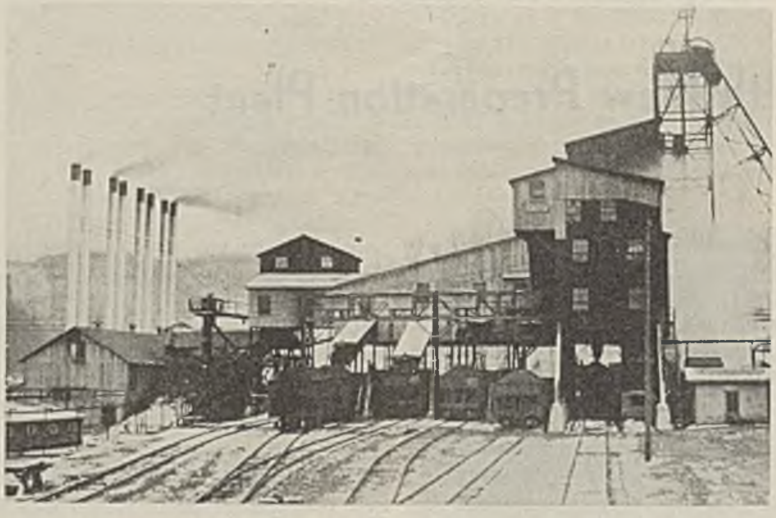
Clean coal from the washer is dewatered and sized on a set of Parrish screens. Washer refuse passes to a bin, where it joins the rock from the mine and is hauled in an electric larry to the dump. Mine rock is hoisted in the same shaft as the coal, but is diverted to the rock bin by a flygate in the receiving hopper. A second flygate in the rock chute allows mine-run to be loaded in an emergency without operating the tipple equipment.

A washer test has shown that 17.22 gal. of make-up water per minute is required to supply the losses to the washed coal and refuse when the plant is shipping washed mine-run, in which case there is no regular waste to the creek. When the plant is running prepared sizes, 22 gal. per minute is used in the sprays, of which about 5 gal. per minute overflows to the creek, carrying with it about 3 tons of fine coal in the course of a day's operation. The remainder of the fine coal sludge goes into the slack. A sludge concentration as close to 5.58 per cent by weight or 10 per cent by volume as is possible is maintained in the wash water at all times. It is not necessary to clean out the sludge tank for months at a time, even though the major output during this period is mine-run.

Cleaning results, together with certain washing characteristics of the coal, are shown in the accompanying table. Data were obtained from samples collected during one day's operation, the intermediate product being that sent to the crusher for boiler fuel. Since the new plant went into operation, no coal —washed or unwashed—with an ash of over 6 per cent has been shipped from the mine.

One man is required to operate the washer, and the rest of the tipple and preparation plant crew is made up of the following: tipple boss, 1; dumper, 1; inspector, 1; oiler, 1; coal pickers, 4; car trimmers, 5. Sizes shipped are as follows: 7½-in. lump, 7½x2½-in. egg, 2½x1-in. stove, 1x½-in. nut, ½x¼-in. pea, and ¼-in. slack. In percentages of the total tonnage shipped, the individual sizes run: lump, 10 per cent; egg, 14; stove, 14; nut, 13; pea, 8; and slack, 41 per cent. A portion of the pea, however, is run into the slack at all times, with the result that the percentages of slack and pea given above do not correspond exactly to the natural separation.

The efficiency of the Fairmont high-speed mechanical vibrating screens is checked every 60 days by the coal inspector. This installation consists of two pairs of screens, each pair made up of two screens in tandem, with an aggregate screening surface of 70 sq.ft. In checking the screens, the inspector takes a sample at random each hour of the day while the screens are handling their full tonnage, or a total of eight samples. For Pair No. 1, a recent test showed an efficiency of 95.64 per cent over ¼ in. A similar test for Pair No. 2 showed an efficiency of 96.84 per cent.



Glen White Preparation Plant. The Washer Is Installed in the Wing at the Left.

Control of all the motors in the plant is handled in proper sequence and with the proper timing interval by a motor-driven master controller instead of by the usual system based on the sequence action of relays with time-delay actions. The entire tipple can be stopped by pushbuttons located at each loading boom and at seven other points within the structure. A signal button is part of the equipment at each stop station. The master controller is started by a pushbutton operated by a coal picker, to whom this duty is assigned, upon receipt of the proper signal from the point where the tipple was stopped. The controller also is electrically connected to the stop switches so that the switch from which the stop order came must be cleared before the controller will operate. In addition to the tipple control stations, start and stop buttons are provided to enable the car trimmers to control the individual loading booms.

General Electric Type MT 440-volt motors are used, and this company also supplied the magnetic starters and master controller. Trumbull safety switches, one for each motor, are grouped on a long metal frame with the starters and master control rheostat. Provisions for this framework, including proper drilling for the mountings, were a part of the plant design. The master controller (dial rheostat type) is driven by a 1/15-hp. d.c. motor, direct current being used to simplify reversal.

There are 34 Texrope drives in the plant, and these were planned to reduce to a minimum the sizes required. By proper selection of the pulleys and calculation of belt centers, the number of sizes was held to two, including differences in both length and width. A few belts of each of the two sizes provide complete protection against shutdowns growing out of drive-connection failures.

The Glen White power plant consists of eight 353-hp. hand-fired water-tube boilers and three 300-kva. 6,600-volt 25-cycle engine-driven generators. Approximate generator output for the operation of the two mines is 500,000 kw.-hr. per month. Synchronous converters transform the 25-cycle power to direct-current for mine use. The 24x48-in. steam hoist, together with the fan engine, account for the large boiler capacity installed.

The combination of a high-quality smokeless coal, modern washing and preparation plant and a power plant as a profitable outlet for middlings and a portion of the less valuable sizes makes it appear that Glen White will hold its place among low-volatile producers for many years to come.

ADEQUATE SEALS

+Mean Longer Bearing Life

For Mine Locomotives

By C. A. ATWELL
Mining Engineer,
Westinghouse Electric & Manufacturing Co.

HOW LONG do ball or roller bearings on mining locomotive motors last? Many answers have been given to this question, varying all the way from less than one day to over eighteen years. Even the average life varies widely. One mine electrician will say, "We replace bearings, on the average, every three months." Another has records to show that the average life is five to six years. Each is right for his particular operation, as variations to this degree have been repeatedly encountered. Moreover, bearing life as measured in years is not comparative between different mines, because regularity of operation and/or length of haul may greatly affect the mileage per year. Records of bearing life in terms of locomotive miles, therefore, furnish a better yardstick.

One principal factor contributing to short life is the use of inadequate bearing seals. This is particularly true for the earlier types of ball-bearing motors, designed at a time when little operating experience with anti-friction bearings was available. Many of these motors are still operating, however, and are capable of giving excellent bearing life by the installation of more modern bearing inclosures.

The more recently designed motors have better bearing seals, as there has been a constantly growing conviction that long bearing life cannot be obtained without very thoroughly excluding all dirt, dust and other foreign matter from the bearing. Even a small quantity of coal or rock dust mixed with the bearing lubricant will act as a grinding compound, and will soon wear the races, balls or rollers, and retainers, so that there is play in the bearing. The bearing is then on the road to failure. An inclosure which will adequately exclude dust will, of course, also prevent leakage of the lubricant.

Fig. 1 shows an armature with bearings, housings and pinion assembled on it; as spare armatures usually are kept on hand for replacements in split-frame motors. This type is for one of the older motors with a bearing-seal construction that is not considered adequate today. Felt rings were relied upon as seals to prevent dust entering the bearing chamber through the clearances which must exist between stationary and rotating parts next to the bearing.

Most mining motors are operated totally inclosed, so that the quantity of dust entering the bearings from the armature side is relatively small. The usual result with the older housing constructions was relatively long life of the bearing at the commutator end, which has a solid cap at the outside. The pinion-end bearing did not fare so well, as dust and dirt entered through the clearance *A* between the stationary bearing cap and the rotating bearing nut. This was especially true after the felt ring in the bearing cap became worn. The result was cumulative. As the dust mixed with the lubricant and acted as a grinding compound on balls and races, radial play increased in the bearing until there was actual wear at *A*. This allowed more dust to enter; then entrance of dust and leakage of lubricant became more rapid, until the bearing failed. There also was a tendency for this bearing to become loose in the housing, on account of the "floating" fit of the outer race required to allow for expansion of the armature shaft.

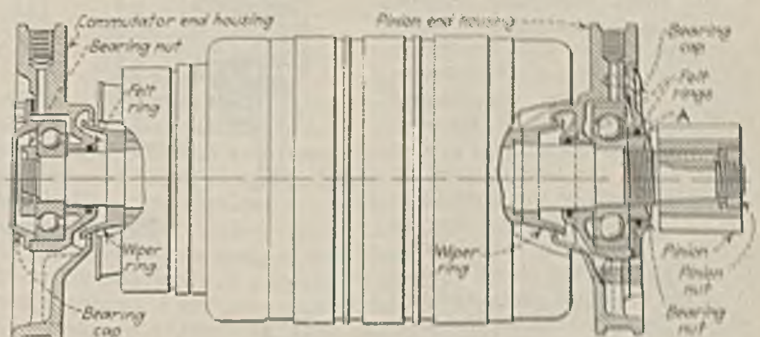


Fig. 1—Old-Type Bearing Seal

Fig. 2 shows an improved labyrinth-type bearing-seal construction, which can be applied to pinion-end housings similar to that of Fig. 1. The only new parts required are the labyrinth collar *F* and the grooved bearing cap *H*. The dust which tries to enter the bearing inclosure, starting at point *X*, must pass around several right-angle turns through close running clearances. Experience has shown that such a shaped path effectively excludes dust and retains the lubricant.

The labyrinth collar *F* may be threaded on its inside diameter to fit the threads on the old shaft, but the pressed-fit construction shown in Fig. 2 is to be preferred from the standpoint of eliminating shaft breakage. Shaft breakages on motors of this kind occur, in most cases, right at the place where these threads are present, because fatigue cracks start at the bottom of a V-thread, and gradually extend to the center of the shaft until the shaft section is weakened and breaks. Threads can be eliminated from old motors by grinding the shaft down to a diameter slightly smaller than the bottom of the thread vees. The bore of the labyrinth collar should be made so that it will have a light press fit on this diameter.

There has been some objection on the part of maintenance men because the pressed-on collar is not as easy to remove as a threaded nut. The advantage of reduced shaft breakage, however, would seem to offset many times any small inconvenience in removing this collar, which needs only to have a light press or shrink fit (0.0005 to 0.0015 in.) on the shaft, depending on the diameter. There is no shaft end thrust on the bearing at this end, the thrust being taken care of by the commutator-end bearing. In the construction illustrated, the collar can be removed by a puller hooked in the circular groove *Y*, or both it and the bearing may be pulled from the shaft at the same time.

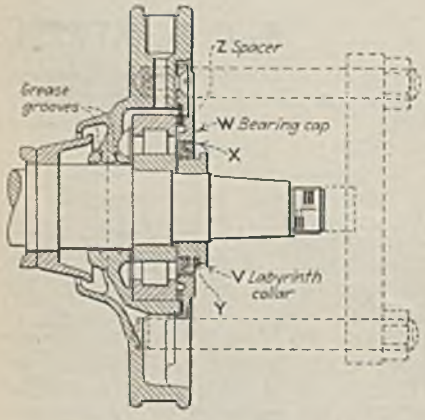


Fig. 2—Labyrinth-Type Seal for Old Motors

In Fig. 2, the housing and bearing pulling device, shown in dotted lines, consists of a plate or bar placed against the end of the armature shaft, and two studs passed through holes in the plate and screwed into tapped holes in the housing. By alternately tightening the two nuts outside the plate, the complete housing with bearing and labyrinth collar is pulled from the shaft all at the same time. In reassembly, the collar is pressed or driven into position by the same method ordinarily used for assembling the bearing on the shaft.

Either a ball bearing or a roller bearing of the straight cylindrical type may be used in the Fig. 2 arrangement. The roller bearing has the advantage of greater capacity, and also permits shaft expansion without the necessity of allowing the outer race to "float" in the housing bore. As the shaft expands or contracts, the cylindrical rollers simply slide on the outer race of the bearing. A steel spacing ring, *Z*, is required with the roller bearing in order to clamp the outer bearing race.

Fig. 3 shows a completely modern housing construction for the motor of Fig. 1. The use of this arrangement on old motors requires a new shaft, new bearings, and new housings with caps and other details. Bearings of increased capacity have been used, and more elaborate labyrinth seals employed in order most effectively to exclude dust from the bearing compartment. The rings *D* add considerably to the seal. Bearing lubricant is thrown from the tips of these rings by centrifugal action against the lips provided on the housing and bearing cap, thus forming a ring of lubricant acting as its own seal between the rotating ring and stationary lip. The circular tongue-and-groove arrangement *E* acts in a similar manner to prevent the entrance of dust from the outside of the bearing chamber.

The usual method of lubricating these bearings is by forcing grease into them under pressure. Usually some grease will be forced past the labyrinth seals. The wiper rings *F* and drain-outs *C* are provided to prevent this excess grease from reaching the commutator or windings of the motor.

Double-row ball bearings are illustrated in Fig. 3. A number of different types of roller bearings may be fitted in the same space. The type of construction of Fig. 3 has proved that dust can be completely excluded from the bearing and that the normal bearing life is many times that of the older construction shown in Fig. 1.

The bearing inclosures shown in Figs. 1, 2 and 3 are for the split type of motor frame, which allows the assembly of bearings and housings complete on the armature before placing it in the motor frame. The explosion-tested type of motor necessarily has a solid frame construction. This makes the bearing inclosures somewhat different, because of the necessity of assembling the armature through one end of the frame. Fig. 4 shows a modern bearing arrangement for this type of motor which permits removal of the armature without exposing either bearing to dirt. The double-slinger bearing seal, similar to that in Fig. 3 is used, but the housing and bearing-cap arrangement is different.

The bearing mounting at the commutator end uses a bearing cartridge, *H*, with an outer bearing cap, *I*. The cartridge has a sliding fit in the commutator-end housing, but is held solidly to it by bolts. When it is required to draw the armature out of the pinion end of the frame, the tap bolts *J* are removed, so that the cartridge and cap cán be removed along with the arma-

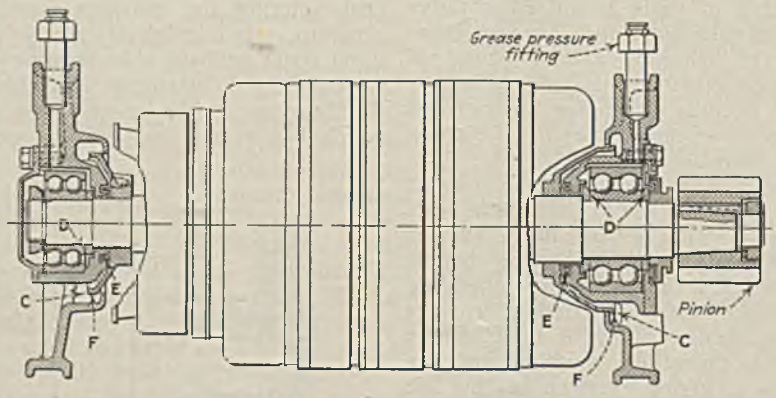


Fig. 3—Modern Housing for Older Motors

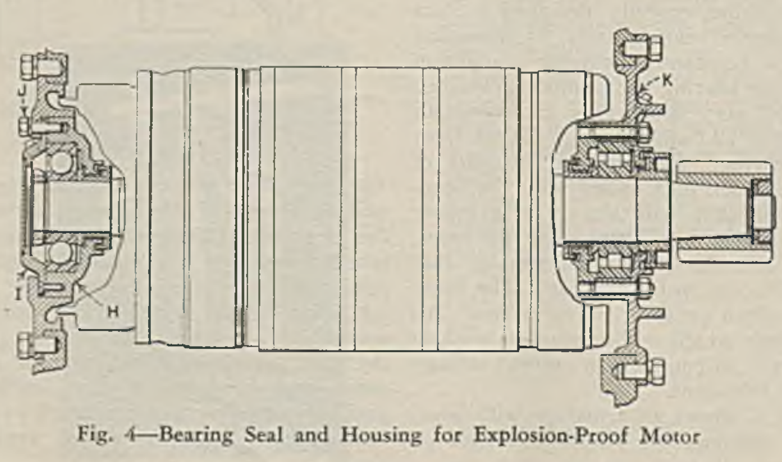


Fig. 4—Bearing Seal and Housing for Explosion-Proof Motor

ture without exposing the bearing at this end. The bearing cap is held to the cartridge by two flat-head screws.

At the pinion end the bearing mounting uses a housing, *K*, that carries the bearing and fits into a bored seat in the frame, and an inner bearing cap which is held to the housing by means of stud bolts. When the armature is being removed from the frame, this housing is drawn from its fit in the frame without disturbing the bearing assembly or removing the pinion. Both bearings are, therefore, kept thoroughly sealed when the armature is removed.

Drain-out openings, such as those illustrated in Fig. 3, are eliminated, because they would destroy the explosion-proof feature by providing a direct path from the interior to the exterior of the motor frame. The seal shown on the armature side of each of these bearings is very effective, however, in keeping bearing lubricant away from motor windings and commutator.

The labyrinth seal used at the pinion-end bearing not only excludes dirt and retains the lubricant but also is very effective in connection with the explosion-tested feature. If a gas explosion occurs within the motor, flame must pass through the seal on the armature side, through the bearing, and then through the seal on the pinion side of the bearing. The flame is thus thoroughly cooled and extinguished before it reaches the outside of the motor.

Armature bearing life in mining service has been entirely too short. The usual speeds of single-reduction-geared motors on mining locomotives are relatively slow, rarely exceeding 1,000 r.p.m., with a large percentage of the operation below 500 r.p.m. These slow speeds are favorable to ball or roller bearings. A mine-haulage locomotive with a haul of three miles, and making ten trips per day, 300 days per year, would have a mileage of only 18,000 per year, and most mining locomotives make much less mileage than this. Perhaps 10,000 miles per year would be a fair average. Street-car motors often average 50,000 miles per year, and 100,000 miles life with modern ball and roller inclosures is common. This would represent ten years' life for the average mining locomotive.

The important steps to be taken by operators in greatly lengthening the life of armature bearings are to equip their old motors with modern bearing inclosures and to insist on modern construction of new motors purchased. Armature bearing life of ten years on mining locomotives should be common instead of rare, and this can be realized if proper steps are taken to obtain it.

What Metals to Use in Anthracite Breaker Chutes

(Concluded from page 336)

Table IV—Relative Costs of Alloys per Month of Service Compared With Standard Steel

Specimen Number	Unit Cost Per Sheet Per Month
3	$0.280
2	0.256
Standard Steel	0.236
6	0.141
7	0.092
9	0.078
1	0.074
8	0.068
5	0.005
4	0.002

Table V—Relative Costs of Alloys per Month of Service Compared With Manganese Bronze

Specimen Number	Weight Loss Gram	Estimated Life Months	Unit Cost
Manganese bronze	0.0135	27 actual	$1.32
10	0.0068	54 calculated	1.09
11	0.0089	41 calculated	1.57

Recognizing the possibility of inherent difficulties in drawing accurate conclusions from laboratory tests in which corrosion is a factor, the fact remains that the carbon steel lost almost fourteen times as much weight as the most easily attacked stainless alloy, under identical test conditions.

As cost is the final criterion as to the suitability of making replacements, the cost of a standard-size sheet of each of the alloys was computed, as shown in Table II. The price was found to range between $29.68 and $41.15. Compared to the cost of a plain carbon-steel sheet ($2.15) the alloys are from fifteen to twenty times more expensive in first cost. However, when a unit price is computed for the sheets per month, it is found that several of the alloys, though so high in first cost, are actually less expensive in use than plain carbon steel. This is shown in Table IV.

Considering next the bronzes, and using the manganese bronze as the standard, with a weight loss of 0.0135 gram per square centimeter and a life of 27 months at a cost of $35.55 per sheet, Table V shows the cost superiority of one of the bronzes tested and the inferiority of the other.

The results of this study of alloys lead to the general conclusion that the chrome and chrome-nickel alloys of iron withstand the combined action of acid mine water and sliding coal abrasion much better than does plain carbon steel. Conclusions derived from a study of the data indicate the superiority of a special 20 per cent chromium, 1 per cent copper alloy over ordinary chrome or even chrome-nickel steels. Two 18-8 steels and a very high chrome (27 per cent) steel are next; followed by a 12-14 per cent chrome, 0.12 carbon steel; a 16-18 per cent chrome, 0.10 carbon; and a 12-14 per cent chrome, 0.30 carbon steel.

It would seem in the latter cases that the higher chromium content of the alloy raises the resistance to corrosion-abrasion and that steels of lower carbon content are more resistant than those with higher carbon. Photomicrographs of these specimens show a very much finer and more even grain structure in alloy steels than in plain carbon steel, which might help to explain their greater resistance under these conditions.

Although both of the phosphor bronzes are more resistant than manganese bronze, only one has a commercial advantage when considering the cost. The better resistance of the phosphor bronzes might be explained, according to R. J. Wheeler (private communication), by the fact that embedded in a fairly plastic matrix of non-corrodible bronze are numerous small particles of hard phosphides, these latter giving the abrasion-resisting qualities.

Considering the nature of the test, the data, while indicative of the probable behavior of the alloys under actual operating conditions, are not to be interpreted as indisputable fact. They may be used, however, as a qualitative basis on which to make plant-scale tests. It has been estimated that to purchase one sheet of each of the stainless alloys (standard size) for insertion in a test chute in a breaker would necessitate an outlay of only $280. The results of such a large-scale test would, it is believed, give opportunity for much larger savings in replacing the plain carbon-steel chutes with the most superior alloy. Although the first cost would be higher, savings would be effected in fewer replacements, lower labor charges and smaller shutdown losses, as well as in better all-round service.

Appreciation is hereby extended to the following companies for cooperation in this work: Allegheny Steel Co., Carpenter Steel Co., Duraloy Co., Hudson Coal Co., Riverside Metal Co. and the Rustless Iron Corporation of America.

HOW TO MAINTAIN

+ Proper Operating Conditions

When Jigging Coal*

By BYRON M. BIRD
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IN THE three preceding articles the adjustment of the jig has been considered. In this concluding article, attention will be given to the maintenance of the favorable conditions thus attained.

When the jig has been adjusted correctly, it must be so maintained every hour of the shift if the quality of the washed coal is to be kept uniform. To this end the operative must be both skillful and alert and all necessary auxiliary devices must be installed to assure a regular supply of feed, water and power, and an automatic withdrawal of the products. If the jig is properly equipped with the auxiliary apparatus about to be described, it should take care of any ordinary variations in the character of the feed without readjustments.

No equipment on a jig can be made to act as substitute for a good feeder. Any attempt to economize at that point in the construction of a plant always results in a loss in operating efficiency many times that of the cost of the feeder.

Three important requirements must be met by a feeder: The flow of the coal should be continuous; the quantity of coal should be positively controlled; and the feeder should have some provision for keeping the coal from hanging in the bin. The apron- or pan-type feeder is almost the only one that meets all three of these requirements; it most nearly approaches the ideal feeder.

However, in its design, a few details should be watched carefully. First, the bin should have one straight side and the remaining sides inclined so that there is a slope of not less than 45 deg. in the corners of the bin. Second, the apron should form the bottom of the bin and should be of a length such that an appreciable weight of the coal in the bin rests upon it; this feature helps to prevent any arching of the raw coal. Third, the feeder should have a safety clutch that will slip in case a piece of rail or a sledge hammer gets into the bin. Fourth, it should have a drip pan beneath to catch any spillage. Fifth, it should have a width within 18 in. of that of the jig to prevent loss of jigging area in the corners of the feed end of the jig. Sixth, the apron should be so placed that the coal drops into the jig close to the feed end.

When this type of feeder is used for slack coal, it should be equipped with water sprays. If the coal is dry, these aid in wetting the coal; if it is wet, they wash it from the apron. As a rule, a shallow baffle dipping beneath the water —perhaps 2 in.—will further aid in wetting the coal. It should not dip more deeply that this, for the reasons given earlier in this series, in the issue of September, p. 301.

An absolutely uniform pressure of water is essential to good jigging. Obviously, a jig should never, under any circumstances, be supplied directly from a pump; a tank should always be used and provision should be made for keeping the water in the tank at a constant level. Furthermore, the mains leading from the tank to the jigs should be amply large so that a change on one water valve will not necessitate a further adjustment of other valves on the same line.

Each jig should, of course, have an independent water line. When the water enters the hutch compartment under fairly high velocity, a hood should be put over the end of the pipe to distribute the water. It is a common experience to find that the current set up by the incoming water has caused a "soft" spot to develop in the second compartment, where the bed is too mobile.

Withdrawal of the refuse and of the hutch product as fast as they form is one essential of good jigging. As explained in previous articles, a change in the depth of the refuse bed materially affects the correct setting of the plunger stroke and of the water valves. A change in the quantity of material in the hutch, if marked, will affect the distribution of the water. Both of these products should be withdrawn continuously and the rate of withdrawing the refuse should be controlled automatically to take care of variations in the character of the feed.

A common type of automatic refuse control is shown in Fig. 1. This is a float which is suspended in the jig bed and registers the depth of refuse material. It may be used either with a rotating gate, as on the Elmore jig, or with a vertical sliding gate, as on the Montgomery jig. When the float rises to a predetermined height it puts the refuse draw in operation. As soon as the level of refuse drops a trifle, it stops the draw from operating. In good operation there is a steady withdrawal of refuse, the draw being operated perhaps three out of every five strokes of the jig plunger.

This type of automatic control usually gives satisfaction, although few operatives ever realize the fullest advantage from its use. For most successful operation, the mechanism connected with the float should be equipped throughout with roller bearings to minimize friction; this is an especially important requirement for second compartments with their light bed of bone. Also the float should be as small and light as practicable. If it is too heavy, it moves sluggishly and half of each plunger stroke is lost before it

*Last of a series of four articles on jigging.

starts to move. Thus, its inertia prevents it from being a sensitive indicator of conditions in the jig bed.

Aside from being small, the float should be shaped to offer the minimum of resistance to the horizontal flow of water. Any eddying caused by the float disturbs the stratification in the jig and is objectionable. A good form now in use in Alabama has a horizontal cross-section like the longitudinal cross-section of a torpedo; this type causes scarcely a ripple in the surface of the water on top of the jig.

This type of automatic draw is not successful unless the tonnage of coal to the jig and the supply of water are uniform. An increase in tonnage deepens the jig bed, causes the float to rise higher than it should, and results in a loss of the refuse bed. Conversely, a decrease in the tonnage allows the refuse bed to build up. This same difficulty is experienced if the water pressure varies. An increase in the pressure causes the float to rise too high and a drop in the pressure keeps it from rising as high as it should. Accordingly, it is practically a waste of money to install the float type of automatic refuse control without also insuring a regular supply of feed and water.

The other common type of refuse control, the dam-and-seal, or well-draw, is a complete draw and automatic control combined. As shown in Fig. 2, it has two parts: the seal, which extends down into the refuse bed, and the dam, which is an overflow to control the height of refuse inside the area inclosed by the seal.

In the adjustment of this device, the height of refuse between the bottom of the seal and the top of the dam is so regulated that on the pulsion stroke it balances the jig bed—that is, these masses of particles in a semi-fluid condition in the water exert the same pressure per square inch at the bottom of the seal. As more refuse accumulates, the pressure exerted by the jig bed on the outside tends to become greater, and refuse overflows the gate on the inside until conditions are again equalized on each side of the seal.

The secret to the successful operation of this type of draw is getting the bed inside the seal into a condition of complete mobility on each pulsion stroke. If this is not done, the draw "tips over" many times a day and runs all the refuse bed from the jig and probably much coal also on each such occasion. To secure a condition of mobility, about 50 per cent more holes, as a rule, must be bored between the seal and the dam than are in the jig screen immediately surrounding the draw.

From the nature of this draw, it is obvious that both the quantity of feed to the jig and the water pressure must remain constant. A change in either of these will operate the draw just as if a change had occurred in the depth of refuse. The previous discussion about the shape of the float control is applicable also to a draw of the dam-and-seal type. It should be so shaped that it will disturb the stratification as little as possible.

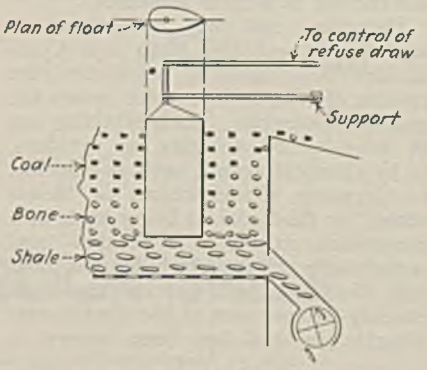
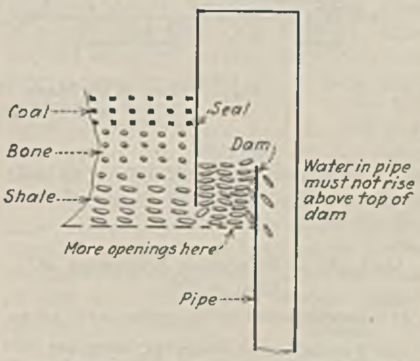


Fig. 1—Float Type of Refuse Control Showing Cross-Section of Float

Fig. 2—Dam-and-Seal, or Well-Draw, Which Removes Shale With Every Pulsion Stroke



In many existing jigs neither of the two common automatic controls can be used because of the prohibitive cost of installation. In these cases two simple expedients for indicating the depth of refuse bed may be helpful. One is to install the float valve, previously described, with a pointer to indicate the level of the refuse bed. When the indicator shows that the refuse bed is changing in depth, the draw can be set by hand to operate more rapidly or more slowly, as conditions indicate to be necessary.

Another indicator that may be used is a tube extending from a point about 2 in. above the screen to a point 12 in. above the water level. Below the water, this tube is made of iron with a coarse screen over the bottom; above the water it is made of glass. On top of the glass tube is a valve that opens just at the peak of the pulsion stroke and then closes on the suction stroke. Anyone can duplicate the action of this indicator by holding a piece of glass tubing in the jig bed and closing the top with his thumb on the suction strokes and opening it at the peak of the pulsion strokes.

Water rises in the tube until it indicates the resistance offered by the jig bed to the upward current of water. As the resistance varies with the depth of refuse, the tube is a sensitive indicator of the thickness of the refuse bed. The only difficulty is to get a valve mechanism that will withstand the hard usage it will receive around a coal washery.

For the withdrawal of hutch material, several methods are in general use, none of which is entirely satisfactory. The type having a screw conveyor for collecting the material and delivering it under water to the refuse or bone-coal elevator comes the nearest to being ideal. It is continuous and involves no waste of water, two requisites of a hutching device. The objectionable feature is that it mixes the hutch with other products of the jig. This might be overcome by building a separate elevator for the hutch, but most companies desiring to rewash the hutch product have found it more satisfactory to screen the refuse or bone-coal product to recover the fine sizes.

One common method of withdrawing hutch material is to discharge it intermittently by hand. As a rule this results in bad jigging practice. The jig operative frequently forgets to open the valves, and the accumulation of material beneath the screen disturbs the water distribution. When he does open the valves, he drops the water level in the jig, leaving it short of water, and throws the whole jigging system out of adjustment. On each occasion, unless the jigs have ample capacity, a batch of poorly prepared coal is passed into the washed coal. To overcome these difficulties, one company in the South has built a mechanical device that opens the hutches slightly after a certain number of strokes of the plunger. This method seems to be much better than hand operation; at least, it does not forget and works well if it receives reasonable attention.

NOTES

. . . from Across the Sea

As with us, the British find anthracite not only has to be ground fine for use as pulverized fuel but also takes more power to produce equal comminution. Thus Welsh anthracite, friable as it is, requires twice as much power for equal pulverization as Ayrshire bituminous coal and almost three times as much power as Welsh bituminous. But the bituminous durain of south Yorkshire requires four-fifths as much power as Welsh anthracite for equal comminution, according to H. D. Tollemache, who addressed the South Wales Institute of Engineers recently at Cardiff.

Colloidal fuel, he declared, is superior to straight oil as a boiler fuel, both in efficiency and safety. Owing to the presence of the solid particles of coal, a most intensely radiating flame is obtained, thus improving heat transfer. In this, Commander Tollemache accords with a declaration, made frequently in this magazine, that the radiant qualities of coal and even ash have their distinct value. The ash, he declares, in colloidal fuel made with a good quality of coal may be less than 1½ per cent.

A ton of colloidal fuel would occupy approximately 32 cu.ft. of the hull space of the vessel using it, as compared with 37 cu.ft. for oil fuel and 43 cu.ft. for coal. Colloidal fuel, also, is rich in heat units. A ship burning colloidal fuel will need 10 per cent less bunker space than a sister ship burning oil and 50 per cent less than one burning coal. As the specific heat of colloidal fuel is 26 per cent less than for straight oil, 26 per cent less heat is needed to give the oil sufficient mobility for atomization.

Oil floats on water, but colloidal fuel sinks, so that the colloidal oil is protected by a water film if it leaks into bilges, thus promoting safety. Oil evaporation also, which may amount to 8 per cent per annum, can be prevented by mixing pulverized coal with the oil, provided water is present to cover it.

Coal in "colloidal" fuel is not a true colloid. It is certainly not in molecular dispersion, and it is not so fine as to be subject to a Brownian movement that will keep it free of the laws of gravity, nor would it be profitable to attempt any such fine grinding as would produce such a condition.

"Supra-colloidal particles"—that is, particles larger than colloidal—tend to coagulate and fall, but stabilizing agents, such as certain soap solutions, will prevent settlement. The liquid may be converted into a gel also by some substance capable of entering into colloid solution with it. Some soaps have that property. Professor Gillet, of France, has formed a gel by the use of 80 per cent coal and 20 per cent of anthracene without the use of a third substance.

However, coal may be reduced to particles of colloidal size, says Commander Tollemache, by peptization, the reverse of coagulation, which causes the coal to disintegrate. Such peptizing can be provided by solvents, as pyridene, or by chemical agents, such as chlorine. In Germany, a fuel known as "fleisskohle," or fluid coal, is being made at a non-commercial plant. Paraffin- and asphalt-base oils will stabilize oils; and coal distillates will peptize the coal. Seventy-five per cent of the vitrain constituents in coal has been known to enter into colloidal solution with oil, whereas only 5 per cent of the durain will do so.

Methods of Preventing Settlement of Coal in Oil

(1) Stabilization with soaps and other agents
(2) Formation of soapy gel with oil
(3) Formation of gel with coal and certain oils
(4) Peptization of coal by pyridene or chlorine

Peptization should result in the elimination of nearly all the ash. Commander Tollemache does not say so, but one can readily imagine that this action should make the colloidal fuel thus created well suited to internal-combustion engines for automobiles and even flying machines. It might have the further advantage of anti-knock properties, great concentration in bulk per unit of power and increased safety.

Apparently the ash in the coal used in the Rupamotor, or pulverized coal engine, of Rudolph Pawlikowski, of the Kosmos factory, Gorlitz, Germany, is pulverized to great fineness by the movement of the piston, so that the largest particles become 0.0004 in. in diameter and so are much smaller than the oil film between piston and cylinder and come in contact with only one of the two surfaces to which they are exposed. Manufacture of the Rupamotor with engines in series is in progress.

According to G. E. K. Blythe, addressing the British Section of the Société des Ingénieurs Civils de France, in London, England, pulverized fuel has the following advantages for use in locomotives: (1) low fuel cost, because small coal can be pulverized and because high-ash and low-rank fuel, even peat, can be used; (2) greater efficiency; (3) high power outputs over long periods; (4) no lengthy steaming period needed to prepare locomotives for service; (5) adjustability of firing to load, no wasteful blowing-off of steam; (6) no sparks emitted; (7) fireman relieved from hard labor and from the blinding effect of looking at fire, thus affording him opportunity for steam regulation and watching signals.

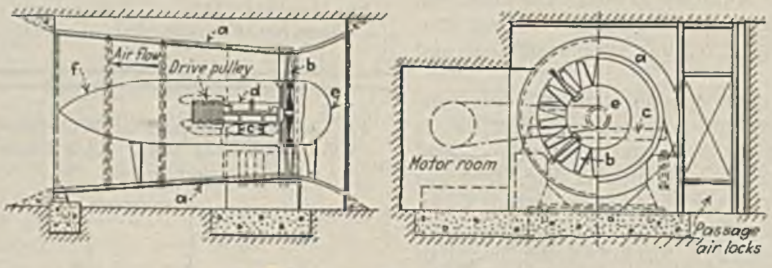


Fig. 1—Fan With Many Short Blades, Venturi Opening and Straight Air Flow.

Internationally speaking, the tendency appears strongly toward straight-flow methods in the coursing of air through mine fans in contradistinction to the method whereby air is taken in at the side of the fan, caught by the blades and thrown out at a right angle to its previous course. Hitherto in this country all straight-flow mine fans but one have been of low-pressure, low-speed type, but these foreign propeller fans deliver at high pressures and are driven at high speed.

Such a fan is the "Aerex," which, tested by the Service Technique de l'Aeronautique Belge, according to the *Iron & Coal Trades Review*, was declared to have the following characteristics: (1) a uniformly high efficiency over a wide range of equivalent orifice, so that a discrepancy in estimating the equivalent orifice is not serious in its consequences. (It may be observed that where a mine has a greatly varying equivalent orifice, as many of our American mines have, because of our room-and-pillar methods of operation, fans which are well fitted to the mines they have to ventilate soon become entirely unfitted and, when new fans are put in, these become unfit in their turn; then, as the mine becomes worked out, the old fan becomes the correct fan again for the mine. What is needed is a fan that will follow all such changes of equivalent orifice with an unchanged efficiency.) (2) Loss of velocity head at the outlet represents a very small proportion of the total pressure, so the useful efficiency is high. (3) Prime movers cannot be overloaded, as the horsepower absorbed decreases beyond the point of specified duty. (4) The fan is reversible.

The Aerex screw ventilating fan is located as shown in a steel venturi, *a*. It has, at least in some instances, eighteen blades as *b*. Two I-beams, *c*, pass across the opening from side to side and support the bearings, *d*, of the fan. Over the fan center and the bearing is placed a large fairing which has a rounded nose, *e*, on the intake end and a stream-lined end, *f*, on the opposite end, creating a sort of évasée with the aid of the venturi. The I-beams, *c*, are masked with a fairing where they cross the airway between the fairing, *f*, and the venturi.

As the belt passes across the same opening it is provided with streamline fairings so as to prevent turbulence in the air in passing them. The central fairing does not revolve with the fan blades, being in no way connected with them. Being stationary, it can be constructed with an upturned nose at the far end, if it is found desirable to turn the airway upward at the discharge end of the venturi so as to discharge the air into an évasée or other chimney.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown. whose name and address in each case is in the review notice.

Heat Service Plans. Miscellaneous Report No. 7, Committee of Ten—Coal & Heating Industries, 307 North Michigan Ave., Chicago. Price, 20c.

Heat service, in the fullest sense of the term, means relieving the customer from all labor and responsibility incidental to the operation of his heating plant. As this is the goal of the oil and gas industries, it also must be the goal of the solid-fuel industries, and to assist retail outlets in reaching this objective, the Committee of Ten has prepared this report on "Heat Service Plans," summarizing the experience of 48 operators, retailers and equipment dealers in 22 states.

The plans included in the report range from the simple service operations involved in furnace cleaning and inspection to full-fledged heat-service plans based on the use of a stoker and modern heat controls under which it is never necessary for the consumer to visit his cellar. While many are still in the experimental stage, sufficient experience has been gained to warrant the conclusion that, in general, heat service strengthens the competitive position of solid fuels as against oil and gas.

* * *

The Performance of Propeller Fans, by A. I. Brown. Ohio State University Studies, Engineering Experiment Station, Bulletin 77. 33 pp. Price, 25c.

Mr. Brown has made tests of 50 or more fans, and he presents data of 21 tests of 15 fans of a variety of designs and sizes, ranging in diameter from approximately 12 to 28 in. Evidently all were small; apparently none were in a pipe and none in a Venturi; none had an enlarged stream-lined hub, nor long screwlike blades on a long hub; none had an évasé chimney; so the last word probably is not said in this bulletin as to the efficiency of propeller fans in mines. The title is intriguing to mining men, but as the author is associate professor of heating and ventilating and not a mining man, as he makes no reference to mining, and as none of the fans he tested worked under mining conditions, the efficiencies he has obtained may not be representative of the work of a propeller fan working under ideal mine conditions, where the mine will take all the air the fan can provide at the pressure the fan affords. His efficiencies range from 30.7 to 63.8 per cent.

* * *

Unwatering Flooded Coal Mines in Washington. Technical Paper 549, by S. H. Ash and Thomas Murphy, U. S. Bureau of Mines. 18 pp. Price, 5c.

This paper describes the method adopted for the removal, at the Newcastle coal mine, of a body of water in the flooded and silt-filled Bagley bed. A tunnel was driven from the underlying Muldoon bed and four drillholes driven into the Bagley workings. The tunnel was used to pass through the intervening May Creek bed, thus obviating the necessity of casing the holes through this dirty bed, to which, it was thought, the water should not have access and through which it was not thought desirable to case holes.

Another tunnel is described made at another level, also with four drillholes, this time to No. 3 bed, a still higher measure and working. In this case the pressure of the water tapped in the first hole drilled was 210 ft. per square inch. A third tunnel with five drillholes was driven from another level. It was found that it is best to drill into the hanging wall instead of into the footwall, for then less solid material will enter the line. About 250,000,000 gal. of water in all was removed.

Drilling methods in tapping water at the Roslyn mines of the Northwestern Improvement Co. also are described. Here 419,000,000 gal. was tapped. Descriptions of several Washington State pumping installations follow.

* * *

Pressure Losses Due to Bends and Area Changes in Mine Airways, by G. E. McElroy. I. C. 6663, U. S. Bureau of Mines; 35 pp.

The reviewer regrets the limiting conclusion of the title, "in Mine Airways," for indeed the coal industry has been all too much disposed to confine its interest to that branch of aerodynamics. It should give even greater attention to air channels in compressors and fans, and also, by the way, to water channels in pumps. The waste in all conduits is excessive, wherever the speeds at which the air or water travels are high.

Nowhere are air channels more ill-fitted for the passage of air than in fans. Plates are flange-jointed so as to project and cause unnecessary turbulence. The air is expanded, contracted and turned without any thought to the resistance such expansions, contractions and turns must inevitably occasion, especially in the presence of bearings, pedestals, partition plates and whirling blades, and when the air is traveling at high speed. Here are real major losses for which correction of underground resistances can never atone.

This information circular deals with losses in rounded, square, crowded, inner-bevel, segmental, venturi and bladed bends, double and reversed bends, upward and downward bends, in vena contracta at open, flush, formed, constricted and converging openings, at nozzle discharges, abrupt and gradual expansions, abrupt, orificial and nozzle constrictions and at gradual contractions, standard venturis and formed venturis. A study of the causes of loss and their prevention in mine air currents, in fans and ventilating air jets will be of assistance in planning ventilation wherever air has to be delivered at high velocity prior to splitting. In considering the condition of roadways, the speed of the current should be given due consideration. A slow current can worm its way past obstructions with much less loss than one of high velocity.—R. Dawson Hall.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Cleaning Borehole Lifts Pump Capacity

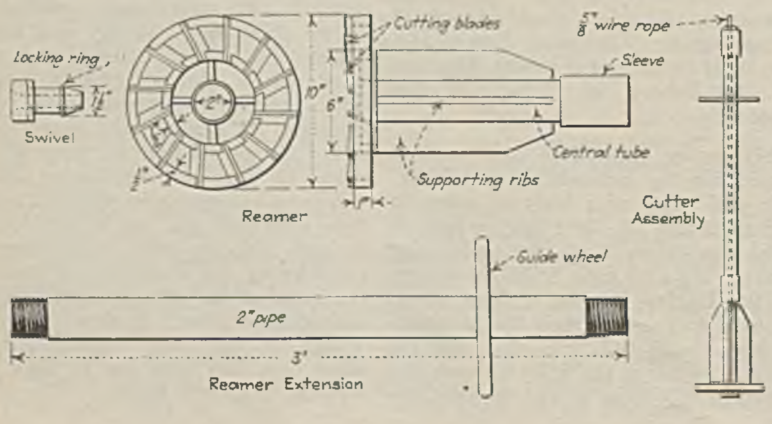
Reduction in the diameter of boreholes through the deposition of material on their walls may have a serious effect on pump capacity. This was the case at the No. 14 mine of the Webster Coal & Coke Co., Nanty-Glo, Pa., controlled by the Pennsylvania Coal & Coke Corporation. At this mine, dewatering is accomplished by pumping the mine water to the surface through a 10-in. borehole 450 ft. deep. Two four-stage, 750-g.p.m., Scranton centrifugal pumps discharge through this borehole, making the total pumping capacity 1,500 g.p.m.

After the borehole had been in service for some time it was found that the deposition of material on the walls had reduced the diameter to 6 in. As a result, the capacity of the pumping station was reduced to 750 g.p.m. with both pumps working. An attempt was made to clean the hole with a go-devil forced through by the pump pressure, but it appeared to follow a spiral path through the hole without removing much of the deposit, after which the material closed in again, leaving the hole in about the same condition as before. As this borehole was the only outlet for the mine water which, due to the reduced discharge, had risen almost to the pumps, some other cleaning method became a necessity. The problem was solved through the development of the boring equipment shown in the accompanying figure. Details on the design and operation of the equipment are furnished by R. S. Connacher, shop foreman, Pennsylvania Coal & Coke Corporation, Cresson, Pa.

The equipment consisted primarily of the cutting tool, or reamer, equipped with cutting blades made of automobile springs, and the reamer extension. The latter, fitted with a guide wheel to keep the assembly in position in the hole, was connected to the bottom of a string of 2-in. pipe running to the surface. The entire assembly was supported in the hole on a 5/8-in. wire rope threaded through the 2-in. pipe. The lower end of the rope was fastened into a swivel working in the lower end of the 2-in. length of pipe to which the reamer parts were welded. Cutting was done by means of a four-armed clamp handle fastened to the top of the string of 2-in. pipe and adjusted to come within the working range of men standing on a platform. These men operated the reamer by moving the handles a half turn forward, then a half turn backward. The swivel, it was found, was of little benefit, and could have been replaced by any simple supporting device.

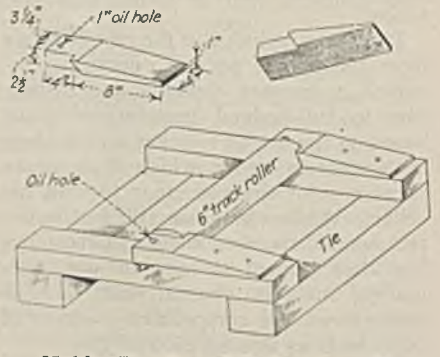
While the reamer was being worked down from the surface by adding lengths of pipe, the pumps were kept running to wash out the cuttings. For the first 251 ft., with the exception of 1 ft. of concrete at 150 ft., the material cut through was a yellow, clayey substance. Below 251 ft., very little deposit was encountered. The pieces of concrete cut away by the tool were removed at the bottom of the borehole after the job was completed. Capacity of the pumps was increased 30 per cent by cleaning out the borehole.

Borehole Reamer Assembly



Holder for Roller Service

For use with the common rope roller bracket made of 2x4-in. hardwood, with a 1-in. bore for the roller spindle, Charles W. Watkins, Kingston, Pa., suggests the roller holder shown in the accompanying illustration. This holder, according to Mr. Watkins, acts as a spindle oiler and also prevents the rope from catching on the end of the roller and thus tearing it out of the bracket. The holder may be made by hand or on a wood-working machine from waste pieces of timber. In addition, its shape and dimensions are such that the wedge-shaped pieces of wood used in a number of mine operations may be adapted to roller service.

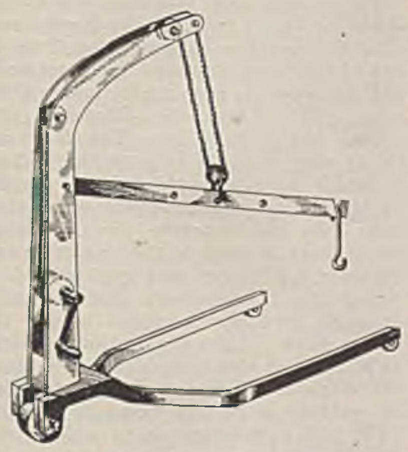


Holder Details and Roller Assembly Showing Its Use

The oil hole is made by boring with a 1-in. wood bit until the pilot screw just breaks the surface on the bottom. The hole serves as an oil well, from which the oil drips onto the spindle through the opening left by the pilot screw. A small piece of cotton waste packed in the bottom of the hole gives a slower, longer-lasting feed. In installing the holders, the roller attendant cuts a dap at one end (right or left, as the case may be) to receive the roller end, as shown in the illustration. This prevents the rope from working down into the space between the roller end and the bracket.

Boom Attachment Broadens Portable Crane Use

For many lifting jobs in repair shops, the typical floor crane is subject to certain limitations in reach beyond the legs, as well as in height of lift. To broaden the use of one of these cranes in the central repair shop of the Fordson Coal Co., Stone, Ky., an auxiliary boom has been added, as shown in the accompanying sketch. With



Boom Enables Crane to Handle Objects Beyond the Legs

this boom, a piece of equipment or material may be raised from the floor even if the size is such that the crane legs will not go around it. Also, it is possible to swing the object onto a lathe under which there is no open floor space to accommodate the crane wheels. Capacity before tipping is reduced, of course, but it has been found that most of the lifting jobs are within this reduced capacity. Therefore, the boom remains on the crane the major part of the time.

Up Against It

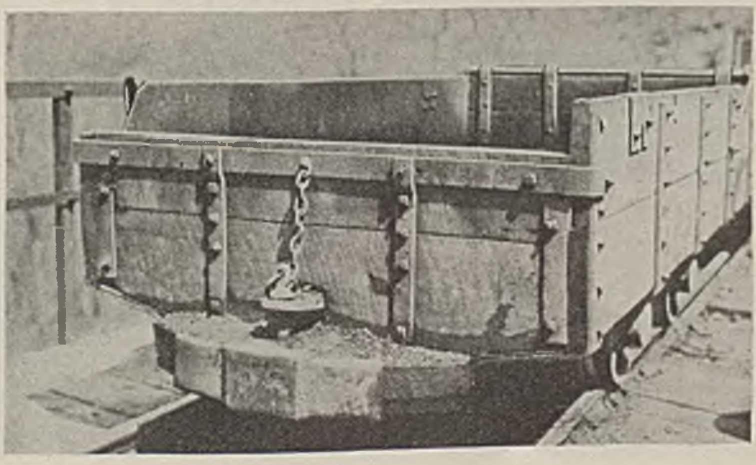
No discredit should come to an operating man who is forced to admit that he is stumped once in a while, for that is only natural. But when it becomes a habit, then it is time to look out. One of the best methods of preventing such a situation is to keep close tab on the latest developments throughout the industry. There is no better way for operating, safety, electrical and maintenance men to do this than to follow the ideas presented from month to month in these pages. The material that appears here is included with the thought it will help to solve the every-day problems that crop up in coal mining. These pages also are open to those who have developed a new short-cut of their own. Send them in. *Coal Age* will pay $5 or more for each one that is acceptable. A sketch or photograph may make them clearer.

Broken Bumpers Reclaimed By Welding

Welding with both the gas torch and the electric arc is one of the mainstays of maintenance work at the Chesapeake & Ohio Ry. fuel mine operations in southern West Virginia. The use of welding has been extended over a wide range of repair jobs, including the reclamation of a broken side member on a locomotive frame. One frequent use for welding has been in the reclamation of broken bumper plates on mine cars by reinforcing them with steel plate, as shown in the illustration.

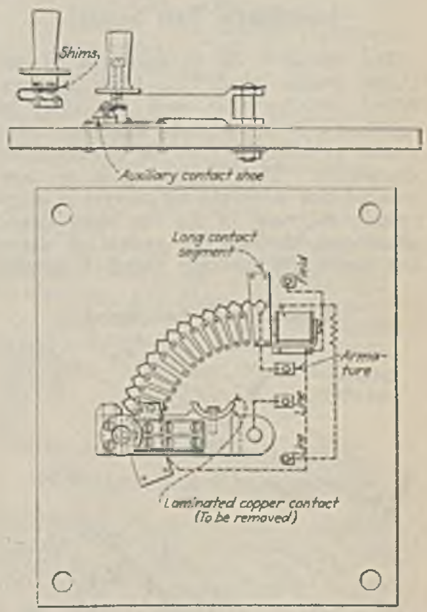
Practically all of the original plates, made of ¾-in. steel, have been broken in the past on a line with the pinholes, and prior to the use of welding it was necessary to discard them. Now, steel plate of the proper width and thickness is bent to shape and welded over the two broken halves to make a new bumper. The repair strip is lapped back over both the top and bottom surfaces of the plate, and drilling it to receive the pins completes the job. Bumper plates repaired in this manner have been so satisfactory that officials now specify that the reinforcement be applied to such new plates as are purchased before shipment.

Welding Kept This Bumper Plate Off the Scrap Heap



Modification of Rheostat Avoids Heating Injury

When direct-current rheostats of 10 hp. or over are used, it often is a difficult matter to keep the contact shoe and the first two or three segments from burning and blistering, especially where the load is heavy and starting is frequent, writes John J. Nolan, Terre Haute, Ind. Where the contact shoe is burned badly, heating will occur when the operating arm is in running position, with the result that frequent repairs and replacements may be necessary.



Rheostat Equipped With Auxiliary Shoe and Large Running Segment

To avoid these difficulties, Mr. Nolan proposes the modifications shown in the accompanying sketch. The long segment in the running position replaces two small segments, and an auxiliary contact shoe is mounted on the end of the operating arm. This auxiliary shoe is not subject to arcing during the initial steps in starting, and consequently makes a good contact with the large segment in running position. In addition, the wiping action between the auxiliary shoe and the large segment insures a smooth face and thus is an added factor in assuring good contact. The original shoe, of course, still assists in carrying the current in running position.

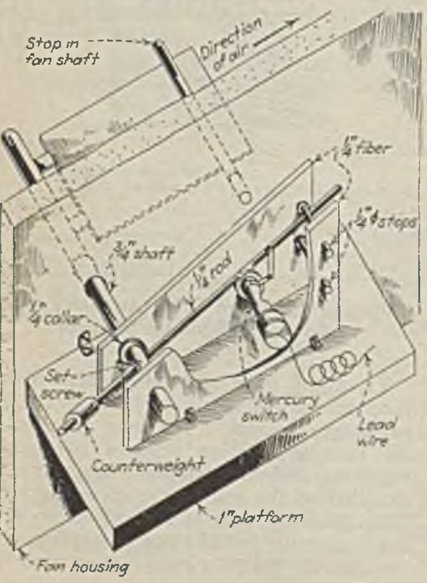
In making this modification, the only additional holes necessary in the slate are the two at the top of the large segment. Also, the same resistance is in circuit as before until the last step is reached, where double the usual quantity is short-circuited. By this time, however, the motor usually is up to speed, so that this will not have any appreciable effect. When the alterations are completed, the laminated copper contact on the operating arm will no longer be needed, as this method of making the running contact is inefficient when the strips have once been overheated, due to the fact that they lose their resiliency.

In mounting the auxiliary shoe, provision should be made for the addition of thin copper shims, as shown in the illustration, to assist in adjusting the pressure so that good contact will be made and yet the operating arm will not be prevented from dropping back when the holding coil releases. On rheostats with button-type segments, the alterations can be made by adding an additional button just above the last and bridging the two together under the rheostat front. The auxiliary shoe is the same. Contact area, however, need not be as large, as button-type rheostats are seldom used in sizes over 10 hp.

Automatic Fan Signal

The revised code of standards of the Union Pacific Coal Co., Rock Springs, Wyo., provides that each fan shall be equipped with an automatic signaling device similar to that shown in the accompanying illustration. This equipment is so constructed that when the air current is interrupted, the vane in the fan shaft drops, whereupon, through the system of shafts and levers, the mercury switch is rotated sufficiently to either make or break the circuit to a bell or light. The latter is installed at any convenient point designated by the mine superintendent to warn those responsible for fan operation in case of a shutdown.

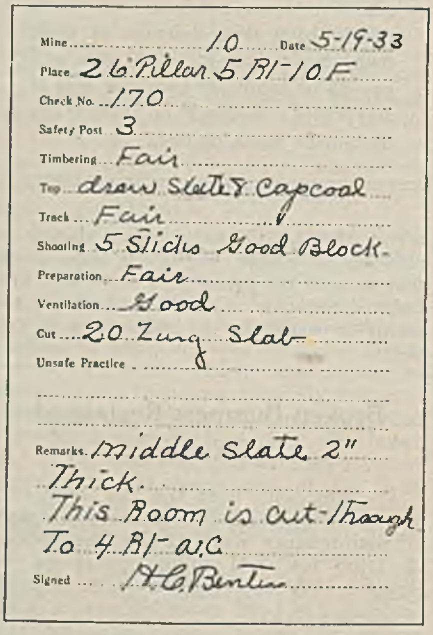
Union Pacific Fan Signal



Constant Inspection of Places Cuts Mine Accidents

What results can be expected from the employment of a full-time safety inspector who spends all of his time underground? At the Bonny Blue and Mayflower mines of the Blue Diamond Coal Co., Bonny Blue, Va., according to Smith Williams, superintendent, such a system went into effect on March 1, 1932. As a result, the total number of accidents at both mines dropped to 15 in 1932, as compared with 78 in the preceding year. In the first five months of this year, only four accidents occurred. The monthly record for both mines since Jan. 1, 1931, is given in the accompanying table.

The safety inspector, H. C. Benton, takes care of both mines, visiting 20 to 30 places per day. Each place in both operations is visited once every two or three weeks. A record of conditions in each and every place is made on the spot, using the form reproduced herewith. This record covers the following: safety posts, timbering, top, track, shooting, preparation, ventilation and the character of the cut. Unsafe practices also are entered on the form, as well as any other information which the inspector thinks is pertinent. Copies of the reports go to the general mine foreman, the superintendent and the general manager. With this system, one of the major objectives in safety work—accurate knowledge of physical hazards and unsafe practices—is achieved, thus simplifying the application of remedial measures.


Mine 10 Date 5-19-33
Place 26 Pillar 5 Rt-10 F
Check No. 170
Safety Post 3
Timbering Fair
Top draw Slate & Capcoal
Track Fair
Shooting 5 Sticks Good Block
Preparation Fair
Ventilation Good
Cut 20 Zung Slab
Unsafe Practice
Remarks middle Slate 2" Thick.
This Room is cut-Through To 4 Rt- a.c.
Signed H.C. Benton

This Form Provides Accurate Safety Information

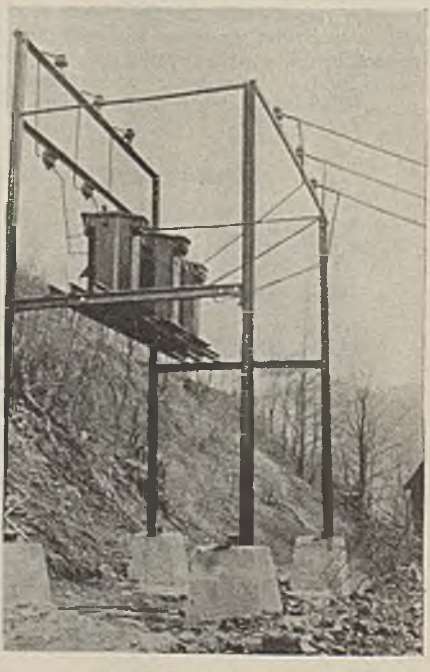
Monthly Record of the Number of Accidents at the Bonny Blue and Mayflower Mines, 1931-1933

	Bonny Blue			Mayflower		
	1931	1932	1933	1931	1932	1933
Jan.	4	0	1	0	1	0
Feb.	3	2	0	2	0	1
March	5	2	0	1	1	0
April	4	1	0	2	0	0
May	6	0	1	1	0	1
June	5	2	..	0	0	..
July	2	2	..	4	0	..
Aug.	6	0	..	5	0	..
Sept.	5	1	..	3	0	..
Oct.	2	1	..	6	2	..
Nov.	3	0	..	4	0	..
Dec.	4	0	..	1	0	..
Total	49	11	..	29	4	..

Transformer Tower Built From Scrap Rails

Tipple and shop transformers at the Diablock (Ky.) mine of the Four Seam Coal Corporation, ranging from 5 to 15 kva., have been mounted on a substantial fireproof tower made from 40-lb. scrap rail. Lloyd G. Fitzgerald describes the installation. The four uprights were made of rails, to the bottom of which were arc-welded 10-in. lengths of angle iron. The angles were then bolted to the concrete piers. Crosspieces were welded to the uprights, and on these a platform was spot-welded to support the transformers. Three lengths of angle iron were welded across the top, as shown in the illustration, to serve as braces and also to hold the fuse plugs and insulators. The tower was grounded by welding a 2-0 rail bond to one upright and connecting it to a 1-in. rod driven into the ground.

Scrap Rails Formed the Basis of This Transformer Tower



WORD from the FIELD

New Preparation Facilities

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

Buck Mountain Coal Mining Co., Gowen, Pa.; contract closed with the Chance Coal Cleaner in July for breaker to replace plant destroyed by fire on May 31; to be completed in October. The plant, which will have a capacity of 125 tons per hour, will be equipped with one 10-ft. Chance cone for cleaning egg to pea, inclusive, and one 8-ft. rectangular-top cone for buckwheat, rice, barley and No. 4.

Consolidated Coal Co., Saginaw, Mich., has completed the installation of coal-feeding, screening and dewatering equipment to replace old equipment in its washery. The equipment, furnished by the Robins Conveying Belt Co., includes "Gyrex" vibrating screens and has a capacity of 100 tons per hour of egg, nut and slack.

Fowler Coal Mining Co., Richmond, Mo.; contract closed with the United Iron Works Co. for three-track, all-steel double shaker screen, including supporting structure, loading booms and slack conveyor for producing four sizes of coal; capacity, 50 tons per hour; to be installed early in October.

Jewell Ridge Coal Corporation, Jewell Ridge (Va.) mine; contract closed with the Morrow Mfg. Co. for four-track, five-grade tipple equipped with conveyors, shaker screens, loading booms and steel structure; capacity, 400 tons per hour; to be completed about Dec. 1.

Lake Superior Coal Co., Superior, W. Va.; contract closed with the Kanawha Mfg. Co. for rescreening tipple consisting of nut and stove conveyor, sizing screens, loading boom and steel structure; capacity, 100 tons per hour.

Maryd Coal Corporation, Simpson, Pa.; now engaged in the construction of a new breaker with a capacity of 100 tons per hour on the site of the old Northwest colliery. The plant will include one 10-ft. Chance cone for cleaning all sizes from egg to buckwheat inclusive, and is expected to go into operation at the rate of 25,000 tons per month early in October.

Pine Hill Coal Co., Oak Hill colliery, Minersville, Pa.; installation of one 8-ft. rectangular-top Chance cone for cleaning buckwheat completed by the Chance Coal Cleaner Sept. 17. The new cone has a capacity of 50 tons per hour, and supplements the 15th. Chance cone previously installed for the preparation of sizes larger than buckwheat.

Raine Coal & Lumber Co., Duo. W. Va.; contract closed with the Kanawha Mfg. Co. for five-track, five-grade tipple equipped with trip feeder, scales, rotary dump, shaker screens, loading booms and mixing, refuse and domestic conveyors; capacity, 250 tons per hour.

Stonewall Jackson Coal Co., Wellston (Ohio) strip mine; contract closed with the Morrow Mfg. Co. for five-track tipple equipped with feeder, conveyors, shaker screens, loading booms and crusher; capacity, 400 tons per hour; to be completed about Dec. 1.

Vibbard Mining Co., Vibbard Mo.; contract closed with the United Iron Works Co. for two-track, all-steel shaker screen, including loading booms, for producing three sizes of coal; capacity, 60 tons per hour.

Pittsburgh Wins Railroad Fight

A court fight to stop construction of a 13-mile railroad between Smiths Ferry, Pa., and Negley, Ohio, was won by the Pittsburgh Coal Co. on Oct. 2, when Federal Judge Samuel H. West, Cleveland, Ohio, denied the Pennsylvania R.R. and allied interests a permanent injunction. Construction of the line was started by Pittsburgh Coal a year ago as an outlet to the Youngstown district for eight mines on the Monongahela River, and all but a quarter of a mile had been completed in spite of a number of court fights when Judge West granted a temporary injunction early in September.

H. W. Clarke

For twelve years sales manager and publishing director of *Coal Age*, joined the staff of Dickson & Eddy, anthracite wholesalers with headquarters in New York, as sales promotion manager on Oct. 1. Mr. Clarke's business career embraces a wide experience in merchandising, advertising and market development work, and prior to joining *Coal Age* as sales manager in 1921 he was director of publicity for the Chicago Pneumatic Tool Co. and a member of the dealer merchandising and household appliance promotion staff of the Westinghouse Electric & Mfg. Co.

Coal Use, Columbus Theme

Uses of coal will dominate the joint meeting of the Coal Division and the Ohio Section of the American Institute of Mining and Metallurgical Engineers, to be held at the Battelle Memorial Institute, Columbus, Ohio, Oct. 27-28. The first day will be devoted to the technical sessions with an informal banquet in the evening, and the second day will be reserved for plant inspections. Charles E. Lawall, director, School of Mines, West Virginia University, Morgantown, W. Va., and Byron M. Bird, research engineer, Battelle Memorial Institute, will preside at the technical sessions. R. L. Ireland, Jr., vice-president, Hanna Coal Co., Cleveland, Ohio, will be toastmaster at the banquet, which will be addressed by Howard N. Eavenson, of Eavenson, Alford & Hicks, Pittsburgh, Pa., on "The Outlook for the Coal Industry."

New Associations Formed

Utah operators producing approximately 67 per cent of the state tonnage organized the Utah Coal Operators' Association last month, with headquarters in Salt Lake City. Officers are as follows: president, J. B. Marks, vice-president, Independent Coal & Coke Co.; vice-president, William C. Stark, general manager, Blue Blaze Coal Co.; secretary-treasurer, B. P. Manley, formerly assistant executive secretary of the Utah Coal Producers' Association.

The recently organized Big Sandy-Elkhorn Coal Association established headquarters in Pikeville, Ky., last month, with the following officers: president, Thomas W. Raymond, general manager, Elk Horn Coal Corporation; vice-president, A. D. W. Smith, president, South-East Coal Co.; treasurer, Sidney B. Hosmer, Wells Elkhorn Coal Co.

How to Make Mines Safer Discussed at Chicago

Suggestions as to prevention of accidents by physical examination and classification of employees, the value of discipline and the promotion of safety and health were presented by several speakers at the two sessions of the Mining Section, National Safety Council Congress, held in Chicago, Oct. 3-5. P. M. Arthur, director of personnel, American Zinc Co. of Tennessee, was elected general chairman of the section, succeeding T. E. Lightfoot, engineer in charge of accident prevention, Koppers Coal Co., Pittsburgh, Pa. F. B. Dunbar, general superintendent, Mather Collieries, Mather. Pa.; J. W. Alt, safety engineer, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.; and W. G. Metzger, safety engineer, Hudson

Coal Co., Scranton, Pa., were chosen vice-chairmen. Daniel Harrington, chief, Health and Safety Branch, U. S. Bureau of Mines, Washington, D. C., was reelected secretary and *Newsletter* editor.

"For the first eight months of the present year the mines of the United States have had the longest consecutive period of freedom from major explosion disasters in the past 50 or more years," said Mr. Harrington. "Seven persons were killed and one injured in an explosion in a bituminous coal mine Sept. 11, 1933."

"Physical examination of prospective employees," said Dr. W. C. Mays, plant physician, Elkhorn Piney Coal Mining Co., Stanaford, W. Va., "undoubtedly will, if properly conducted, help to reduce the number of accidents. Every man should be properly examined and classified." Dr. Mays declared that examination merely for serious heart lesions and advanced tuberculosis, with rejection of the unfit but with no classification or occupational shift, is mere wasted time.

"A weakness of our accident-prevention work is that, nine times out of ten, we do not discover infractions of the rules unless someone winds up in the doctor's office or hospital. Then discipline usually is tempered with mercy," declared C. E. Bockus, president, Clinchfield Coal Corporation, New York, adding that, "when mines are operated only one or two days a week, the most careful inspection is of the highest importance, both as regards the conditions and ventilation."

All manufacturers should assist purchasers in the safe use of their equipment and should so fabricate it that maximum safety will be assured. This has been a practice of the makers of explosives, with the result that only 31 bituminous coal mine fatalities in 1930 out of 1,619 were traceable to explosives and only 475 accidents out of 59,946, said Theodore Marvin, editor, the *Explosives Engineer*, Wilmington, Del., in the opening address at the second session.

Section foremen are allowed to discipline employees by suspension, and the employee thus disciplined is required to present himself for a personal interview to the foreman, who may increase the period of supension if he believes it inadequate, declared Cadwallader Evans, general manager, Hudson Coal Co., Scranton, Pa., in a paper read by Mr. Metzger. A safety record is carefully kept for every mine worker, and also for each section foreman, showing injuries occurring in his section, and discipline is meted out for violations of rules. Crew bosses are held responsible for accidents to and violations of rules by men in their crews.

Bituminous Coal Flies the Blue Eagle Under Code of Fair Competition

(Continued from page 328)

price schedules which must be submitted to Washington for approval and to set up the administrative machinery required under the code. One of the first jobs tackled was the determination of the number of Subdivisional Code Authorities which the industry considered necessary. Present indications point to fifteen to twenty such subdivisional units. A subdivision is defined in the code as "a geographical area within which all coal producers shall be entitled to membership in the association or committee establishing the Code Authority."

Naturally, because the boundaries of Division I include such diverse elements as the Appalachian region outside of Alabama, Michigan and western Kentucky, tentative plans call for the greatest number of subdivisions in this section. Operators in this area are discussing the establishment of at least seven subdivisions. Directors of the Eastern Bituminous Coal Association, representing the central Pennsylvania area, have been named as the Code Authority for Eastern Subdivision No. 1 of Division I. Membership for the Subdivisional Code Authority in western Pennsylvania will include the directors of the Coal Control Association of Western Pennsylvania and four additional operators not members of the board. P. M. Snyder, president, C. C. B. Smokeless Coal Co., heads the Southern Subdivisional Code Authority No. 1, representing the smokeless fields, and A. A. Liggett, vice-president, Raleigh Coal & Coke Co., is secretary. The high-volatile region, Southern Subdivisional Code Authority No. 2, will have a membership of sixteen, two from each of the producing fields embraced in that area. Irvin Davis is chairman of this subdivision and C. B. Gleaves is secretary-treasurer. C. F. Richardson, K. U. Meguire, J. L. Rogers, H. H. Coil and B. F. Reed have been elected members of the Subdivisional Code Authority to look after the interests of western Kentucky.

George W. Reed, vice-president, Peabody Coal Co., has been made chairman of the Subdivisional Code Authority for Illinois. Indiana operators, at a meeting last month, decided to establish a subdivisional unit for their state, and similar action will be taken in Iowa. Representatives from the three states in Division II plan to meet in Chicago this week to perfect the organization of the Divisional Code Authority. Grant Stauffer, president, Hume-Sinclair Mining Co., has been elected chairman for a Subdivisional Code Authority to act for operators in Missouri, Kansas and Oklahoma. F. V. H. Collins, president, Bair-Collins Co., has been chosen to head up the Divisional Code Authority for Division V; John R. Doolin is secretary of the organization.

With Divisional Code Authorities still in the process of formation at the time the code went into effect and with no Presidential appointees yet named to sit with the boards already organized in formulating the schedules of fair market prices required under the code, Oct. 2 passed without formal approval of any schedules. Subdivisional boards in the Appalachian region embraced in Division I were the first to come under the wire with schedules for all subdivisions in that group outside of the Southern high-volatile area. James H. Pierce, technical adviser on coal for NRA, was temporarily assigned to the task of examining these schedules and of working with the operators in correlating the prices suggested. These schedules were approved by Deputy Administrator Simpson on Oct. 3, but were not published by NRA. As submitted, the schedules called for average increases on a mine-run basis of approximately 60c. per ton in Pennsylvania and slightly higher advances in Ohio. Increases decided upon by Appalachian Coals, Inc., meeting in Cincinnati, were said to approximate 50c. on a mine-run basis.

The text of the code follows:

Art. I—Purposes

To effectuate the policies of Title I of the National Industrial Recovery Act, the following provisions are submitted as a Code of Fair Competition for the bituminous coal industry and upon approval by the President shall be the standards of fair competition for this Industry.

Art. II—Definitions

As used in this Code, the term "Industry" as applied to the bituminous coal industry means the production and original sale of all kinds of coal (except anthracite), lignite, and the production and original sale of coke other than byproduct coke.

The term "employer" includes any person employing labor in any phase of the industry.

The term "employee" includes all persons employed in the industry.

The term "Administrator" means the official designated by the President to administer the National Industrial Recovery Act.

Art. III—Maximum Hours of Labor

No employee, except members of the executive, supervisory, technical and confidential personnel, shall be employed in excess of 40 hours in any calendar week after the effective date of this code. No employee shall be required or permitted to work more than eight hours in any one day at the usual working places or otherwise in or about the mine (exclusive of lunch period), whether paid by the hour or on a tonnage or other piecework basis.

There shall be excepted from the foregoing limitations *(a)* employees required because of accidents which temporarily necessitate longer hours for them; *(b)* supervisors, clerks, technicians and that small number of employees at each mine whose daily work includes the handling of man trips and/or haulage animals and coal in transit and those who are required to remain on duty while men are entering and leaving the mine.

The foregoing maximum hours of work shall not be construed as a minimum; and if at any mine a majority of the employed workers express their desire, by written request to the employer, to share available work with bona fide unemployed workers of the same mine, the number of hours may be adjusted accordingly by mutual agreement between such employed workers and their employers.

Art. IV—Minimum Rates of Pay

The basic minimum rate for inside skilled labor and the basic minimum rate for outside common labor shall be the rate hereinafter set forth in Schedule "A" for each district therein described for each such classification of labor, with the understanding that other classifications of employment will maintain their customary differentials above or below said basic minimum rates and that payments for work performed on a tonnage or other piecework basis will maintain their customary relationship to the payments on a time basis provided in said basic minimum rates.

Art. V—Conditions of Employment

(a) 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) no employee and no 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) employers shall comply with the maximum hours of labor, minimum rates of pay and other conditions of employment, approved or prescribed by the President.

(b) Except as otherwise hereinafter provided, all coal mined on a tonnage basis shall be weighed and the miner paid on the basis of 2,000 or 2,240-lb. ton. The miners shall have the right to a checkweighman, of their own choosing, to inspect the weighing of coal; *Provided,* that where mines are not now equipped to weigh coal, a reasonable time may be allowed to so equip such mines; and provided, that in any case where rates of pay are based on any other method than on actual weights, the miners shall have the right to check the accuracy and fairness of the application of such methods, by representatives of their own choosing.

(c) The net amount of wages due shall be paid semi-monthly in lawful money or par check, at the option of operators. Any deductions from employees' pay, if not a matter of agreement, shall be in conformity with such general rules and regulations as the Administrator may prescribe for the purpose of preventing unfair deductions, or those which may in effect lower the rates of pay herein provided.

(d) Employees other than maintenance or supervisory men or those necessary to protect the property, shall not be required as a condition of employment to live in homes rented from the employer.

(e) No employee shall be required as a condition of employment to trade at the store of the employer.

(f) No person under seventeen (17) years of age shall be employed inside any mine or in hazardous occupations outside any mine, provided, however, that where a state law provides a higher minimum age, the state law shall govern; no person under the age of sixteen (16) shall be employed in or about a mine.

(g) As soon as possible after the adoption of this code, the National Recovery Administration shall undertake, through a designated committee or agency, an investigation for the purpose of reporting on or before Dec. 31, 1933, upon *(a)* the practicability and cost (assuming the maintenance of existing rates of pay) of applying to bituminous coal mining a shorter work day and work week, *(b)* the effect of and advisability of revising wage differentials in the various divisions and districts of the industry and, in the event of recommended change, specification of the amount thereof; *(c)* the sales obtained for coal, or reasonably to be anticipated, up to the time of the report, for the purpose of determining whether wages and employment can be further increased or maintained without imposing undue burdens upon the industry.

On Jan. 5, 1934, there shall be held a conference between representatives of employers and employees operating under this code, together with representatives of the National Recovery Administration, for the purpose of determining what, if any, revisions may be desirable at that time of the wages, hours and differentials, or any other requirements of this code, on the basis of conditions then existing and the report of representatives of the National Recovery Administration made as hereinbefore provided.

Unless revised by mutual agreement, as the result of said conference beginning Jan. 5, 1934, the hours of work, minimum rates of pay and wage differentials as set forth in this code shall continue in effect until April 1, 1934.

Art. VI—Unfair Practices

Sec. 1. The selling of coal under a fair market price (necessary to carry out the purposes of the National Industrial Recovery Act, to pay the minimum rates herein established, and to furnish employment for labor) is hereby declared to be an unfair competitive practice and in violation of this code. In order to determine the fair market price, agencies shall be established, as hereinafter provided, and sales of coal at any time at a price less than a fair market price determined and published, as hereinafter provided, shall create against any person selling at a lower price a *prima facie* presumption that such a person is engaged in destructive price cutting and unfair competition. It shall be proper in determining such fair market price to take into consideration, in addition to the matters above set forth, also competition with other coals, fuels and forms of energy or heat production.

Sec. 2. The fair market prices of coal of any grade and character referred to in the next preceding section, subject to the power of review hereinafter stated, shall be:

(a) The minimum prices for the various grades and sizes in the various consuming markets which may be established for future application by a marketing agency or by marketing agencies, of whatever form or howsoever constituted, now existing or hereafter created or organized, acting for coal producers truly representative of at least two-thirds of the commercial tonnage of any coal district or group of districts, such minimum prices to be effective when and as announced as provided in Sec. 4 hereof.

(b) The minimum prices for the various grades and sizes in the various consuming markets, where no such marketing agency exists, which may be established for future application by the respective Code Authorities hereinafter set up, for their respective areas, after having given consideration to the various conditions and circumstances entering into the sale of each grade and class of commercial coal produced in the district or group of districts it represents, such minimum prices to be effective when announced as provided in Sec. 4 hereof.

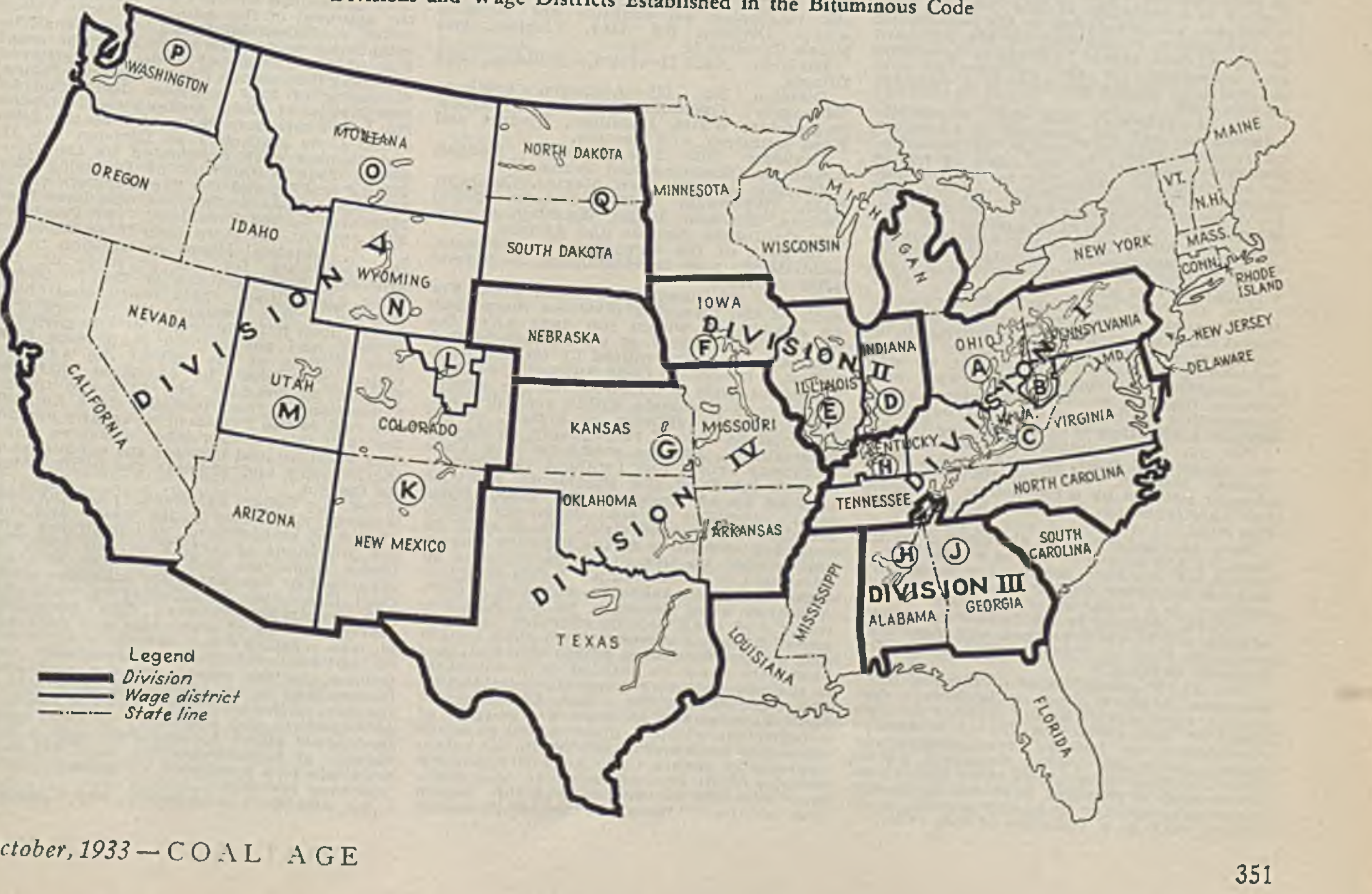
(c) As a basis for determining the fair market price to be announced and published, as provided in the two preceding clauses, the Code Authorities shall utilize the classifications of coals made by such agencies as are referred to in clause *(a)* of this section, and shall classify the coals in said districts not sold by such agencies and also the coals in the districts referred to in clause *(b)* of this section, to which the various prices apply. Said Code Authorities shall, at all times, provide and keep open an office during business hours to which any coal producer in said districts and any representative of the Administrator may apply for information with respect to said classifications and prices.

(d) The term "marketing agency" or "agency" as used in this Article shall include any trade association of coal producers complying with the requirements of a marketing agency and exercising the functions thereof.

Sec. 3. The fair market prices established for future application under the provisions of Sec. 2 *(a)* shall be reported to said Code Authorities by any such marketing agencies in such manner as may be required by such Authorities.

Sec. 4. The fair market prices of bituminous coal, established as aforesaid by such agencies and Code Authorities, shall be pub-

Divisions and Wage Districts Established in the Bituminous Code



lished within fifteen days after the effective date of this code, after approval by the Presidential member of the Code Authority (acting under the direction of the Administrator), who in his approval may permit a reduction or increase in said prices by action of said agencies or Authorities within the limits which he may prescribe, and thereafter shall be published whenever any change is made therein, and not less frequently than once each month, and on the first of the month. Simultaneously with such publication, said fair market prices of bituminous coal shall be transmitted by the Code Authorities to the National Recovery Administrator for his further review and subsequent action.

Sec. 5. Both the records and the data of such marketing agencies and of said Code Authorities shall be open to inspection and investigation by any agent of the Administrator whom he shall appoint for that purpose. Should such an agent of the Administrator disapprove of any changes proposed in any fair market prices from those previously approved by the Administrator as being in excess of any reductions or increases allowed in such approval, such changes shall not be made effective unless and until the Administrator shall approve them.

Sec. 6. The consignment of unordered coal, or the forwarding of coal which has not actually been sold, consigned to the producer or his agent, is a violation of this code; provided, however, that coal which has not actually been sold may be forwarded, consigned to the producer or his agent at rail or truck yards, tidewater ports, river ports or lake ports and/or docks beyond such ports, but such consignments shall be limited to cover: *(a)* bunker coal; *(b)* coal applicable against existing contracts; *(c)* coal for storage (other than in railroad cars) by the producer or his agent in rail or truck yards or on docks, wharves or other yards for resale by the producer or his agent.

Sec. 7. The adjustment of claims with purchasers of coal in such manner as to grant secret allowances, secret rebates or secret concessions creates price discrimination and is a violation of this code.

Sec. 8. The prepayment of freight charges with intent or with the effect of granting a discriminatory credit allowance is a violation of this code.

Sec. 9. The giving in any form of adjustments, allowances, discounts, credits, or refunds to purchasers or sellers of coal, for the purpose or with the effect of altering retroactively a price previously agreed upon in such manner as to create price discrimination is a violation of this code.

Sec. 10. The pre-dating or the post-dating of any invoice or contract for the purchase or sale of coal, except to conform to a bona fide agreement for the purchase or sale entered into on the pre-date, is a violation of this code.

Sec. 11. Terms of sale shall be strictly adhered to; and the payment or allowance of rebates, refunds, credits, or unearned discounts, whether in the form of money or otherwise, or extending to certain purchasers services or privileges not extended to all purchasers under like terms and conditions, is a violation of this code.

Sec. 12. An attempt to purchase business, or obtain information concerning a competitor's business by gifts or bribes, is a violation of this code.

Sec. 13. The intentional misrepresentation of analysis and/or sizes or the intentional making, causing or permitting to be made, or publishing of any false, untrue, misleading or deceptive statement, by way of advertising, invoice, or otherwise, concerning the size, quality, character, nature, preparation or origin of any coal, bought or sold, is a violation of this code.

Sec. 14. The unauthorized use, either in written or oral form, of trademarks, trade names, slogans, or advertising matter already adopted by a competitor, or deceptive approximation thereof, is a violation of this code.

Sec. 15. Inducing or attempting to induce, by any means or device whatsoever, a breach of contract between a competitor and his customer during the term of such contract, is a violation of this code.

Sec. 16. Nothing in the foregoing sections of this article shall prevent any American producer from creating special prices for overseas exports.

Sec. 17. The splitting or dividing of commissions, brokers' fees, or brokerage discounts, or otherwise in any manner through sham or indirection the use of brokerage commission or jobbers' arrangements or sales agency for making discounts, allowances, or rebates, or prices other than those determined as provided in this code, to any industrial consumer or to any retailer, or to others, shall be a violation of this code.

Soft-Coal Tonnage Down

Bituminous coal production, primarily as a result of strikes in various districts, dropped to 29,450,000 net tons in September, according to preliminary figures compiled by the U. S. Bureau of Mines. Production in August was 33,910,000 tons and the output in September, 1933, was 26,314,000 tons. Anthracite production rose to 4,981,000 net tons in September, against 4,396,000 tons in August and 4,108,000 tons in September, 1932.

Total production of bituminous coal in the first eight months of this year was 238,052,000 tons, an increase of 26,804,000 tons, or 12.7 per cent, over the total of 211,248,000 tons in the same period in 1932. Anthracite output in the first nine months was 35,441,000 tons, an increase of 685,000 tons, or 2 per cent, compared with the total of 34,756,000 tons in the same period last year.

Sec. 18. To sell to, or through, any broker, jobber, commission account, or sales agency, which is in fact an agent for an organization of retailers or industrial consumers, whereby they secure indirectly a discount, dividend, allowance or rebates, or a price other than that determined as provided in this code shall be a violation of this code.

Art. VII—Administration

Sec. 1. For the purposes of administration of this code, the bituminous coal industry is hereby divided into five divisions as follows:

Division No. I.—Pennsylvania, Ohio, lower peninsula of Michigan, Maryland, West Virginia, Kentucky, northern Tennessee (including all counties not included within Division No. III), Virginia and North Carolina.

Division No. II—Iowa, Indiana and Illinois.

Division No. III—Alabama, southern Tennessee (including Marion, Grundy, Sequatchie, White, Hamilton, Bledsoe and Rhea counties), and Georgia.

Division No. IV—Missouri, Kansas, Arkansas, Oklahoma and Texas.

Division No. V—New Mexico, Colorado, Utah, Wyoming, North Dakota, South Dakota, Montana, Idaho, Washington, Oregon, California, Nevada and Arizona.

In each of the foregoing five divisions, subdivisions may be established, as hereinafter provided.

Sec. 2. Divisional Code Authorities. For each of the foregoing divisions there shall be established within ten days after the effective date hereof, or within such further time as may be permitted by the Administrator, a Divisional Code Authority, or Subdivisional Code Authorities for the administration of this code within such division, either for the division as a unit, or for subdivisions thereof, respectively, as may be determined. All the members of a Code Authority except one (without vote and to be appointed by the President) shall be selected by an association or associations, or a committee of coal producers within the division or subdivision which shall be truly representative of the industry therein and impose no inequitable restrictions on admission to membership. A full report of any such action taken to establish a Code Authority shall be made to the Administrator and shall become effective upon approval by him. A subdivision shall consist of a geographical area within which all coal producers shall be entitled to membership in the association or committee establishing the Code Authority. The Administrator shall have power to limit the number of subdivisions within a division and to determine any controversy arising in the establishment of such a Code Authority, and his decision shall be conclusive as to compliance with the requirements of this section and of the National Industrial Recovery Act in the initial establishment of such a Code Authority.

In the event that Subdivisional Code Authorities are established within a division, such Subdivisional Code Authorities shall establish a Divisional Code Authority to exercise the functions hereinafter provided for a Divisional Code Authority and any other functions which may be conferred upon the Divisional Code Authority by the Subdivisional Code Authorities, all in conformity with any rules and regulations prescribed by the Administrator. One member of a Divisional Code Authority, without vote, shall be appointed by the President.

A Code Authority shall administer this code in its division or subdivision and shall have the duties and exercise the powers which are conferred upon it in this article and in Art. VI of this code, and shall have authority to adopt appropriate bylaws, rules and regulations for the exercise of its functions.

Marketing agencies or trade associations may be established or maintained within any division or subdivision by a voluntary association of producers within any producing district therein, as such district may be defined by the Code Authority and function under such general rules and regulations as may be prescribed by the Code Authority, with the approval of the Administrator, for the purpose of preventing any unfair practices, as defined in Art. VI of this code.

Sec. 3. Each Code Authority shall collect and compile any reports and other information required under the National Industrial Recovery Act; and in investigations of any complaint of unfair practices the Presidential member of a Code Authority shall have power to require reports from, and shall be given access to inspect the books and records of, producers within the jurisdiction of such Code Authority to the extent he may deem necessary for the determination of the validity of the complaint. All coal producers subject to the code shall furnish to any government agency or agencies designated by the Administrator such statistical information as the Administrator may, from time to time, deem necessary for the purposes recited in Sec. 3 *(a)* of the National Industrial Recovery Act; and any reports and other information collected and compiled by a Code Authority, as heretofore provided, shall be transmitted to such government agencies as the Administrator may direct.

The expense of administering this code by a Divisional (or Subdivisional) Code Authority shall be borne by those subject to such Code Authority, each paying his proportionate share, as assessed, computed on a tonnage basis, in accordance with regulations prescribed by the Code Authority with the approval of the Administrator.

Sec. 4. Industrial Board. There shall be established within ten days after the creation of the Divisional Code Authorities a National Bituminous Coal Industrial Board, consisting of four members designated by the Divisional Code Authority of Division No. I, two members designated by the Divisional Code Authority of Division No. II, one member each designated by the Divisional Code Authorities of Divisions Nos. III, IV and V, and the five members of the Divisional Code Authorities who have been appointed by the President. The President may appoint not more than three members of the Industrial Board in addition to, or in substitution for one or more of, the aforesaid five members of the Divisional Code Authorities. This board shall have the duties and exercise the powers conferred upon it in this code, or any revisions thereof, and particularly shall meet from time to time at the call of the Administrator, who shall be ex-officio chairman thereof, to consider and to make recommendations to the Divisional Code Authorities and to the President as to any amendments of this code, or other measures which may stabilize and improve the conditions of the industry and promote the public interest therein.

Sec. 5. Labor Relations. *(a)* Any controversy concerning hours, wages and conditions of employment, or compliance with the provisions of Art. V of this code, between employers and employees who are organized or associated for collective action shall, if possible, be adjusted by conference and negotiation between duly designated representatives of employers and such employees, meeting either in a mine conference or district conference or divisional conference, as the machinery for such conference may be established by agreement of the parties thereto; and it shall be the duty of employers and employees to exert every reasonable effort to establish such a machinery of adjustment and to utilize it to negotiate to a conclusion such controversies wherever possible.

(b) Any such controversy which cannot

be settled in the manner so provided and which threatens to interrupt or has interrupted, or is impairing, the efficient operation of any mine or mines to such an extent as to restrain interstate commerce in the products thereof, shall be referred to the appropriate Bituminous Coal Labor Board, established as hereinafter provided, and the decision of said board shall be accepted by the parties to the controversy as effective for a provisional period of not longer than six months, to be fixed by the board.

(c) During the consideration of any such controversy either by the agreed machinery of adjustment or by the Bituminous Coal Labor Board, neither party to the controversy shall change the conditions out of which the controversy arose or utilize any coercive or retaliatory measures to compel the other party to accede to its demands.

(d) If any such controversy shall involve or depend upon the determination of who are the representatives of the employees chosen as provided in Sec. 7 *(a)* of the National Industrial Recovery Act, the appropriate Bituminous Coal Labor Board, through any agent or agency it may select, shall have the power to determine the questions by an investigation and, if necessary, by a secret ballot taken under its direction.

(e) A Bituminous Coal Labor Board shall be appointed by the President for each division, except there shall be two boards for Division No. I, to exercise the powers herein conferred upon it, which shall consist of three members, one to be selected from nominations submitted by organizations of employees within such division, one to be selected from nominations by the Divisional Code Authority and one who shall be a wholly impartial and disinterested representative of the President. The expenses of such board shall be met by equal contributions from the employers and employees nominating members, the amount and method of collecting which shall be determined by regulations prescribed by the President.

(f) There shall be a National Bituminous Coal Labor Board composed of the members of the six divisional labor boards which may be convened upon call of the Administrator in the event that:

1. A controversy involves employers and employees of more than one division, or
2. The decision of a divisional labor board affects operating conditions of more than one division either directly or because of its effect upon competitive marketing, or
3. In the opinion of the Administrator the decision of a divisional labor board involves the application of a policy affecting the general public or the welfare of the industry as a whole.

The National Bituminous Coal Labor Board may exercise all the powers conferred upon a divisional labor board, either in giving original consideration to a controversy or in reviewing the decision of a divisional labor board, which may be either affirmed, set aside and/or modified.

Art. VIII—Safety

Employers and employees shall cooperate in maintaining safe conditions of operation in compliance with the applicable requirements of state laws or regulations in conformity therewith.

Art. IX—Amendments

Any Code Authority may propose amendments to this code from time to time effective generally or as to the area within its jurisdiction, which, after submission to any other Code Authority affected thereby (which shall include the divisional Code Authority in case of an amendment proposed by a subdivisional Code Authority), may be recommended by the Administrator for the approval of the President.

Art. X

This code and all the provisions thereof are expressly made subject to the right of the President, in accordance with the provision of sub-section *(b)* of Sec. 10 of the National Industrial Recovery Act, from time to time to cancel or modify any order, approval, license, rule or regulation issued under Title I of said Act and specifically, but without limitations, to the right of the President to cancel or modify his approval of this code or any conditions imposed by him upon his approval thereof.

Art. XI—Effective Date and Termination

This code shall become effective on the second Monday following its approval by the President, and shall continue in effect until April 1, 1934, and thereafter in the absence of the exercise of the power reserved to the President in Art. X, subject to the exercise of the option, after 30 days' notice to the Administrator, by any coal producer to withdraw his consent after April 1, 1934, to the further enforcement of the code as a code to which he has voluntarily given his consent.

Schedule A—Basic Minimum Rates*

	Minimum Inside Skilled Labor Dollars Per Day	Minimum Inside Skilled Labor Cents Per Hour	Minimum Outside Common Labor Dollars Per Day	Minimum Outside Common Labor Cents Per Hour
District A				
Pennsylvania......	4.60	57½	3.60	45
Ohio...............	4.60	57½	3.60	45
Lower Peninsula of Michigan........	4.60	57½	3.60	45
Panhandle District, West Virginia.....	4.60	57½	3.60	45
District B				
Northern West Virginia[2]........	4.36	54½	3.36	42
District C				
Southern West Virginia[3]............	4.20	52½	3.20	40
Eastern Kentucky[4].	4.20	52½	3.20	40
Upper Potomac District, West Virginia[5]...........	4.20	52½	3.20	40
Maryland.........	4.20	52½	3.20	40
Virginia..........	4.20	52½	3.20	40
Northern Tennessee[6]	4.20	52½	3.20	40
District D				
Indiana...........	4.57½	57¼	4.20	52½
District E				
Illinois............	5.00	62½	4.00	50
District F				
Iowa[7].............	4.70	58¾	4.00	50
Wayne and Appanoose counties, Iowa............	4.56	57	3.86	48¼
District G				
Missouri, Kansas, Arkansas and Oklahoma.........	3.75	46⅞	3.28	41
District H				
Western Kentucky[8].	4.00	50	3.00	37½
District J				
Alabama..........	3.40	42½	2.40	30
Georgia...........	3.40	42½	2.40	30
Hamilton and Rhea counties, Tennessee.............	3.40	42½	2.40	30
District J-1				
Marion, Grundy, Sequatchie, White, Van Buren, Warren and Bledsoe counties, Tennessee.............	3.84	48	2.84	35½
District K				
New Mexico.......	4.48	56	3.75	46⅞
Southern Colorado[9].	4.44	55½	3.75	46⅞
District L				
Northern Colorado[10]	5.00	62½	3.75	46⅞
District M				
Utah..............	5.44	68	4.48	56
District N				
Southern Wyoming.	5.42	67¾	4.44	55½
Northern Wyoming.	5.42	67¾	4.54	56¾
District O				
Montana..........	5.63	70⅜	4.82	60¼
District P				
Washington........	5.40	67½	4.00	50
District Q				
North Dakota......	4.00	50	3.20	40
South Dakota......	4.00	50	3.20	40

*Differences between districts in the foregoing minimum rates are not to be considered as fixing permanent wage differentials or establishing precedents for future wage scales.

[1]Includes Hancock, Brooke, Ohio and Marshall counties.

[2]Includes Monongalia, Preston, Marion, Harrison, Taylor, Lewis, Barbour, Gilmer, Upshur, Randolph, Braxton and Webster counties and those mines in Nicholas County served by the B. & O. R. R.

[3]Includes all mines in counties of West Virginia not named under districts A and B and under the Upper Potomac District.

[4]Includes all mines in Kentucky located east of a north and south line drawn along the western boundary of the city of Louisville.

[5]Includes Grant, Mineral and Tucker counties.

[6]Includes all counties in Tennessee not named in Districts J and J-1.

[7]Excludes Wayne and Appanoose counties.

[8]Includes all mines in Kentucky west of a north and south line drawn along the western boundary of the city of Louisville.

[9]Includes all counties in Colorado not named under District L.

[10]Includes Jackson, Larimer, Weld, Boulder, Adams, Arapahoe, El Paso, Douglas, Elbert and Jefferson counties.

The text of President Roosevelt's executive order of Sept. 29 approving the basic minimum wage rates in Schedule A and also providing that only impartial and disinterested representatives of the President appointed to the divisional labor boards shall participate in decisions on any controversy submitted to the National Bituminous Coal Labor Board, the other members thereof acting only in an advisory capacity, is as follows:

Executive Order—Revised Code of Fair Competition for the Bituminous Coal Industry

A Code of Fair Competition for the Bituminous Coal Industry was approved by an Executive Order dated Sept. 18, 1933, subject to certain conditions including a condition that basic minimum rates not fixed in Schedule "A," as attached to the code, might be approved or prescribed by the President at any time prior to the effective date of the code, which provision was also incorporated in the code in said Schedule "A." Following said Executive Order of Sept. 18, further consideration has been given to said basic minimum rates and said Schedule "A" has been revised so as to include additional rates either agreed upon and submitted for approval, or recommended as those which should be prescribed by the President.

The associations and groups of coal producers and individual coal producers submitting said code for the approval of the President also authorized the Administrator to make such minor changes as might be desirable to improve its language without substantially altering the substance thereof.

Now, Therefore, I, Franklin D. Roosevelt, President of the United States, pursuant to the authority vested in me by Title I of the National Recovery Act, approved June 16, 1933, and otherwise, and upon the recommendation of the Administrator do order that—

(1) Schedule "A," as revised and attached to this order, is hereby approved as the schedule of basic minimum rates approved or prescribed by the President and incorporated in the Code of Fair Competition for the Bituminous Coal Industry, as provided in Article IV of said code.

(2) In order to correct a typographical error in the code and in the Executive Order of Sept. 18, in the two places where the phrase "six members of the Divisional Code Authorizes" occurs in Art. VII, Sec. 4, this shall be corrected to read "five members of the Divisional Code Authorities."

(3) In order to provide for the impartial decision of any controversy submitted to the National Bituminous Coal Labor Board there is hereby imposed, as a condition upon the functioning of said Board, that only the impartial and disinterested representatives of the President appointed to the Divisional Labor Boards shall participate in the decisions of the National Bituminous Coal Labor Board, the other members thereof acting only in an advisory capacity.

(4) Subject to the conditions of the Executive Order of Sept. 18, 1933, and the modification thereof and other provisions of this order, the Code of Fair Competition for the Bituminous Coal Industry is hereby approved.

[Signed] Franklin D. Roosevelt

Sept. 29, 1933.

Approval Recommended

[Signed] Hugh S. Johnson
Administrator

Anthracite Equipment Standards Accepted by U. S. Bureau

Acceptance by the U. S. Bureau of Standards of the design, installation and maintenance standards required by the Anthracite Institute Laboratory as a condition of its approval of anthracite-burning equipment was announced by the Anthracite Institute Oct. 5, following a meeting of stoker manufacturers and institute engineers with I. J. Fairchild, Washington, D. C., Chief, Division of Trade Standards, Bureau of Standards.

Agreement on the stoker standards marked the first step in a program of cooperation between the Anthracite Institute and the federal authorities which, it was said, will eventually impose upon manufacturers of every variety of anthracite equipment a set of authoritative standards that will protect the purchaser from inferior apparatus. Mr. Fairchild said the Bureau at Washington would file and publish the standards agreed upon, but that it would be the obligation of the manufacturers who came under its provisions to "police" operations under the code specifications.

Safety Equipment Under NRA

Temporary approval of a code of fair competition submitted by the Industrial Safety Equipment Manufacturers' Association was granted by NRA on Sept. 7. The proposed code for the industry was submitted on Aug. 29 by a committee composed of J. T. Ryan, vice-president, Mine Safety Appliances Co., and chairman of the association; T. A. Willson, vice-president, Willson Products Co.; and A. C. Carruthers, acting secretary of the association.

Coal Increase Forecast

An increase of 15.1 per cent in shipments of coal and coke in the fourth quarter of this year is forecast by Shippers' Regional Advisory Boards. These boards estimate that loadings of coal and coke will total 2,071,073 cars in the fourth quarter, against actual loadings of 1,799,325 cars in the same period in 1932.

Personal Notes

H. A. Berg, vice-president and general manager, Sloss-Sheffield Steel & Iron Co. for the past three years, has been elected president of the Woodward Iron Co., Woodward, Ala., vice A. H. Woodward, who continues as chairman of the board.

R. H. Gross, Boston, Mass., has been elected chairman of the board of the New River Co., Macdonald, W. Va., and subsidiaries. Mr. Gross is succeeded as president of both the parent and subsidiary companies by S. A. Scott, Macdonald, formerly executive vice-president. F. W. Paine was elected a vice-president of all companies except the White Oak Coal Co. S. Scott Nicholls, New York, was chosen vice-president of the latter company.

William Glennon, for some years deputy inspector, has been appointed State Mine Inspector for Kansas, with headquarters at Pittsburg.

J. E. Lee, formerly treasurer, has been appointed general manager of the Sheridan-Wyoming Coal Co., with headquarters at Kleenburn, Wyo. W. A. Gallagher is now assistant to the general manager.

Gen. Brice P. Disque, for two years executive director of the Anthracite Institute, was elected president of Pattison & Bowns, Inc., New York anthracite distributors, Oct. 2. General Disque succeeds Gardner Pattison, elected president of Burns Bros., retail coal dealers, on Sept. 28. Mr. Pattison takes over the duties of C. F. Huber, chairman of the board of the Glen Alden Coal Co., who became acting head of Burns Bros. upon the resignation of Noah H. Swayne some months ago.

Appalachian Wage Agreement Signed Sept. 21; Fails to Halt Strikes in Eastern Fields

With the expressed belief that it "marks the beginning of a new era in the task of stabilizing and modernizing the economic processes" of the bituminous industry, Appalachian operators and the United Mine Workers signed on Sept. 21 a wage agreement running from Oct. 2, 1933, to March 31, 1934, and affecting a normal yearly output of 300,000,000 to 350,000,000 tons and 314,000 miners in Ohio, Pennsylvania, West Virginia, Maryland, Virginia, eastern Kentucky and northern Tennessee. Informal negotiations leading up to the agreement started Aug. 19, and its consummation, an outgrowth of the passage of NIRA and the development of a code of fair competition for the soft-coal industry, marks the reestablishment of the United Mine Workers in Ohio, Pennsylvania and certain outlying districts to the south, as well as the extension of control to Southern fields never before under the union banner.

In a joint statement on Sept. 21, J. D. A. Morrow, president, Northern Coal Control Association; E. C. Mahan, president, Smokeless and Appalachian Coal Association; and John L. Lewis, president, United Mine Workers, termed the agreement the greatest in magnitude and importance ever negotiated in the history of collective bargaining in the United States. "All interests represented in the agreement," said the statement, "are hopeful of its complete success and have pledged themselves to contribute in every possible and practical way to add to its workability. The negotiating committees of operators and miners have been the recipients of the splendid assistance of Gen. Hugh S. Johnson, Administrator of the National Industrial Recovery Act, as well as the sympathetic and inspiring help of President Roosevelt.

"The agreement was negotiated under the direction of the President in conformity with Sec. 7(b) of the Recovery Act, and its sponsors in submitting it for approval commend it not only to the President but to the people of the United States."

The agreement, given in full on p. 356 of this issue, was approved and signed by President Roosevelt on Sept. 22. In approving the agreement, the President declared that it was with "the understanding that the hours, wages and conditions of employment recited herein may also be applied to employees not parties hereto; and that the requirements of Sect. 7(a) of the National Industrial Recovery Act will be complied with in carrying out this agreement."

In addition to provisions for an eight-hour day, election of checkweighmen and the selection of pit committees, the agreement provides machinery for the complete settlement of disputes. Suspension of work during adjustment of grievances is forbidden, and in case of illegal suspension the operator is prohibited from discussing the matter under dispute with the pit committee or any representative of the union as long as the men remain out.

The agreement also provides that supplementary agreements shall be made in the different districts to take care of local conditions, and repeats the provisions of the bituminous code calling for a conference between representatives of the employers, employees and the NRA on Jan. 5, 1934, to determine what revisions, if any, are necessary in wages, hours, differentials and other code requirements on the basis of the experience gained prior to that time.

Immediately after the adoption of the general agreement, miners and operators in the various fields covered began conferences to draw up district agreements before the general agreement went into effect, and reports indicate that supplementary documents were completed for all these districts. Of the agreements available for reference early in October, the majority followed more or less closely the general agreement, with modifications to take care of local conditions. Supplementary agreements for Districts 3, 4 and 5 of western Pennsylvania added to the district agreements provisions for checking off union dues not in excess of $1 per month and initiation fees not in excess of $1 per pay, as well as provisions for the imposition of penalties of $1 per man per day on miners or operators for illegal strikes or lockouts. Wage scales included in the various available district documents are given in Tables I, II, III, IV and V.

The picture of harmony in the Appalachian region was badly marred, however, by the continuation of a strike by approximately 55,000 miners in western Pennsylvania after Oct. 2, the effective date of both the basic and district wage agreements and the code. The September walkout followed close on the heels of an earlier stoppage over the question of union recognition, which began at the mines of the H. C. Frick Coke Co. and was brought to an end in August following adoption of truce agreements. The new strike, which received official sanction at a meeting of miners' representatives at Pricedale Sept. 13, was originally directed at the delay in adopting a coal code. When it became apparent, after the code was approved, that the steel companies operating captive mines were reluctant to sign either it or the wage agreement, the "holiday" stoppage was transformed into a demand for union recognition.

Once started, the strike developed rapidly until practically all mines in western and southwestern Pennsylvania were closed, whereupon partially successful attempts were made to extend the stoppage to central Pennsylvania. An attempt to extend the shutdown to northern West Virginia, however, failed. In all, approximately 75,000 were said to be out at the height of the strike, of whom about 20,000, largely in central Pennsylvania, returned to work on Oct. 3. The course of the strike was featured by clashes between pickets and mine guards, in one of which, at the Gates mine of the Frick company, Sept. 14, fifteen strikers were wounded by buck-shot and a deputy's arm was blown off by one of his mates. The strikers also made three attempts to close the Clairton (Pa.) plant of the Carnegie Steel Co., the last on Sept. 29.

Attempts by officers of Districts 3, 4 and 5 of the United Mine Workers, comprising the western Pennsylvania fields, to halt the stoppage proved unavailing, with the result that the NRA took a hand late in the month. As a result of conferences with the representatives of steel companies, who contended that as they already were operating under the steel code it was not necessary for them to sign the coal code or enter into the wage agreements, these companies, on Sept. 29, signed an agreement under Sec. 4(a) of the NIRA which the Administration hoped would solve the captive mine question. Under the terms of this pact steel companies operating captive mines bound themselves "to comply with the maximum hours of labor and minimum rates of pay which are or shall be prescribed under or pursuant to the coal code for the district in which such mine is located so long as the coal code shall remain in effect." The agreement is subject to all the terms and conditions of Sec. 7(a) of the NIRA, but does not include any direct mention of union recognition.

Armed with this agreement and the approval of President Lewis of the United Mine Workers, General Johnson, NRA Administrator, on Oct. 2, revealed the fact that "with the approval of the President" he had telegraphed Philip Murray, vice-president of the union, at Pittsburgh, declaring that Thomas Moses, president of the H. C. Frick Coke Co., had addressed a letter to Mr. Murray confirming the conditions of the agreement and agreeing to maintain the working conditions, wages and hours included in wage agreements signed by other operators, which include the check-off. This was coupled with a request that the miners resume work immediately, which was relayed to 82 representatives of the miners at a meeting in Pittsburgh on the same day. While it met with general approval, opposition was not entirely absent.

This opposition was given further force at a meeting near Uniontown, Pa., Oct. 3, called by Martin F. Ryan, an employee at the Colonial No. 3 mine of the Frick company and leader of the insurgent movement. At this meeting, 10,000 to 15,000 insurgents shouted down union officials and rejected proposals that they return to work under the terms of the steel agreement, which union representatives declared guaranteed "virtual recognition" of the United Mine Workers.

In addition to the question of formal union recognition by captive mine owners, the situation was further complicated, according to reports, by a dispute over the refusal of the steel companies to concede that the agreement included the "check-off" and the employment of checkweighmen, as well as differences over the right of John L. Lewis to represent the miners not working under contract. The new disagreement aroused General Johnson's ire at what he termed "quibbling" by the companies, and on Oct. 3 he announced that he would bring pressure to bear on the companies to force their observance of the code and supplementary agreement. It was later revealed that Donald Richberg, general counsel, NRA, had ruled that the steel agreement did not include the checkoff. President Roosevelt took a hand in the situation on Oct. 6 by summoning steel representatives to the White House and laying down conditions to govern future negotiations.

A number of operations in the Pocahontas and Tug River districts, in southern West Virginia, also were closed by strikes early in October; and in the Southwest Arkansas and Oklahoma miners variously estimated at 1,500 to 3,000 in number stopped work in September in protest against the wage scale set up in the coal code. Missouri and Kansas, according to reports, were little affected. The strikers demanded a basic scale of $4.54 a day, against the $3.75 embodied in the present agreement expiring on March 31, 1935. Later, this demand was scaled down to $4.20, and the srikers subsequently went back with the reported understanding that the $3.75 scale would be revised upward.

With the resumption of operations at the Calvin mine of the Blackwood Coal & Coke Co., Sept. 20, the month-old strike in the St. Charles field in Lee County, Virginia, over the question of union activity came to an end. The Wise County strike, however, was continued into October, the miners refusing to go back even after the wage agreement was signed.

Oakland City, Ind., was the scene of a

Table I—Hourly Rates for Day Labor Established in Various Eastern Districts

	Field and Union District		
	Pennsylvania Nos. 2, 3, 4, 5,	Nor. W. Va. No. 31	Poca.-Tug River No. 17
Inside:			
Machine runner, motormen, rock drillers....	$0.595	$0.565	$0.545
Drivers, brakemen, spraggers, snappers, coal drillers, trackmen, wiremen, bonders, timbermen, bottom cagers	0.575	0.545*	0.525
Pumpers; track, wire and timber helpers; other inside labor not classified..........	0.545	0.515†	0.495
Greasers, trappers, flaggers, switchthrowers.	0.375	0.345	0.325
Loading- and Cutting-Machine Scale:			
Operators, Joy, Oldroyd and similar machines	0.725	0.700	.....
Operators, 44-C loaders	0.690	.....	.....
Helpers and preparation men on above.......	0.595	0.600	....
Operators, track-mounted drills..............	0.635	.....	.....
Helpers..............	0.545	.....	.....
Operators and helpers, cutting and shearing machines...........	0.725	.....	.....
Cutting-machine crew..	.....	0.700	0.545
Outside:			
Bit sharpeners, car droppers, trimmers, car repairmen, dumpers..	0.480	0.450‡	0.430
Sand dryers, car cleaners, other able-bodied labor...............	0.450	0.420§	0.400
Slate pickers..........	0.375	0.345	0.325

*Also shotfirers and bratticemen.

†Also brattice helpers, assistant cagers and couplers.

‡Also all other tipplemen other than dumpers and slate pickers.

§Rates for other classifications set up in the Fairmont district are as follows: coal hoist engineers, 63½c.; blacksmiths and general repairmen, 62½c.; slope and man-hoist engineers, 57½c.; blacksmiths and general repairmen, 2d class, 57c.; hand firemen, wheelmen, 56½c.; combination engineers and firemen, lamp men and man-hoist engineers, power house and man-hoist engineers or wheelmen's helpers, 54½c.; lamp men, 49c.; combination firemen, substation and fan tenders or substation operators and fan tenders, 44c.; helpers, car and general repairmen, truck drivers, teamsters, 42c.; greasers, 34½c.

Table II—Basic Piecework Rates Established in Central Pennsylvania (District 2, U.M.W.)

	Net Ton
Pick mining..........................	$0.700
Machine loading.........................	0.520
Cutting, shortwall machine............	0.080
Arcwall machine........................	0.055

Pick-hammer rate at Berwind-White Coal Mining Co. operations, 60c. per ton pending investigation and arbitration to be concluded within 30 days.

Loading on conveyors, 43½c. per ton, except at Nos. 37 Upper, 37 Lower, 40 Upper and 40 Lower, which is set at 40.1c. pending investigation and arbitration.

Miners reopening old workings shall be paid 57½c. per hour for relaying track, retimbering, bailing water and cleaning up falls of roof not caused by their own negligence.

Table III—Piecework and Deadwork Scales Established in Western Pennsylvania Districts

	Union District		
		No. 5	
Pick Mining, Per Net Ton:	Nos. 3 and 4	Thin Vein	Thick Vein
Mining rate.............	$0.650	$0.700	$0.650
Additional yardage, narrow work, per yd......	1.130	1.130	1.130
Deadwork Scale, Pick Mining:			
Clay vein, 6 to 12 in., per vein.................	2.480	2.480	2.480
Clay vein, over 12 in., across place, per ft.....	2.480	2.480	2.480
Clay vein, at angle, per yd.	0.640	0.640	0.640
Spar, under 6 in., each....	1.480	1.480	1.480
Spar, at angle, per yd.....	0.270	0.270	0.270
Ripping roof, entries, per yd.................	0.170	0.170	0.170
Drawslate, over 12 in., per in. per lin. yd.........	0.054	0.054	0.054
Connellsville Scale:			
Pick mining, per ton.....	0.560	.....	.....
Additional yardage, narrow work, per yd......	1.130	.....	.....
Drilling by hand and loading, per ton...........	0.400	.....	.....
Undercutting, per ton....	0.060	.....	.....
Undercutting, Shortwall Machine, Per Net Ton:			
Wide work.............	0.070	0.080	0.070
Narrow work...........	0.070	0.080	0.070
Additional yardage, narrow work, per yd......	0.190	0.170	0.190
Cutting, Drilling and Shearing, Track-mounted Machine, Per Net Ton:			
Cutting.................	0.048	0.058	0.048
Cutting and shearing.....	0.050	0.060	0.050
Cutting and drilling......	0.050	0.060	0.050
Cutting, shearing and drilling................	0.052	0.062	0.052
Machine Deadwork, Shortwall or Track-mounted Machine:			
Clay vein, 6 to 12 in., each	0.350	0.350	0.350
Clay vein, over 12 in., across place, per ft.....	0.350	0.350	0.350
Clay vein, at angle, per yd.	0.080	0.080	0.080
Spar, under 6 in., each....	0.140	0.140	0.140
Spar, at angle, per yd.....	0.040	0.040	0.040
(All places over 12 ft. wide are to be paid for at the regular wide-work rates)			
Hand Loading, Machine-cut Coal, Per Net Ton:			
Hand drilling and loading, wide work, 12 in. drawslate..................	0.480*	0.520*	0.480*
Same, drawslate supported by top coal...........	0.440*	.....†	0.440*
Hand drilling and loading, narrow work, 12 in. drawslate............	0.480*	0.520*	0.480*
Additional yardage, narrow work, per yd......	0.520	0.500	0.520
Hand-loading Deadwork:			
Clay vein, 6 to 12 in., each	1.370	1.370	1.370
Clay vein, over 12 in., across place, per ft.....	1.370	1.370	1.370
Clay vein, at angle, per yd..................	0.350	0.350	0.350
Spar, under 6 in., each....	0.790	0.790	0.790
Spar, at angle, per yd.....	0.130	0.130	0.130
Drawslate, over 12 in., per in. per lin. yd.........	0.540	0.540	0.540
(All places over 12 ft. wide are to be paid for at the regular wide-work tonnage rates)			

Where miner removes posts in making falls in stumps or pillars drawn by machine he shall receive 5c. for each post recovered.

Where rooms are narrowed to less than 12 ft. for any reason, narrow-work prices shall be paid.

In turning rooms, the miner shall be paid the regular narrow-work rate for the actual yardage driven.

*When drilling is done for the loader, $0.0125 per ton shall be deducted from these rates; when shearing is done, $0.0175 per ton shall be deducted; when both are done, $0.03 per ton shall be deducted.

†Prices do not apply to the thin-vein section that may be top-cut by any type of arc or straight-cutting top machine where the combined thickness of kerf and coal to be loaded out is less than 5 ft.

raid on the homes of miners employed at the Francisco and Somerville co-operative mines on Sept. 27. The raid was staged by union adherents, who demanded that the non-union miners, alleged to have been imported from Kentucky and Illinois, leave town immediately. Thirty people were reported to have decamped as a result. Picketing at the Star Burn cooperative mine, near Sullivan, Ind., resulted in the death of a union miner on Oct. 4.

Mid-Western producers late in September expressed concern over the possibility that the decision of the Progressive Miners of America late in the month to expand their organization into other fields would seriously interfere with quiet operation under the coal code. The Progressives followed up their decision by declaring a general drive on Illinois mines operated under contracts with the United Mine Workers, which was followed by an outbreak of terror in Saline County on the night of Oct. 3-4. In addition to widespread sniping during the night, six homes occupied by regular union sympathizers were dynamited. On Oct. 5, six National Guard companies lifted a siege enforced against Mine 43 of the Peabody Coal Co., Harrisburg, Ill., by 1,500 pickets. More than 5,000 shots were reported to have been poured into the property where officials and 100 members of the United Mine Workers were beleaguered.

Donald Richberg, general counsel for the NRA, left for Illinois on Oct. 4 to discuss possible peace measures with Governor Horner.

In the Rocky-Mountain region, the Gallup (N. M.) strike, organized by the National Miners' Union, continued to lose force as September wore on, according to reports. Carbon County (Utah) mines, closed down by the National Miners' Union in August, continued to operate after reopening early in September, although conditions remained unsettled.

To the accompaniment of dynamite explosions and attacks on miners loyal to the Lewis organization, the Anthracite Miners of Pennsylvania attempted to hold their gains at the operations of the Penn Anthracite Mining Co. in the northern anthracite field and extend the strike to the collieries of the Hudson Coal Co. last month. The drive against Hudson Coal properties started Aug. 25, and, according to reports, was successful in closing the Luzerne County collieries of the company. The full effect was not felt at Lackawanna County collieries until a day or two later. The success of the insurgents was short-lived, however, as practically all the Hudson properties were operating normally on Sept. 28 under strong police protection. Collieries of the Penn Anthracite Mining Co. had resumed normal operation a week earlier.

With the announced intention of extending its efforts to other companies in the northern field, the insurgent group laid plans for the organization of general grievance committees for several other companies early in October.

Table IV—Basic Piecework Scale Established in Northern West Virginia (District 31, U.M.W.)

	Net Ton
Pick mining, basic scale	$0.560
Loading stumps and wings, pillar work	0.460
Loading, Machine-Cut Coal:	
Basic scale, coal not drilled	0.400
Coal drilled	0.380
Coal drilled and sheared	0.335
Coal sheared but not drilled	0.355
Cutting, Air and Electric Machines:	
Track-mounted type:	
Top cutting	0.044
Undercutting	0.048
Undercutting and drilling	0.055
Undercutting and shearing	0.060
Undercutting, shearing and drilling	0.068
Shortwall machine	0.060

Table V—Basic Piecework Scale Established in the Pocahontas-Tug River District (Included in District 17, U.M.W.)

	Net Ton
Loading, machine-cut coal	$0.357
Cutting, shortwall machine	0.045
Cutting, track-mounted machine	0.032

Where a middleman or parting replaces the usual Pocahontas bone, 4 in. shall be removed free; all over 4 in. shall be paid for at the rate of 6c. per inch per lineal yd., also the rate for the usual drawslate in excess of 4 in.

▶ When the miner is required to leave his work to perform other duties, he shall be paid $4.20 per day unless the scale rate is higher, whereupon it shall prevail.

Appalachian Agreement

This agreement is made and entered into pursuant to the provisions of Sec. 7 *(b)* of the National Industrial Recovery Act, and shall become effective upon approval by the President of the United States as provided therein.

This agreement, made the 21st day of September, 1933, between the Northern Coal Control Association, a voluntary association on behalf of each member thereof, and the Smokeless and Appalachian Coal Association, a voluntary association on behalf of each member thereof, hereinafter referred to as the operators, parties of the first part; and the International Union United Mine Workers of America and Districts 2, 3, 4, 5, 6, 17, 19, 30 and 31, hereinafter referred to as mine workers, and on behalf of each member thereof, party of the second part. (New districts of the United Mine Workers of America may be established in this territory.)

Witnesseth: It is agreed that this contract is for the exclusive joint use and benefit of the contracting parties, as heretofore defined and set forth in this agreement; and it shall be construed as binding upon and effective in determining only the relations with each other of those represented by the parties signatory hereto. It is the intent and purpose of the parties hereto that this agreement will promote an improved industrial and economic relationship in the bituminous coal industry, and to set forth herein the basic agreements covering rates of pay, hours of work, and conditions of employment to be observed between the parties in the following districts constituting the Appalachian territory:

Northern Coal Control Association Territory—Pennsylvania, Ohio, together with Ohio, Brook and Marshall counties of West Virginia, and northern West Virginia, including counties of Monongahela, Marion, Harrison, Preston, Taylor, Barbour, Randolph, Upshur, Lewis, Gilmer, Braxton, Webster and that portion of Nicholas County containing coal or coal mines along the line of the B. & O. R.R.

Smokeless and Appalachian Territory—The State of Virginia, northern Tennessee, that part of Kentucky lying east of a line drawn north and south through the city of Louisville, and that part of West Virginia not included in Northern Coal Control Association Territory, as set out above, and except Grant, Mineral and Tucker counties of West Virginia.

Maximum Hours and Working Time

Eight hours of labor shall constitute a day's work. The eight-hour day means eight hours' work in the mines at the usual working places for all classes of labor, exclusive of the lunch period, whether they be paid by the day or be paid on the tonnage basis; except in cases of accident which temporarily necessitates longer hours for those mine workers required on account thereof; and also excepting that number of mine workers in each mine whose daily work includes the handling of man-trips and those who are required to remain on duty while men are entering or leaving the mine.

The eight-hour day, five-day week (40 hours per week), as provided in this agreement, shall prevail.

The following classes of mine workers are excepted from the foregoing provisions as to maximum hours of work:

All mine workers engaged in the transportation of men and coal shall work the additional time necessary to handle man-trips and all coal in transit, and shall be paid the regular hourly rate.

When day men go into the mine in the morning they shall be entitled to two hours' pay whether or not the mine works the full two hours, but after the first two hours the men shall be paid for every hour thereafter by the hour for each hour's work or fractional part thereof. If for any reason the regular routine work cannot be furnished inside day men, the employer may furnish other than the regular work.

Drivers shall take their mules to and from stables, and the time required in so doing shall not include any part of the day's labor, their work beginning when they reach the change at which they receive empty cars, but in no case shall the driver's time be docked while he is waiting for such cars at the point named. The method at present existing covering the harnessing and unharnessing of mules shall be continued throughout the life of this agreement.

Motormen and trip riders shall be at the passway where they receive the cars at starting time. The time required to take motors to the passway at starting time and departing from the same at quitting time shall not be regarded as a part of the day's labor, their time beginning when they reach the change or parting at which they receive cars, but in no case shall their time be docked while waiting for cars at the point named.

Holidays to be recognized are referred to the various district conferences for settlement.

Basic Tonnage Rate

Pick mining is the removal by the miner of coal that has not been undercut or overcut by a machine. The basic rate for pick mining and hand-loading of coal shall include the work required to drill, shoot and clean and load the coal properly, timber the working place, and all other work and customs incidental thereto.

In the districts represented by Northern Coal Control Association a shortwall machine differential of ten cents (10c.) per net ton between pick and machine mining rates shall be maintained.

Any change in mining methods or installation of equipment that relieves the mine worker of any of the above duties and increases his productive capacity shall be recognized and a piecework rate agreed to therefor properly related to the basic rate.

The standard for basic tonnage rates shall be 2,000 lb. per ton; where the gross ton of 2,240 lb. is the measure, the equivalent rate shall be paid.

The basic tonnage, hourly and day wage rates for the various producing districts represented in this conference are shown in the attached Schedules A, B and C, which are parts hereof.

Yardage and deadwork rates in all districts shall be increased twenty (20) per cent.

Checkweighmen

The mine workers shall have the right to a checkweighman, of their own choosing, to inspect the weighing of coal; provided that where mines are not now equipped to weigh coal a reasonable time may be allowed to so equip such mines; and provided that in any case where on account of physical conditions and mutual agreement wages are based on measure or other method than on actual weights, the mine workers shall have the right to check the accuracy and fairness of such method, by a representative of their own choosing.

Cars shall be tared at reasonable intervals and without inconvenience to the operation of the mine. Tare shall be taken of the cars in their usual running condition.

At mines not employing a sufficient number of men to maintain a checkweighman, the weight credited to the mine workers shall be checked against the billing weights furnished by railroads to the operators, and on coal trucked from such mines a practical method to check the weights shall be agreed upon. Such weights shall be checked once a month.

The wages of checkweighmen will be collected through the pay office semi-monthly, upon a statement of time made by the checkweighman and approved by the mine committee. The amount so collected shall be deducted on a percentage basis, agreed upon by the checkweighman and clerk, from the earnings of the mine workers engaged in mining coal and shall be sufficient only to pay the wages and legitimate expenses incident to the office, except where the method of payment is otherwise provided by state law.

If a suitable person to act as checkweighman is not available among the mine workers at the time, a man not employed at the mine may be selected upon mutual agreement.

The checkweighman, or checkmeasurer, as the case may require, shall be permitted at all times to be present at the weighing or measuring of coal, also have power to checkweigh or checkmeasure the same, and during the regular working hours to have the privilege to balance and examine the scales or measure the cars, providing that all such balancing and examination of scales shall only be done in such a way and at such time as in no way to interfere with the regular working of the mine. It shall be the further duty of checkweighman or checkmeasurer to credit each mine worker with all merchantable coal mined by him on a proper sheet or book kept by him for that purpose. Checkweighmen or checkmeasurers shall in no way interfere with the operation of the mine.

Boys

No person under seventeen (17) years of age shall be employed inside any mine nor in hazardous occupations outside any mine; provided, however, that where a state law provides a higher minimum age, the state law shall govern.

Exemption Under This Contract

The term mine worker as used in this agreement shall not include mine foremen, assistant mine foremen, firebosses, or bosses in charge of any classes of labor inside or outside of the mine, or coal inspectors or weighbosses, watchmen, clerks, or members of the executive, supervisory and technical forces of the operators.

Management of Mines

The management of the mine, the direction of the working force, and the right to hire and discharge are vested exclusively in the operator, and the United Mine Workers of America shall not abridge these rights. It is not the intention of this provision to encourage the discharge of mine workers, or the refusal of employment to applicants because of personal prejudice or activity in matters affecting the United Mine Workers of America.

Mine Committee

A committee of three (3) mine workers shall be elected at each mine. The duties of the mine committee shall be confined to the adjustment of disputes that the mine management and mine worker, or mine workers, have failed to adjust. The mine committee shall have no other authority or exercise any other control, nor in any way interfere with the operation of the mine. For violation of this clause the committee or any member thereof may be removed from the committee.

Settlement of Disputes

Should differences arise between the mine workers and the operator as to the meaning and application of the provisions of this agreement, or should differences arise about matters not specifically mentioned in this agreement, or should any local trouble of any kind arise at any mine, there shall be no suspension of work on account of such differences, but an earnest effort shall be made to settle such differences immediately:

First—Between the aggrieved party and the mine management:

Second—Through the management of the mine and the mine committee;

Third—By a board consisting of four members, two of whom shall be designated by the mine workers and two by the operators.

Should the board fail to agree, the matter shall be referred to an umpire to be selected by said board. Should the board be unable to agree on the selection of an umpire, he shall be designated by the Administrator of the National Industrial Recovery Act. The decision of the umpire, in any event, shall be final.

The district conference may establish an intermediate board consisting of two (2) commissioners, one representing the operators and one representing the mine workers, with such powers as said conference may delegate.

Pending the hearing of disputes, the mine workers shall not cease work because of any dispute; and a decision reached at any stage of the proceedings shall be binding on both parties thereto and shall not be subject to reopening by any other party or branch of either association except by mutual agreement.

Expense and salary incident to the services of an umpire shall be paid jointly by the operators and mine workers in each district.

Discharge Cases

When a mine worker has been discharged from his employment and he believes he has been unjustly dealt with, it shall be a case arising under the method of settling disputes herein provided. In all discharge cases, should it be decided under the rules of this agreement that an injustice has been dealt the mine worker, the operator shall reinstate and compensate him at the rate based on the earning of said mine worker prior to such discharge. Provided, however, that such case shall be taken up and disposed of within five days from the date of discharge.

Illegal Suspension of Work

A strike or stoppage of work on the part of the mine workers shall be a violation of this agreement. Under no circumstances shall the operator discuss the matter under dispute with the mine committee or any representative of the United Mine Workers of America during suspension of work in violation of this agreement.

Irregular Work

When any mine worker absents himself from his work for a period of two days without the consent of the operator, other than because of proven sickness, he may be discharged.

Preparation of Coal and Mining Practice

Each district agreement shall provide for the preparation and proper cleaning of coal. Proper disciplinary rules and penalties shall also be incorporated in such agreements.

Safety Practice

Reasonable rules and regulations of the operator for the protection of the persons of the mine workers and the preservation of property shall be complied with.

Engineers' and Pumpers' Duties

When required by the management, engineers, pumpers, firemen, power-plant and substation attendants shall under no conditions suspend work, but shall at all times protect all the company's property under their care, and operate fans and pumps and lower and hoist men or supplies as may be required to protect the company's coal plant.

Shifts

The operator shall have the right during the entire period of this agreement to work all the mines, or any one or more of them, extra shifts with different crews.

When the mine works only one shift it shall be in the daytime, but this shall not prevent cutting and loading coal at night in addition to the day shift cutting and loading.

Pay Day

Pay shall be made semi-monthly and at least twice each month.

Coke and Cleaning Plants

Proper rules may be negotiated in district conferences to provide for continuous operation of coking and cleaning plants.

Miscellaneous Provisions

Matters affecting cost of explosives, blacksmithing, electric cap lamps and house coal are referred to the district conferences.

To the extent that it has been the custom in each district, all bottom coal shall be taken up and loaded by the mine worker.

The cutter shall cut the coal as directed by the operator.

District Conferences

District agreements shall be made dealing with local or district conditions, and it is agreed that such district agreements shall embody the basic rates of pay, hours of work and conditions of employment herein set forth, and all specific rights and obligations of operators and mine workers herein recognized.

This agreement shall supersede all existing and previous contracts, and all local rules, regulations and customs heretofore established in conflict with this agreement are hereby abolished. Prior practice and custom not in conflict with this agreement may be continued.

All internal differences are hereby referred to the various districts for settlement, with the understanding that only by mutual consent shall anything be done in district conferences that will increase the cost of production or decrease the earning capacity of the men: Provided, however, all yardage and deadwork rates not specified in this contract shall be properly adjusted.

Joint Wage Conference

A joint conference of representatives of Northern Coal Control Association and Smokeless and Appalachian Coal Association and of the International Union United Mine Workers of America shall be held in accordance with the following provisions of the code of fair competition for the bituminous coal industry:

"On Jan. 5, 1934, there shall be held a conference between representatives of employers and employees operating under this code, together with representatives of the National Recovery Administration, for the purpose of determining what, if any, revisions may be desirable at that time of the wages, hours and differentials, or any other requirements of this code, on the basis of conditions then existing and the report of representatives of the National Recovery Administration made as hereinbefore provided.

"Unless revised by mutual agreement, as the result of said conference beginning Jan. 5, 1934, the hours of work, minimum rates of pay and wage differentials as set forth in this code shall continue in effect until April 1, 1934."

This agreement shall become effective after approval by the President and on the same day that the bituminous coal code applicable to the territory embraced herein shall become effective, following its approval by the President; and it shall continue in effect until the first day of April, 1934.

In witness whereof each of the parties hereto, pursuant to proper authority, has caused this agreement to be signed by its proper officers.

United Mine Workers of America: By John L. Lewis, president; Philip Murray, vice-president; Thomas Kennedy, secretary.

Northern Coal Control Association: By J. D. A. Morrow, president; Walter Jones, secretary.

Smokeless and Appalachian Coal Association: By E. C. Mahan, president; H. R. Hawthorne, secretary.

Joint Scale Committee

For the Mine Workers: Van A Bittner, P. T. Fagan, Sam Caddy, Percy Tetlow, James Mark, Frank Miley, William Turnblazer, Frank Hughes, William Feeney.

For the Operators: J. D. A. Morrow, R. E. Jamison, W. L. Robison, R. L. Ireland, Jr.; William Emery, Jr.; E. C. Mahan, D. C. Kennedy, H. C. Faust, W. A. Richards, D. A. Reed, Charles O'Neill, Heath S. Clark, W. A. Bishop, J. D. Francis, S. C. Higgins, R. E. Taggart, S. D. Brady, Jr.

Schedule A—Basic Rates Established in the Following Named Districts

	Tonnage Rates per 2,000 Lb. Run-of-Mine Coal
Western Pennsylvania	
Pick mining, thin vein	$0.70
Thick vein	.65
Machine loading, thin vein	.52
Thick vein	.48
Cutting, shortwall machine, thin vein	.08
Thick vein	.07
Central Pennsylvania	
Pick mining	.70
Machine loading	.52
Cutting, shortwall machine, thin vein	.08
Connellsville, Pa.	
Pick mining	.56
Machine loading	.40
Cutting, shortwall machine	.06
Westmoreland-Greensburg, Pa.	
Pick mining	.65
Machine loading	.48
Cutting, shortwall machine	.07
Thick Vein Freeport, Pa.	
Pick mining	.65
Machine loading	.48
Cutting, shortwall machine	.07
Ohio and the Panhandle District of Northern West Virginia	
Pick mining	.70
Machine loading	.52
Cutting, shortwall machine	.08

The following hourly and day wage rates shall be paid in all mines in Pennsylvania, Ohio and the Panhandle district of northern West Virginia for the classification of occupations shown herein:

Classification of Occupations Inside:	Hourly Rate	Day Rate
Motormen, rock driller	$0.595	$4.76
Drivers, brakemen, spraggers, snappers, coal drillers, trackmen, wiremen, bondmen, timbermen, bottom cagers	.575	4.60
Pumpers, trackmen helpers, wiremen helpers, timbermen helpers and other inside labor not classified	.545	4.36
Greasers, trappers, flaggers, switch throwers	.375	3.00
Outside:		
Bit sharpener, car dropper, trimmer, car repairmen, dumpers	.48	3.84
Sand dryers, car cleaners, other able-bodied labor	.45	3.60
Slate pickers	.375	3.00

Skilled labor not classified to be paid in accordance with the custom at the mine.

SCHEDULE B—BASIC RATES ESTABLISHED IN THE NORTHERN WEST VIRGINIA DISTRICT

	Tonnage Rates per 2,000 Lb. Run-of-Mine Coal
Pick mining	$0.56
Machine loading	.40
Cutting, shortwall machine	.06

The following hourly and day wage rates shall be paid in all mines in the northern West Virginia district for the classification of occupations shown herein:

Classification of Occupations Inside:	Hourly Rate	Day Rate
Motormen, rock driller	$0.565	$4.52
Drivers, brakemen, spraggers, snappers, coal drillers, trackmen, wiremen, bondmen, timbermen, bottom cagers	.545	4.36
Pumpers, trackmen helpers, wiremen helpers, timbermen helpers and other inside labor not classified	.515	4.12
Greasers, trappers, flaggers, switch throwers	.345	2.76
Outside:		
Bit sharpener, car dropper, car trimmer, car repairmen, dumpers	.45	3.60
Sand dryers, car cleaners, other able-bodied labor	.42	3.36
Slate pickers	.345	2.76

Skilled labor not classified to be paid in accordance with the custom at the mine.

SCHEDULE C—BASIC RATES ESTABLISHED IN THE FOLLOWING NAMED DISTRICTS

	Tonnage Rates per 2,000 Lb. Run-of-Mine Coal
New River	
Machine loading	$0.442
Cutting, shortwall machine	.075
Winding Gulf	
Machine loading	.384
Cutting, shortwall machine	.07
Greenbrier	
Machine loading	.392
Cutting, shortwall machine	.055
Pocahontas	
Machine loading	.357
Cutting, shortwall machine	.045
Tug River	
Machine loading	.357
Cutting, shortwall machine	.045
Kanawha	
Machine loading	.422
Cutting, shortwall machine	.07
Logan	
Machine loading	.332
Cutting, shortwall machine	.052
Williamson	
Machine loading	.358
Cutting, shortwall machine	.056
Big Sandy-Elkhorn	
Machine loading	.465
Cutting, shortwall machine	.08
Hazard	
Machine loading	.402
Cutting, shortwall machine	.08
Harlan	
Machine loading	.41
Cutting, shortwall machine	.07
Southern Appalachian	
Machine loading	.43
Cutting, shortwall machine	.08
Virginia	
Machine loading	.408
Cutting, shortwall machine	.067

The following hourly and day wage rates shall be paid in all mines in the New River, Winding Gulf, Greenbrier, Pocahontas, Tug River, Kanawha, Logan, Williamson, Big Sandy-Elkhorn, Hazard, Harlan, southern Appalachian and Virginia districts for the classification of occupations shown herein:

Classification of Occupations Inside:	Hourly Rate	Day Rate
Motormen, rock driller	$0.545	$4.36
Drivers, brakemen, spraggers, snappers, coal drillers, trackmen, wiremen, bondmen, timbermen, bottom cagers	.525	4.20
Pumpers, trackmen helpers, wiremen helpers, timbermen helpers, and other inside labor not classified	.495	3.96
Greasers, trappers, flaggers, switch throwers	.325	2.60
Outside:		
Bit sharpener, car dropper, trimmer, car repairmen, dumpers	.43	3.44
Sand dryers, car cleaners, other able-bodied labor	.40	3.20
Slate pickers	.325	2.60

Skilled labor not classified to be paid in accordance with the custom at the mine.

Industrial Notes

JAMES T. CASTLE, 424 First Avenue, Pittsburgh, Pa., has been appointed district representative for Roots-Connersville-Wilbraham, Connersville, Ind., in western Pennsylvania, northern West Virginia and the border counties of Ohio.

EDDIE PHILLIPS has joined the staff of the Tyson Roller Bearing Corporation, Massillon, Ohio, as field sales engineer in charge of mine-car anti-friction-bearing applications. Mr. Phillips held a similar position with the Timken Roller Bearing Co. for sixteen years.

GRANT B. SHIPLEY, Pittsburgh, Pa., has been elected chairman of the board of the Wood Preserving Corporation and has resigned as president of that company as well as the National Lumber & Creosoting Co. and the Century and Carolina wood-preserving companies. Mr. Shipley will be succeeded as president of the various companies by ARTHUR W. ARMSTRONG, now executive vice-president and also president of the Ayer & Lord Tie Co.

CEDARBURG MFG. CO., Cedarburg, Wis., has acquired the property and patents of the American Electric Motor Co., formerly a subsidiary of the Splitdorf-Bethlehem Electrical Co., Newark, N. J.

ALFRED E. PICKARD, Manufacturers' Warehouse Service, 12th and Casey Sts., Mt. Vernon, Ill., is now engaged in the warehousing and distribution of mine supplies.

Gas Line for Arizona

Western Gas Co., El Paso, Texas, has let a contract for the construction of a 215-mile, 10¾-in. natural-gas line from Douglas to Tucson and Phoenix, Ariz. Capacity of the line will be 15,000,000 cu.ft. daily. The company received a loan of $2,200,000 from the Reconstruction Finance Corporation to finance the cost of construction.

Obituary

CHARLES S. NIELD, 83, general manager, Pioneer Coal Co., Kettle Island, Ky., and a resident of Louisville, died in a London (Ky.) hospital, Sept. 10, of injuries received in an automobile crash.

FRANK S. LOVE, 59, president, Union Collieries Co., died at his home in Pittsburgh, Pa., Sept. 26, after a long illness. Mr. Love was long active in the commercial and industrial development of central and western Pennsylvania.

JOHN J. COYLE, 69, president, Bell Union Coal & Mining Co., Curlew, Ky., died at the Jefferson Hospital, Philadelphia, Pa., Sept. 4, of bronchial pneumonia.

R. MARSH DEAN, for a number of years president of the Dean Coal & Mining Co., Elk Garden, W. Va., died early in September.

FRANK E. HERRIMANN, president of the Clearfield Bituminous Coal Corporation until his retirement a few months ago, died in New York, Sept. 27, of bronchial pneumonia, at the age of 75.

CHARLES PIEZ, 67, chairman of the board, Link-Belt Co., died of pneumonia at the Garfield Hospital, Washington, D. C., Oct. 2. Mr. Piez, who was born in Germany and studied mining engineering at Columbia University, entered the employ of the Link-Belt Engineering Co. at Philadelphia, Pa., in 1889. In 1917, he was chosen vice-president and general manager of the Emergency Fleet Corporation, and later became director general. Mr. Piez returned to the Link-Belt Co. in 1919, and was elected chairman in 1924.

Wire Rope Information

A. Leschen & Sons Rope Co., St. Louis, Mo., has brought out the second revised edition of its booklet of "Practical Information on the Use and Care of Wire Rope," covering the correct handling of such rope both before and during use. In addition to practical information on safety factors, stresses and deflection, sheave and drum design, fleet angle and other technical points, the 40-page booklet takes up handling and storage of wire rope before use, preliminaries of installation, kinks and kinking, lubrication, care of idle ropes, binding and cutting, splicing, socketing, application of clips, reeving tackle blocks and approximate efficiencies of properly applied fittings.

Coming Meetings

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

Pan-Handle Coal Mining Institute; annual banquet, Saturday evening, Oct. 28, Wheeling, W. Va.

Illinois Coal Operators' Association; annual meeting, Oct. 31, Chicago.

Illinois Mining Institute; forty-first annual meeting, Nov. 3, Hotel Abraham Lincoln, Springfield, Ill.

School of Mineral Industries, Pennsylvania State College; coal conference at State College, Pa., Nov. 10 and 11, devoted mainly to the problem of fine coal.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Totally Inclosed Motors; Industrial Tester

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces a new line of totally inclosed motors in sizes up to 200 hp. with a new ventilation system which allows mounting dimensions comparable to those

of open types. Internal and external air is circulated through two sets of ducts by fans, the result, it is said, being a rapid transfer of heat from the internal air to the frame and from the frame to the external air.

Westinghouse also offers a new portable a.c. testing set for testing household electrical appliances and industrial apparatus and motors up to 100 hp., 440

volts. The equipment, known as the "Industrial Analyzer," is capable of making complete tests up to 125 amp., 500 volts, and is, according to the company, a miniature portable three-phase switchboard panel in carrying case complete with necessary switching equipment, transformers and resistors. The unit includes a triple-scale ammeter (0-5, 0-25 and 0-125 amp.), a triple-range voltmeter (0-150, 0-300 and 0-600 volts), a polyphase wattmeter with three scales for the above voltage and current ranges, and a polyphase power-factor meter with a 10-100-80 scale. Over-all accuracy, according to the company, is better than 2 per cent. Weight is 28 lb. Size is 7x11x19 in.

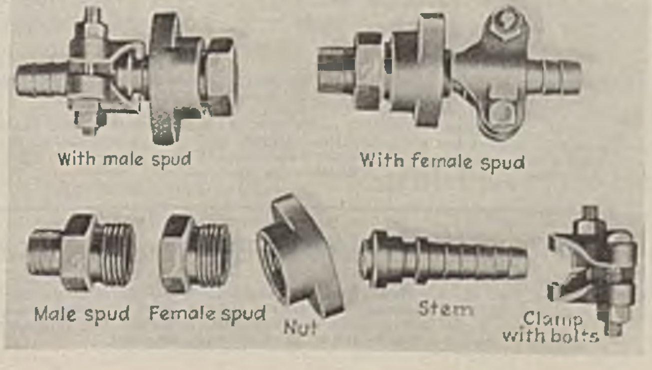
Delay Blasting Cap

A new all-metal delay electric blasting cap, said to be revolutionary in design, is announced by the Hercules Powder Co., Wilmington, Del. Firing and delay elements that produce practically no gas are a feature which makes possible the use of a solid, one-piece, ventless shell. As there is no hot gas, the cap cannot cause ignition of dynamite, the company declares, and as no opening to permit the gas to escape is necessary, no moisture can enter the shell and cause misfires.

Air-Hose Coupling

Howells Mining Drill Co., Plymouth, Pa., offers a new ¾-in. air-hose coupling to meet the conditions encountered in drilling service. Among the advantages pointed out by the company are: long life and high resistance to the shocks encountered, satisfactory operation and low cost. The couplings are made from malleable iron, and are cadmium plated to resist corrosion. One of the principal construction features, according to the company, is the gripping jaw on the clamp. The corrugated stem is of special length and is recessed to prevent the loss of the washer, thus insuring a perfect connection. The construction is said to be such that it is practically airtight, even without the washer. An extra heavy nut is provided to resist the hammering it usually receives in coupling and uncoupling. Unusually heavy construction also features the male and female spuds, which have a ¾-in. standard pipe thread on one end.

Howells ¾-In. Air-Hose Couplings Assembled, Together With the Principal Parts



Coal-Treating Compound

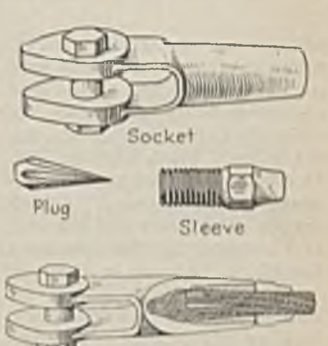
To improve the clinkering characteristics of coals with a low ash-fusion temperature, and thus enable them to enter new markets, the Columbia Alkali Corporation, Barberton, Ohio, offers "Coal-Rec," a dry compound which is dissolved in water and sprayed on the coal. Extensive tests have shown, the company declares, that for industrial purposes, in addition to soot and smoke reduction, "Coal-Rec" changes the character of the clinkers so that they are dry, brittle, lower in combustible matter, easily broken and do not adhere to the grates. As a result, combustion rates and firing temperatures are raised, with corresponding improvement in evaporation rates, an especial advantage where boiler capacity is limited or forcing is necessary, and the added labor and maintenance costs due to clinkering are largely eliminated.

In the case of coal for domestic use, according to the company, "Coal-Rec" acts as a dust-proofing agent, cuts smoke output and makes it lighter in color, and materially reduces the formation of soot, in addition to making it lighter and dryer than certain tarry-sticky types. It also facilitates, it is said, the use of low-fusion coals in domestic stokers.

"Coal-Rec" is shipped in either 125-lb. sacks or 400-lb. drums. Mixing and spraying equipment corresponds to that required for calcium chloride. The proportion of compound to water in making the treating liquid is 2½ lb. per gallon, making the specific gravity 1.8. Average quantity of liquid required per ton is given as follows: high-volatile, 2 gal.; low-volatile, 3 gal.

Rope Socket

For socketing wire ropes without the use of zinc, babbitt or lead, American Steel & Wire Co., Chicago, offers the Fiege "Tiger-Claw" wire rope socket. Among the features of this



socket, consisting of the socket proper, a sleeve and a plug, the company points out the following: installation without flame or hot metal, 100-per cent rope strength, easy attachment in the field with ordinary labor, lower cost, convenience in installation, and greater safety.

Electrical Controls

A new oil-immersed combination switch, CR7008, is offered by the General Electric Co., Schenectady, N. Y., for use in Class 1, Group D hazardous locations. The switch is available in three sizes for motors up to 50 hp. at 440 volts, and consists of three parts: magnetic switch, motor-circuit switch and thermal overload relay which is set by a plunger extending through the top cover. These parts, together with all connections, are located 6 in. below the surface of the oil in a welded tank supported from the top cover by four wing bolts. Handles on the side of the tank facilitate removal. The weatherproof construction permits installation outdoors.

Unusually attractive and serviceable cases feature a new line of portable electrical instruments, according to the General Electric Co. These instruments, Type AP-9, include medium-sized voltmeters, milliammeters, ammeters and wattmeters. The case, Textolite compound with hinged cover and snap lock, is 2½x6½x4¾ in.; when the cover is closed, there are no projecting points. Ter-

minals are under the cover, where they are out of the way and easily connected. The cover also protects the glass over the scale when the instruments are not in use. Flush with the surface on top of the case is an external zero adjustment. A high degree of accuracy and low cost are stressed by the company. Length of the scale in mean arc is 4¼ in. Accuracy is 0.75 per cent of the full-scale value, except for triple-range voltmeters, 1.50 per cent, which can be improved by special calibration on the job. The instruments can be read easily to within 0.5 per cent of full-scale value. Instruments other than the three- and four-range ammeters with internal transformers may be used for direct current also.

General Electric also announces a new line of rectangular switchboard instruments which it declares can be read at an angle without error or parallax. Other features are: anti-glare glass, magnetic damping, high torque, unusual responsiveness, constant characteristics and three styles of cases. The line, designated as Types AD-6 and DD-6, include a.c. voltmeters, ammeters, wattmeters, power-factor meters and frequency meters, and d.c. ammeters and voltmeters. Special instruments include temperature meters and radio-frequency and rectifier-type devices. Both surface and flush type cases are supplied with dimensions as follows: surface type, 6x5½ in.; flush, 7x6½. Three-element ammeters and voltmeters, 12x5½ in., also are available.

Valve

Hanna Engineering Works, Chicago, offers the "Unitite" valve for use with air, oil or water at pressures up to 250 lb. per square inch. Sizes are: ⅜, ½, ¾, 1 and 1¼ in., and the valves may be used in straightway, three-way or four-way service. One of the principal features, according to the company, is the fact that the disk seats on the bonnet, and that both may be reground without removing the valve body from the pipe line or without disturbing pipe connections on valve mountings. Between reversals, it is declared, disks ro-

tate on two eccentric points while in contact with the seats. Therefore, circular lines of scoring do not develop and both disk and seat wear uniformly across their full diameter.

Timber Treatment

Schramm, Inc., West Chester, Pa., offers the Rice-Schramm timber-treatment system primarily for treating green timber at the source of supply to eliminate long seasoning periods and to remove sap and sugars detrimental to the proper seasoning of some species. The system, according to the company, employs the principle of end penetration, and is said to be cheaper. In operation, each log is treated individually after first being soaked in water to soften resins and speed the treating cycle. Compressed air is employed to force the solution through the log, using a special head which is fastened to one end with an inflatable gasket. The solution forces the sap ahead of it. Logs are peeled after treatment, and use of the process is said to facilitate framing at the mine due to the small percentage of untreated heart wood left.

Turbine Pumps

Quantities of liquids as small as 5 g.p.m. and ranging up to 300 g.p.m. can be handled efficiently at heads up to 350 ft. by a new line of turbine pumps announced by Roots-Connersville-Wilbraham, Connersville, Ind. Among the features pointed out by the company is a tapered-edge impeller which makes it possible to vary the quantity of liquid handled while the pump is running.

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