COAL AGE

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

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Opportune

IN SOME RESPECTS the picture presented by the annual survey of research progress published in this issue is discouraging. While projects undertaken by educational institutions and independent private research organizations are comparable in number with the 1933 record, the anthracite industry as a unit has curtailed its support of work at Penn State and inadequate funds hamper the activities of the Bureau of Mines. These retrenchments, however, emphasize the importance of the entrance of Bituminous Research, Inc., upon the scene. No industry stands in greater need of research to insure its future than bituminous coal mining. Having created an agency to promote this work, producers should be generous and prompt in their financial support so that Bituminous Research, Inc., can soon become a real factor in this field.

First-Line Defenses

IF THE HEARING on the bituminous code and the meetings of the National Bituminous Coal Industrial Board which both preceded and followed it last month did nothing else they clearly demonstrated the urgency of ending the uncertainty about what is to happen after June 16. Admittedly, as the delay in releasing the final report of the special legislative committee of the National Coal Association has already shown, there is wide room for honest difference of opinion on the best road to stabilization. But few dissent from the belief that it would be suicidal to abandon the code at the expiration of the present NIRA.

Nevertheless, so long as uncertainty exists, the danger that increasing numbers of operators and groups will feel driven to take advance steps to "protect" their individual competitive positions after June 16 is ever present. That the industry is awake to the menace of this uncertainty is evidenced in the recent unanimous decision of the National Coal Association directors in favor of a two-year extension of the code and to draft legislation for that purpose. This proposal should be pressed regardless of any general plans—administration or industrial—for the future of NRA. Coal can hardly afford to wait for the necessary reconciliation of divergent views on the act as applied to industry at large: its case is special and distinct.

Tight Shafts and Drifts

IN SINKING FAN SHAFTS, attention often is given only to their permanence and air velocities. Another factor just as important—that of making the entrance so tight around the shaft that air cannot escape from it under forced draft nor enter it, except from the mine, under exhaust draft—is frequently overlooked.

In excavating for the shaft, the ground around it is often badly creviced, and dirt may be washed out of these crevices later, enlarging them so that air may leave or enter without much resistance. To hold the upper part of the shaft in place, rock may be pounded around it, and this unconsolidated material also may be full of crevices, which will give the air forced into the shaft access to the surface, or the surface air access to the shaft, according to the difference in pressure. Thus the air will

recirculate. Where such conditions are to be suspected, it is well to grout around the shaft, for it is difficult to ascertain whether leakage occurs.

With drifts and slopes, conditions are equally favorable to leakage, for the weight, being incompletely supported by the lagging above the timber, is likely to allow the loose surface to sag and crevice. Once above the timbers, the air may travel under exhaust ventilation a long way into the mine to reach a point where it can escape into the airway and travel with the mine air to the surface. Even with a portal well concreted for some distance, there is no assurance of tightness, and many imposing facewalls merely mask the fact that air is secretly leaking behind them.

At the point where fan drift meets shaft, drift or slope, leakage may be suspected. Where a ditch or pipe discharges water to the surface, much air may leak back through it if the water is not properly trapped, or it may leak back on the outside of the pipe. Where the air is being drawn in or expelled by a fan at a distance, however, the tightness of the point of entry is not an issue.

Did Worms De-ash Coal?

SEEING how free coal is from mineral matter, speculation arises as to whether it is still in its natural condition or was submitted by a kindly nature to a de-ashing process. The possibility of this having been effected by worms has perhaps never been considered. Worms live on vegetal matter but use earthy materials for grinding this food, and then throw their excreta on the surface at the adits of their tunnels as "worm casts." They are found at low and high elevations alike and are believed to be the sources of what is known as "vegetable mold."

Above coal seams is often found what is known as a black bituminous shale. Geologists often deny that it is shale, declaring it to be an extremely fine sand rock. It is full of oil, and the fine sand it contains is hardly to be ascribed to the erosion of coarse rocks and pebbles, for streams are not disposed to grind hard materials so uniformly fine or to deposit the product uniformly if so ground. The uniformity of grinding seems to suggest that the mill in the esophagus of the worm is the means of such pulverization.

If so, the bituminous shale was largely coeval with the peat bog by which the coal was formed, and the worms in burrowing lifted parts of the coal bed to the surface. Sometimes no bituminous shale is found, and this suggests that, in such case, worms were absent. Are we to conclude that such deposits were of another nature to those where the bituminous shale is found, and was the bog too acid or too alkaline for worms? Thus far no study has been made of the worms around peat bogs, and all geological studies of annelids are grievously hampered by the fact that rarely are worm tunnels preserved through the ages, and casts of the worms themselves perhaps never.

These considerations are merely hypothetical. Were worms present, and when? What did they do, and how otherwise did the mysterious bituminous shales develop? They usually are not far above the coal and never immediately beneath it. Are the cannels also of a like origin?

On the Calendar

NATIONAL social insurance passed from the stage of academic discussion on Jan. 17 when Senator Wagner and Representative Lewis introduced identical bills in Congress to give legislative substance to the recommendations of President Roosevelt and his committee on economic security. These proposals, summarized elsewhere in this issue, contemplate unemployment compensation, old-age pensions and annuities, and government aid to widows and dependent children. The federal and state governments would pay the costs of old-age pensions, unemployment compensation would be financed by a payroll tax, and annuities would be built up by the joint contributions of employers and employees.

Sympathy with the underlying purpose of the administrative program is widespread. That sympathy, however, should not accept good intentions as a substitute for a soundly conceived plan—a plan that will meet every fair test of reason, justice and future solvency. Desire for speedy action to whip state legislatures into enacting the complementary legislation envisaged in the Wagner-Lewis bill ought not be used as an excuse to shut off full consideration and mature deliberation of every phase and possible pitfall embraced within this ambitious program.

COAL INDUSTRY

+ Presses Battle Along Economic Front in 1934

WHILE faint traces of blue persisted throughout 1934, the bituminous industry and its employees ended the year in a substantially improved condition, thanks to a rise in production, maintenance of prices at a level assuring a substantial increase in realization to the majority of the producers in the industry, and increased employment growing out of better running time and shorter hours at the same or, in a number of important fields, higher wage rates. On the other hand, intensified efforts by the industry failed to yield any appreciable relief from the competition of substitute fuels and sources of energy—in part fostered by the federal government; code enforcement failed to measure up to the necessities of the situation and frequent intra- and interdivisional squabbles over the correlation of prices and marketing practices punctuated attempts to smooth out relations between various units in the industry.

Production of bituminous coal, according to preliminary figures by the U. S. Bureau of Mines, was 357,500,000 tons in 1934, an increase of 23,869,000 tons, or 7.2 per cent, over the 1933 total of 333,631,000 tons. The 1933 output was 23,921,000 tons, or 7.7 per cent, above the 1932 total of 309,710,000 tons. With only a nominal change in the total coal in storage during 1934, railroad consumption increased approximately 6.5 per cent to about 70,400,000 tons, against 66,041,787 tons in 1933, while utility consumption rose about 9.1 per cent from 30,575,000 tons in 1933 to approximately 33,350,000 tons in 1934. An increase of approximately 20 per cent in pig-iron production accounted for an increase of about 3,900,000 tons in consumption (23,200,000 tons, estimated, against 19,300,000 tons in 1933). Lake shipments marked up another increase in 1934, the total dumpings (both cargo and fuel coal, including storage loading) aggregating 35,971,146 tons last year, against 32,333,393 tons in the preceding year, an increase of 3,637,753 tons, or 11.2 per cent.

Anthracite output showed an increase for the first time since 1926, the preliminary total for 1934 (excluding an unknown but substantial bootleg output) standing at 57,385,000 net tons, an increase of 7,844,000 tons, or 15.8 per cent, over the 1933 production of 49,541,000 tons. Conditions in the hard-coal industry, however, were not as rosy as the rise in production would seem to indicate. Bootlegging, which has plagued the industry ever since the advent of the depression, registered another sharp increase in spite of intensification of efforts by both the operators and the United Mine Workers to stamp it out. Some estimates place the 1934 bootleg tonnage, mined by moonlight and hauled by truck, as high as 6,000,000 tons.

Another disturbing factor was the continuance of the campaign of the insurgent United Anthracite Miners of Pennsylvania for control of the northern field, which found companies in the region in the traditional rôle of the innocent bystander. This campaign, if anything, was intensified after the major claims of the new union had been disallowed in October by James A. Gorman, umpire for the Anthracite Conciliation Board, who conducted an investigation into insurgent demands and activities as representative of the National Labor Relations Board, successor to the National Labor Board.

Lack of stabilization in market conditions, complicated by large stocks of coal above ground, was offered as the major reason for a movement toward the establishment of a central sales agency similar to Appalachian Coals, Inc., late in the year. This action was initiated by independent producers representing an aggregate annual capacity of 15,000,000 tons at a conference in Wilkes-Barre, Pa., Dec. 4, followed by the appointment of a committee to draft an organization plan. Decision to go ahead with the formation of the agency was taken at a meeting on Jan. 15, 1935. Anthracite developments also were marked by the final abandonment of attempts to formulate a code under the provisions of NIRA after disagreements between operators and between the operators and the miners.

Developments in operation under the bituminous code were featured by the adoption of four amendments to the code itself, three dealing with adjustments in hours and wages (p. 79), the fourth providing for the establishment of statistical bureaus. In addition, two major steps of an extra-code nature were taken: promulgation of the Adams plan of price correlation and adoption of an allocation scheme in Division I.

Controversies over correlation of prices started between Illinois and Indiana almost immediately after the code went into effect, later spreading to other fields throughout the country. The growing seriousness of the situation led C. E. Adams, who succeeded K. M. Simpson as divisional administrator, to "request" on June 1 that a correlation procedure somewhat similar to that suggested by certain subdivisions of Division I be adopted until Sept. 1. Under this procedure, all price changes were required to be approved by the proper code authorities at least ten days before their effective date, copies being mailed to the deputy NRA administrator, each Presidential member and the code-authority secretary in each subdivision or division affected by such changes. Approval of schedules, it was provided, would be withheld until all interested subdivisions had an opportunity to object, if they so desired, and meetings of all Presidential members, code-authority and marketing-committee chairmen, with such other representation which the code authorities might desire, in Washington at least five days before the effective date of any price change were provided for to give the Presidential members and the deputy administrator an opportunity to exercise the right of review contemplated in Sec. 4, Art. VI, of the code. In the absence of any agreement in controversies between subdivisions, final decision was reserved to the NRA administrator. The plan was continued by an administrative order issued Oct. 3. While it did not entirely eliminate correlation conflicts, the Adams plan did result in a substantial decrease in the intensity with which they had previously been waged.

Supplementing the Adams plan, NRA, in July, approved an agreement "entered into at the suggestion of NRA" for allocation of tonnage in Division I, coupled with a threat of price revisions to curb districts overshipping their monthly quotas, which were based on

production for the five-year period 1929-1933. While the plan met with protests from some subdivisions, it was put into effect and served as the basis for settlements in one or two districts.

Mandatory establishment of statistical bureaus by code authorities for the collection of information on spot orders, contracts, invoices, credit memoranda "and such other information concerning the production and sale of coal as such code authority, with the approval of its Presidential member, may require" was the subject of the fourth amendment to the bituminous code approved by NRA on Nov. 5.

Although practically all divisions and subdivisions are reported to be laying plans for the establishment of these bureaus, a recent check by *Coal Age* indicates few such agencies actually have been set up. Both the Northern Panhandle and the Northern West Virginia subdivisions of Division I authorized the establishment of statistical bureaus the same month the amendment was promulgated. C. T. Dabney, Jr., was appointed managing director of the Panhandle bureau with headquarters at Cleveland, Ohio, and Raymond Kerr was made managing director of the Northern West Virginia bureau, which takes over the functions of a similar bureau started by this subdivision several months ago. When the code became effective in October, 1933, the code authority for Southern Subdivision No. 1 of Division I took over the Smokeless Coal Bureau of Statistics and statistical work in that subdivision is now under the direction of W. G. Crichton, chairman of the subdivisional code authority executive committee. Southern Subdivision No. 2 expects to complete the organization of its bureau within a few days.

No official action has been taken in Division II. The Illinois subdivision has been marking time with the idea that arrangements should be made to have a bureau begin functioning April 1. The Indiana subdivision established a bureau for the collection of statistics in October, 1933, and expected to have plans perfected for the collection of copies of contracts, acknowledgments of orders and credit memoranda by Feb. 1. The Southwestern subdivisional code authority of Division IV authorized a bureau on Nov. 21, with W. E. Blucher, secretary of the subdivisional authority, as managing director, with headquarters at Kansas City, Mo., and J. C. Reid as deputy managing director, with headquarters at Henryetta, Okla. B. P. Manley, Salt Lake City, has been appointed managing director of the bureau set up by the Utah subdivisional code authority of Division V.

Enforcement was the target of much adverse criticism during 1934, one cause of complaint being a seeming inability to halt the inroads of unregulated wagon mines, which generally went their way without check. Delay in the prosecution of shipping operations in a number of fields also provoked comment. Revisions in enforcement procedure resulted in some improvement late in the year, but measures still were considered inadequate in many quarters. Failure of the NRA and other government agencies to fulfill promises of relief from the inroads of competitive fuels was another sore point with the industry.

Results of the first year's operation of the code (see Table I) give little comfort to the Jeremiahs who were bewailing the sharp shifts in tonnage between producing districts east of the Mississippi River, which, they insisted, code prices and wages made inevitable. A partial picture of financial operations under the code during the first half of 1934 is presented in Table II, which covers costs and gross sales income per ton for most of the subdivisions east of the Mississippi River. Compilation of comparable data for Division III had not been completed at the time these tabulations were made and reports from operations in Divisions IV and V were too fragmentary for inclusion. The picture is necessarily limited to the first six months of 1934 because complete data for later months were not yet available. June figures for Southern subdivision No. 1 and for Indiana are omitted for the same reason. How these results compare with gross realizations in earlier years is shown in Table III.

Table I—Pre-Code and Code Tonnage Relationships

	Year Ended Sept. 30 1933 Per Cent of Total Output	1934 Per Cent of Total Output	Per Cent of Change (Decreases in Italics)
Division I			
North			
Maryland	0.43	0.44	2.3
Ohio	5.80	5.92	2.1
Pennsylvania	23.94	25.22	5.3
Northern West Virginia	6.75	6.79	0.6
Subtotal	36.92	38.37	3.9
South			
Eastern Kentucky	8.72	8.43	*3.3*
Tennessee	1.12	1.01	*9.8*
Virginia	2.61	2.56	*1.9*
Southern West Virginia	21.49	20.95	*2.5*
Subtotal	33.94	32.95	*2.9*
Western Kentucky	2.40	2.11	*12.1*
Total*	73.26	73.43	0.2
Division II			
Illinois	10.84	11.27	4.0
Indiana	3.95	4.17	5.5
Iowa	0.94	0.84	*10.6*
Total	15.73	16.28	3.5
Division III	2.64	2.68	1.5
Division IV			
Arkansas-Oklahoma	0.75	0.61	*18.7*
Kansas-Missouri	1.69	1.50	*11.2*
Total	2.44	2.11	*13.5*
Division V			
Colorado	1.65	1.40	*15.1*
Montana	0.64	0.61	*4.7*
New Mexico	0.36	0.33	*8.3*
North Dakota	0.49	0.50	2.0
Texas	0.20	0.20	
Utah	0.83	0.65	*21.8*
Washington	0.45	0.42	*6.7*
Wyoming	1.17	1.20	2.6
Total	5.79	5.31	*8.3*

*Exclusive of Michigan, but including southern Tennessee.

†Alabama only; southern Tennessee included in total for Division I.

Other States, including Michigan, produced 0.14 per cent of the national soft-coal output for the year ended Sept. 30, 1933, and 0.19 per cent for the year ended Sept. 30, 1934.

In spite of the disappointments and disillusionments, the majority of the industry thought well enough of the results of code operation to vote for its continuance for a period of two years, or until "some permanent basis of sound recovery" is attained, at the October meeting of the National Coal Association. This action was recommended in the report of the association's special legislative committee, which began the consideration of legislation to follow NRA in June.

Competitive fuels and sources of energy presented a still gloomier picture in 1934, the only relief being an increase in fuel-oil prices in some localities and an improvement in the coal industry's ability to fight back. Bituminous operators found developments particularly disheartening, being faced on the one hand with higher prices necessary to pay the higher wages and increased costs growing out of code operation, and on the other hand by increased competition from such fuels as oil and gas, which have been comparatively free of the added costs of NRA regulation, in addition to direct competition from hydro and liquid or gaseous fuel plants either built by the federal government or constructed by other agencies with government funds.

Available information indicates a substantial increase in installations of oil burners in 1934. For the first eight months of the year, according to the Bureau of the Census, shipments in the United States by manufacturers reporting totaled 47,421 units (domestic, industrial, boiler-burner and furnace-burner), an increase of 5,795 units, or 13.9 per cent, over the 1933 total of 41,626 units. Shipments of distillate burners for ranges, stoves, water heaters and small heating plants, on the other hand, suffered a heavy decline, the total number of units dropping from 79,456 in the first eight months of 1933 to 37,100 in the same period in 1934, or 53.2 per cent.

Consumption of oil by railroads in road-train and yard-switching service increased to 1,875,000,000 gal. (estimated) in 1934, an increase of 10.6 per cent over the 1933 total of 1,695,297,762 gal. Coal consumption, on the other hand, increased only 6.6 per cent. Utility oil consumption also rose, although only 2.2 per cent, to an estimated total of 10,156,000 bbl. in 1934, against 9,940,000 bbl. in the preceding year. Consumption of coal increased approximately 9.1 per cent.

Natural-gas sales, on the basis of ten months' figures by the American Gas Association, increased approximately 14 per cent in 1934. The largest item in the rise was an increase of approxi-

mately 23 per cent in industrial sales. Increased utility consumption undoubtedly played a major part in the jump in industrial consumption, the 1934 total, based on eleven months' figures by the U. S. Geological Survey plus an estimate for December, standing at 128,794,000,000 cu.ft., a rise of 25.5 per cent over the 1933 total of 102,601,000,000 cu.ft.

Statistics on sales of manufactured and mixed gas by eleven companies whose sales constitute 99 per cent of the manufactured-gas distribution in Illinois throw considerable illumination on the competitive situation in that State and Chicago in particular, where an intensive campaign to promote sales went into effect following the introduction of Texas natural gas a few years ago. In the first ten months of 1934, according to the American Gas Association, sales for house heating aggregated 5,620,167,000 cu.ft., an increase of 156.5 per cent over the total of 2,190,844,000 cu.ft. in the same period in 1933. Industrial and commercial sales aggregated 10,835,887,000 cu.ft. in the first ten months of this year, an increase of 47.2 per cent over the total of 7,362,216,000 cu.ft. in the same period in 1933.

One method of checking competitive inroads on which coal is placing considerable reliance is the installation of automatic coal-burning equipment, which showed a substantial increase in 1934. Sales of domestic stokers in the first eleven months aggregated 15,024 units, an increase of 4,797 units, or 46.9 per cent, over the total of 10,237 units reported by identical manufacturers in the same period in 1933.

The anthracite industry again laid stress on improving merchandising as its chief weapon in fighting competition, and both the industry as a whole and individual companies continued their work of developing and improving equipment for burning hard coal more efficiently and automatically. In line with this objective, anthracite burner standards were approved in March at a meeting called by the U. S. Bureau of Standards at the instigation of the Anthracite Institute.

Recognizing the importance of domestic stokers in building up the anthracite market, Dickson & Eddy, New York, offered a stoker-merhandising plan to its dealers late in the year. Two sizes of stokers were made available to dealers at prices to the customer as low as $198.50. Dealers, limited to one per community, are expected, as a general rule, to handle installation and service, with assistance from the company in getting the plan under way.

Bituminous relations with competitive fuels and sources of energy were marked by a year-long campaign against federal hydro projects and the expenditure of government money for municipal power plants using oil and natural gas, in which operators participated individu-

Table II—Operating Results Under Bituminous Code (January-June, 1934)

	January	February	March	April	May	June
Division I						
Eastern subdivision						
Mines reporting	186	175	182	156	160	156
Tipple starts	19.0	18.1	20.9	14.4	14.1	13.0
Total tons produced	2,621,356	2,549,586	3,118,219	1,816,875	1,891,320	1,732,303
Mine labor cost	$1.0728	$1.0752	$1.0575	$1.3137	$1.2943	$1.3055
Total cost	$1.7243	$1.7483	$1.6743	$2.1724	$2.1203	$2.1804
Pre-code realizations	$1.6297	$1.6249	$1.6129	$1.8018	$1.8655	$1.9047
Code-price realizations	$1.9353	$1.9470	$1.8940	$2.0875	$2.0799	$2.0864
Average realizations	$1.7258	$1.7439	$1.7236	$1.9776	$2.0002	$2.0511
Western Pennsylvania						
Mines reporting	128	133	154	140	123	136
Tipple starts	17.6	18.6	21.6	16.4	17.8	16.4
Total tons produced	2,531,106	2,706,380	3,774,513	2,427,167	2,555,048	2,474,004
Mine labor cost	$0.9966	$0.9929	$0.9784	$1.2034	$1.1723	$1.1889
Total cost	$1.6815	$1.6704	$1.5935	$1.9806	$1.8882	$1.9296
Pre-code realizations	$1.4854	$1.4778	$1.4733	$1.7283	$1.7050	$1.7232
Code-price realizations	$1.8410	$1.8565	$1.7756	$1.9654	$1.9167	$1.9234
Average realizations	$1.6725	$1.6790	$1.6696	$1.8783	$1.8786	$1.8811
Ohio subdivision						
Mines reporting	54	52	65	53	52	55
Tipple starts	17.1	18.4	21.3	12.8	13.2	13.6
Total tons produced	1,106,128	1,125,700	1,524,201	743,875	763,609	834,565
Mine labor cost	$0.9567	$0.9303	$0.9446	$1.1832	$1.1605	$1.1307
Total cost	$1.5294	$1.4895	$1.4858	$1.8922	$1.7934	$1.7583
Pre-code realizations	$1.4672	$1.4494	$1.4660	$1.6437	$1.6581	$1.7023
Code-price realizations	$1.8906	$1.8787	$1.8030	$1.8829	$1.8925	$1.8464
Average realizations	$1.6890	$1.6977	$1.6830	$1.7994	$1.8014	$1.7975
Northern West Virginia						
Mines reporting	59	69	65	49	61	54
Tipple starts	17.8	17.9	21.4	6.8	16.9	15.7
Total tons produced	1,301,156	1,467,013	1,599,062	382,551	1,300,529	1,133,442
Mine labor cost	$0.7785	$0.7722	$0.7743	$1.1332	$0.9623	$0.9827
Total cost	$1.3299	$1.3261	$1.3194	$2.0883	$1.5909	$1.5824
Pre-code realizations	$1.1738	$1.1798	$1.2074	$1.3329	$1.3355	$1.3987
Code-price realizations	$1.5055	$1.5238	$1.5235	$1.6519	$1.6859	$1.6945
Average realizations	$1.3149	$1.3309	$1.3871	$1.5488	$1.5650	$1.6124
Southern No. 1						
Mines reporting	153	154	160	155	155	
Tipple starts	20.0	19.3	22.1	18.6	19.8	
Total tons produced	3,436,984	3,338,605	3,871,963	3,076,524	3,463,603	
Mine labor cost	$0.9413	$0.9352	$0.9400	$1.1438	$1.1278	
Total cost	$1.6256	$1.6436	$1.6262	$1.9344	$1.8969	
Pre-code realizations	$1.3550	$1.4196	$1.3951	$1.6370	$1.6805	
Code-price realizations	$2.0596	$2.2100	$2.2066	$2.0397	$2.0665	
Average realizations	$1.7539	$1.7816	$1.7892	$1.9035	$1.9476	
Southern No. 2						
Mines reporting	234	235	248	241	213	192
Tipple starts	16.2	17.7	20.7	15.9	17.1	14.8
Total tons produced	4,013,956	4,104,491	5,093,913	3,653,029	3,544,992	2,935,329
Mine labor cost	$0.8748	$0.8671	$0.8681	$1.0830	$1.0779	$1.0888
Total cost	$1.5327	$1.5321	$1.4933	$1.8237	$1.7913	$1.8239
Pre-code realizations	$1.3554	$1.3527	$1.3724	$1.5609	$1.5504	$1.6180
Code-price realizations	$1.8455	$1.8520	$1.7898	$1.8219	$1.8323	$1.8361
Average realizations	$1.5620	$1.5987	$1.5816	$1.7226	$1.7563	$1.7837
Division II						
Illinois—Deep mines						
Mines reporting	112	97	96	78	65	60
Tipple starts	17.5	15.9	16.8	10.5	10.7	11.5
Total tons produced	2,969,025	2,689,106	2,920,813	1,412,943	1,222,839	1,320,400
Mine labor cost	$0.8678	$0.8585	$0.8403	$1.0013	$1.0192	$0.9495
Total cost	$1.4208	$1.4202	$1.3953	$1.7721	$1.7730	$1.7117
Pre-code realizations	$1.3951	$1.4374	$1.4128	$1.5968	$1.6421	$1.6441
Code-price realizations	$1.7546	$1.8330	$1.7610	$1.6554	$1.5923	$1.6076
Average realizations	$1.5681	$1.5783	$1.5452	$1.6800	$1.6298	$1.6375
Illinois—Strip mines						
Mines reporting	14	13	14	13	13	14
Tipple starts	18.0	16.9	17.5	14.5	13.7	13.9
Total tons produced	564,445	534,166	570,141	444,377	409,761	413,251
Mine labor cost	$0.3483	$0.3388	$0.3312	$0.3784	$0.3140	$0.4534
Total cost	$1.0718	$1.0535	$1.0538	$1.1619	$1.2306	$1.2920
Pre-code realizations	$1.2795	$1.2638	$1.2659	$1.3334	$1.3336	$1.3154
Code-price realizations	$1.4591	$1.8223	$1.7430	$1.5050	$1.3739	$1.3278
Average realizations	$1.4089	$1.4070	$1.3915	$1.4033	$1.3575	$1.3301
Indiana—Deep mines						
Mines reporting	35	35	31	26	27	
Tipple starts	18.8	18.4	20.7	14.8	12.8	
Total tons produced	746,979	718,218	756,854	420,993	379,717	
Mine labor cost	$0.7511	$0.7400	$0.7228	$0.8598	$0.8946	
Total cost	$1.3668	$1.3705	$1.3549	$1.6378	$1.7256	
Pre-code realizations	$1.2891	$1.2946	$1.2337	$1.5123	$1.4263	
Code-price realizations	$1.7447	$1.7807	$1.7623	$1.6098	$1.6774	
Average realizations	$1.4986	$1.5144	$1.4976	$1.5761	$1.5717	
Indiana—Strip mines						
Mines reporting	20	19	20	17	14	
Tipple starts	14.8	14.9	17.3	11.9	9.9	
Total tons produced	440,226	426,629	510,437	291,791	247,519	
Mine labor cost	$0.3638	$0.3565	$0.3408	$0.5098	$0.4909	
Total cost	$1.0897	$1.0579	$1.0562	$1.4081	$1.4346	
Pre-code realizations	$1.1805	$1.1827	$1.1988	$1.2632	$1.2846	
Code-price realizations	$1.5473	$1.6271	$1.5357	$1.5434	$1.4931	
Average realizations	$1.3205	$1.3554	$1.3454	$1.4369	$1.3939	

"Tipple starts" as used in this table correspond to the number of days tipples started as reported to NRA. Cost and realization figures shown are per net ton. "Pre-code realizations" cover the average price per ton received by reporting operators on sales and orders taken prior to the effective date of code prices; "code-price realizations" cover similar data on sales made at code schedules; "average realizations" per ton cover total income received from coal sales, including in addition to sales at code and pre-code prices also shipments to storage, to beehive ovens and briquetting plants controlled by the mines, sales at mines to dealers and retailer customers (including house coal), net changes in inventories and coal used at the mines for power and heat. "Total cost" includes administrative and sales expenses as well as production costs; for a breakdown of items entering into the make-up of the total cost figures see *Coal Age*, April, 1934, pp. 137-141.

Table III—Average Realizations Per Net Ton—1929-1933

(Commercial Operations Only)

	1929	1930	1931	1933	1933†
Division I					
Eastern subdivision	$1.81	$1.74	$1.61	$1.40	$1.70
Western Pennsylvania	1.63	1.53	1.40	1.16	1.63
Ohio subdivision	1.55	1.45	1.27	1.10	1.65
Northern West Virginia	1.24	1.22	1.02	.83	1.30
Southern No. 1	1.75	1.72	1.44	1.14	1.65
Southern No. 2	1.54	1.45	1.25	1.02	1.54
Total	1.59	1.52	1.34	1.10	1.58
Division II					
Illinois	1.84	1.73	1.68	1.53	1.56*
Indiana	1.63	1.58	1.44	1.29	1.50*
Total	1.84	1.74	1.67	1.53	1.59*
Division III	2.11	2.13	1.85	1.57	1.86
Division IV	2.54	2.47	2.14	1.83	2.44*
Division V	2.66	2.55	2.35	2.10	2.35*

*Deep mines only; average realizations for strip mines in November, 1933, were as follows: Division II, $1.40; Division IV, $1.69; Division V, $1.35. †For month of November only.

ally and in local and national groups with the aid of the United Mine Workers. One result of the united front of the operators and miners was the organization of the National Job Saving and Investment Protection Bureau for the Coal Industry late in February.

The year 1934, on the other hand, witnessed a long step toward the development of adequate foundations for efficient merchandising policies, as well as policies themselves, largely through the efforts of the three district sales agencies in operation throughout the year. Development of an industry-sponsored research program also was brought appreciably nearer through the formal organization of Bituminous Coal Research, Inc., in October.

In regard to fuel oil and natural gas, as well as hydro power, the industry consistently maintained its right to protection against any weakening of its competitive position as a result of necessary increases in prices to cover the added costs of code operation. Progress in this direction was hampered, however, by the failure of NRA and other government agencies to live up to promises that no injustices would be permitted. Presentation of the industry's contention that adequate protection against unfair fuel-oil price competition could be secured only through direct control of prices early in the year failed to move the Petroleum Administrative Board from its stand that production control would accomplish the desired result.

Anticipating failure to secure the insertion of fair-trade practices in the natural-gas code proposed late in 1933 and which, as it finally turned out, was never adopted in any form, the National Coal Association decided to press for legislation for a federal tax on natural gas, in which move it was joined by the United Mine Workers. As a result, a bill calling for a tax of 5c per 1,000 cu.ft. was drafted and given into charge of a committee of eleven operators early in the year. This bill was submitted to the NRA in an attempt to secure its support, and after a series of inconclusive conferences, a plan was proposed by a natural-gas representative, and tentatively agreed to, under which the price of natural gas in any community would bear a fixed relationship to the price of bituminous coal in the same community. District conferences between coal and gas representatives were held in Chicago and Kansas City and committees of engineers were appointed to work out an acceptable formula. The attempt, however, met with failure, except in the Southwest, due to the insistence of natural-gas producers on retention of existing markets plus a certain fixed increase in sales before the plan would become operative. The year ended with no improvement in relationship between the two industries.

The campaign against government-sponsored or assisted competition took the form of widespread opposition to the administration's hydro-electric program in general and TVA and its blood relations, actual or putative, in particular, supplemented by local proceedings against government-financed municipal power plants, the latter being attended by a substantial degree of initial success. As one step in the fight against hydro-electric development, the National Coal Association inaugurated an educational campaign for the purpose of arousing public sentiment with a broadside entitled "The Facts About the Billion-Dollar Water-power Development of the Federal Government" in October. Appalachian Coals, Inc., stepped into the picture with "Debunking the TVA" in November, while the National Job Saving and Investment Protection Bureau continued its steady drumfire of informative releases, culminating it in December by offering for consideration a proposal that the government turn its attention to farm electrification, which it declared offered employment for nearly 600,000 men, as against unemployment for 200,000 men in coal-mining and related industries as the ultimate result of the present hydro program. Concrete opposition to the hydro program rested largely on coal and ice men in Tennessee, who started the first of a series of actions against TVA purchase of distribution systems in June, the campaign finally taking in federal courts and public-service commissions and State courts in both States, and attracting the support of groups of investors in the utilities in question.

Developments in TVA-coal relations were marked by insistence of the industry on an impartial investigation of the economic aspects of the program, an outgrowth of a discussion of possible TVA support of coal research. The releasing of a trial balloon by TVA to ascertain the reaction of the industry toward its research proposals was met with a suggestion that, in view of the fact that consummation of the TVA program meant a substantial increase in unemployment in the coal industry, its economic justification should first be ascertained by an impartial investigation. Answering this contention, Dr. A. E. Morgan, TVA chairman, proposed such an investigation in October—with certain unacceptable conditions (*Coal Age,* December, 1934, p. 506) later rejected by J. P. Williams, Jr., president of the National Coal Association, who expressed the industry's willingness to participate in any fair study.

In addition to the efforts of individual producers, merchandising developments in the bituminous industry were highlighted by the operation of three district selling agencies — Appalachian Coals, Inc. (*Coal Age,* August, 1934, p. 311; September, p. 348), and two Ohio agencies, Northern Coals, Inc., and Hocking Coals, Inc. (*Coal Age,* October, 1934, p. 390). The work of these three organizations last year was largely directed toward the basic task of uncovering information on distribution and consumption in their respective marketing areas. In the case of ACI, plans were laid for supplementing regular compilation of reports on distribution by sizes and uses by States and communities with a population of over 2,500 by detailed studies covering individual industrial consumers and retail distributors. This agency also perfected its organization specializing in coal applications and the solution of combustion problems encountered by its customers, and inaugurated the "Flying Squadron," a committee of representatives of interested departments organized for the specific purpose of helping retailers in various communities meet the problem of substitute competition as one phase of a general program designed to preserve markets.

The possibilities in the sales agency plan resulted in consideration of projects by producers in central and western Pennsylvania and in Alabama, where preliminary programs had been halted by the adoption of the coal code. Northern Colorado, however, was the only region to set up a district agency in 1934, fourteen producers in this region, representing an annual production of 2,000,000 tons, organizing Northern Colorado Coals, Inc., in December.

ANTHRACITE COMPANIES

+ Explore All Roads to Cost Reduction

ANTHRACITE operations in 1934 faced much price cutting. With no code to sustain prices, with active competition between producers and with much bootleg and other undercircular coal, there was every incentive to increase mechanization. The closing of high-cost mines threw the burden of production on those operated at lower cost and made it necessary to develop these rapidly to meet the load thus thrown on them.

Some parts of the anthracite region have seam inclinations easy enough and coal thick enough to permit of the loading of coal by mobile loaders, and not a few have concluded that, where such conditions obtain, the use of conveyors alone will not produce the maximum economies of production. So three Joy loaders have been installed at the mines of the Philadelphia & Reading Coal & Iron Co. and one at the mines of the Lehigh Navigation Coal Co.

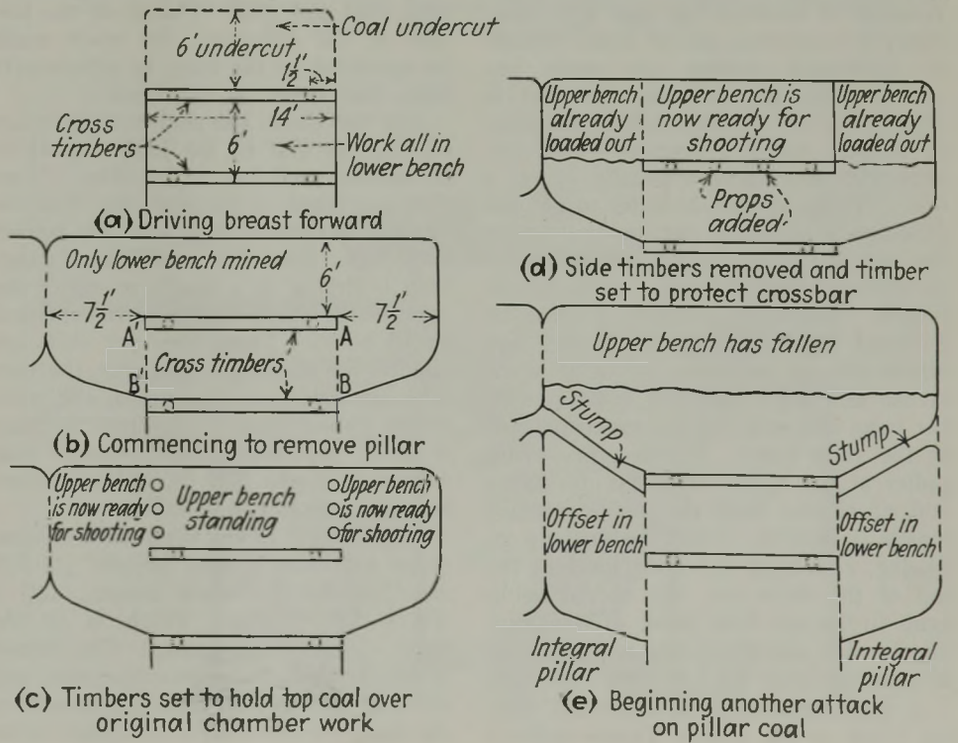
In the third level at Coaldale No. 9 of the last-named company, two rooms in the Primrose seam are being driven by the aid of a Jeffrey flameproof short-wall cutting machine and an electric drill. The coal is lifted by a Joy 5-BU loading machine into a Vulcan shaking-chute conveyor which, in turn, transports the coal to a Jeffrey pit-car loader at the mouth of the breast for delivery to 120-cu.ft. capacity cars in the gangway. The coal being mined is 12 ft. thick, but the breast is driven in the lower bench only, which is 6 ft. thick and separated from the under side of the upper 6-ft. bench by a slip, smooth or soot seam varying from nothing to 3 in. thick. Rooms are driven 14 ft. wide straight up a pitch of 8 to 10 deg. As the breast is too steep for cars to be placed at the face, it is necessary to load the coal into a conveyor and to transport it by this means to the mouth of the room. The cover at the point of operation varies between 350 and 400 ft., the trough not being in the line of the main basin of the Primrose seam but a local basin formed by an irregularity on one side of it where the side of the main basin has begun to flatten.

A 6-ft. undercut is made at the face of the room, the coal is shot down up to the slip, and a cross timber is set in the face as soon as the coal is loaded out. This timber is as long as the face and of 8 in. diameter. Near its ends it is notched into and supported by two 9-in. diameter posts, inclined about 3 in. in 12. These cross timbers are set at 6-ft. centers, and in driving the breast forward they hold the face satisfactorily without any further support. Cutting and loading machines operate without much interference with this timber at the face.

After the breast is driven to its limit, retreat on the pillar is made in 6-ft. steps. First, offsets are cut on each side of the breast into the rib of the lower bench, and the coal of that bench is drilled, shot and loaded, the cutting, drilling and loading being done by the equipment mentioned, for a distance of 6 ft., as shown in (*b*) Fig. 1. As it is necessary for the loading machine to reach the offsets in the rib on either side from some other point than by going under the upper bench near the face of the breast, the right offset is extended from the line *AB* and the left offset from the line *A'B'* so that the loading machine can enter the offset at those points and reach the offset beyond the inby cross timber. Then two or three posts, as necessity may require, are set along each rib line of the room, fronting on the forward pillar excavation. That being done, the upper bench of coal over each of these offsets is drilled and shot down, leaving the upper bench of coal in the center of the room intact, supported by the side posts. The coal from the offsets is then loaded out by the Joy machine.

As soon as that has been done, the posts along the two ribs are pulled out with a post puller, and two posts are set intermediately under the near cross timber so as to make certain that the upper bench, when shot, will break off along the edge of that timber without breaking it; see (*d*). By similar methods the coal in the offsets opposite the space between the two foremost cross timbers is shot down and loaded. Then the foremost timber set is re-

Fig. 1—Method of Operation With Mobile Loading Machine, Lehigh Navigation Coal Co.



moved also, and the top coal between the next timber and the location of the foremost timber is similarly removed. New cuts are then made in the pillar, one each side, as near the first cuts as is convenient, and a plan similar to that heretofore described followed, thus removing the pillar and the upper bench of coal above the pillar and above the middle of the room for another distance of 6 ft.; see (*e*). In practice most of the pillar is removed, though small stumps are left at the rear between successive offsets. In shooting the top coal, 2 or 3 ft. of drawslate often falls.

As the pillars between rooms are only about 15 ft. wide, the two offsets from adjacent rooms meet. Only two breasts are being driven or two pillars being removed at any one time, and the working faces of each pair, whether breasts or pillars, are kept at equal distances from the gangway at all times. Though the work is not yet beyond the experimental stage, satisfaction is expressed with the performance of the installed equipment. The one cutting machine travels from room to room, and the loading machine has caterpillars for the same purpose. Two cuts are being made daily.

Need for more rapid development has made one company install 33 Vulcan shaking conveyors at its mines; 5 were installed in 1933 and 28 added last year. These conveyors by their mechanical construction throw the coal forward even when the conveyor pans are on a rising gradient, but to this has been added an innovation, a Westinghouse motor with a differential speed which causes the pans to make the forward stroke 2½ times as rapidly as the return stroke, the forward movement of the pans being actuated by the motor running at a speed of 1,100 r.p.m. and the backward stroke by the same motor running at between 600 and 400 r.p.m. Sixty-five forward and an equal number of backward strokes are made per minute. By this means, the coal is readily carried forward and inclinations of 16 deg. can be traversed. The conveyor in development usually is on a level, of course, but, in order to put the coal into a string of cars spotted under the end of the conveyor, it is necessary to elevate that end to a considerable height. The same company is using an Eickhoff Uplift Shaker with pivoted legs which lift the conveyor on the forward stroke and thus move the coal up with the pans and enable it to travel forward at the same time. A new type spring puller at the drive below the discharge end of shaker with the legs described makes it possible to lift the coal up an 8½-deg. rise from the floor level to the top of the mine car, this ascent being made in the last three pans. This equipment, when operating, has a capacity of 40 tons per hour for both coal and rock.

A most noticeable advance has been the work at the Harry Taylor colliery

Fig. 2—A 36-In. Pipe of Concrete and Asbestos in a Glen Alden Coal Co. Mine.

of the Penn Anthracite Mining Co. Here the coal is brought from the working face to the breaker by conveyors, eliminating tracks except for the movement of heavy machinery. The safety features of this installation were described in the November, 1934, issue of *Coal Age*, pp. 419-420, but its operations have been accompanied with notable economies.

An outstanding development has been that of Humboldt mine of the Lehigh Valley Coal Co., west of Hazleton. At first it was proposed to install belt conveyors in the two main haulage slopes and entirely eliminate mine-car transportation; but, ultimately, to reduce first cost, mine cars were used in the slopes and landings and in the 14-ft. main gangway of the First Level West off No. 1 Slope. All other work is being performed by conveying equipment except where the coal will travel by gravity. The car gangway is 2,100 ft. long. Of this, 1,400 ft. was driven by shaking chute with duckbill loading head, the shaking chute delivering at the rear, or mine-car, end onto a pit-car loader. This equipment handled both coal and rock. Placed on the low side of the gangway, the track could be extended to the face, to which cars have free access at all times.

Six feet thick, the coal bed pitches at 22 deg., so that on the high side 4½ ft. of bottom rock has to be lifted. Two cuts are taken in the coal, and then the duckbill is drawn back and the bottom rock shot. From 300 to 400 ft. of gangway is driven at a single set-up of the equipment, which can be moved forward in 16 hours. Three men per shift are needed for each face unit, but the men who operate the trips control the work of the pit-car loader. Average advance is 8 ft. per 8-hour shift—twice that achieved in the 700 ft. driven before the equipment was installed.

The Second Level West off the same slope has been driven beyond its 22d chamber by the same means, and a Third Level West, which is in the basin, is now being opened. The former is wholly shaker-conveyor-operated, and the coal is delivered from the breasts to the conveyor by sheet-iron chutes in the chambers. The latter level will be equipped for car haulage but will be advanced by duckbill shakers and a pit-car loader.

On the east side of this same slope also, two levels 16 to 24 ft. wide have been driven by similar equipment traversing 1,050 ft., the advance being 10 ft. per shift, with four men driving the gangway and loading the coal and rock.

At No. 2 Slope, the maximum pitch is only 6 deg. On the east side of this slope, chambers have been driven by shaking chutes, which deliver their coal to a main chute in a heading that parallels that inclined roadway. A swivel chute carries the coal to the main car-loading point on the slope. On the west side, levels are driven in the coal 30 ft. wide and of equal width with the chambers. Breasts are driven from these levels by shaking chutes. All the coal mined is delivered to the loading point on the slope by shaking chute in the level, but in one of these levels a belt 1,000 ft. long operated by two drives will be installed. This level will be advanced by a shaking chute and duckbill which will discharge the coal on the belt. Spring Mountain Colliery, Hazleton shaft and Exeter and Westmoreland collieries of the same company are using chutes, duckbills and flight or chain conveyors.

Some anthracite companies are experimenting with undercutting machines and others are continuing their use. One company has introduced an Eickhoff coal saw for shearing the face.

Pursuing its efforts to get a lighter car, the Lehigh Navigation Coal Co. has purchased 100 "Buckeye" steel cars with a corrugated underframe. The sides are added by the coal company and are of sheet steel. These cars are about 500 lb. lighter than any previous cars of equal capacity in service. Twenty-five all-steel mine cars with a water-level capacity of 113 cu.ft. have been in successful operation for several months at one of the mines of the Hudson Coal Co. They have the same outside dimensions as the wood cars which they replaced and which had a water-level capacity of only 72.26 cu.ft. The new all-steel cars were built by the Bethlehem Steel Co. and are equipped with one-piece General Steel Castings steel underframes. Each car has two Miner combined draft and buff gears; Timken and Tyson roller bearings and brakes which have successfully demonstrated their practicability in mines where spragging was formerly held to be indispensable.

At Gravity Slope colliery of the Hudson Coal Co. a new type of refuse disposal was installed at the top of a new incline leading from the breaker. The refuse-disposal equipment consists of a transfer hopper, a belt feeder and a 50-ft. swinging self-supported distributing belt conveyor. The refuse is

dumped on each side and ahead of the inclined plane. The transfer hopper and distributing conveyor are supported on three 3x10-in. wood rails at 5-ft. 9-in. centers. The equipment is moved up the slope by manual operation of three 25-ton screw jacks which react against the end of the fill on which the permanent tracks rest. With this equipment 700 tons of refuse is being handled by two men in less than eight hours. With the system formerly employed the daily handling of refuse required fourteen to sixteen hours and six men.

Drainage problems also are meeting with new solutions. On Sept. 8, 1934, a cross-measure water tunnel was holed through from No. 40 shaft of the Lehigh Valley Coal Co., at Hazleton, to Ebervale Slope. A force of men since that time has been lining the passageway. Because of the frequency with which the wooden flumes of the Lehigh Navigation Coal Co. were burned by forest fires and destroyed by persons traveling over them and cutting them with axes for firewood and by rot engendered by alternate wetting and drying, that company decided recently to use half round steel flumes in 12- to 30-ft. lengths for carrying water over crop falls.

Transite pipe is being tried in the Hudson Coal Co.'s mines for acid mine drainage. At its Pine Ridge colliery several hundred feet of 8-in. pipe is in use, and at Coal Brook colliery, 1,900 ft. of 4-in. A 36-in. line 400 ft. long has been installed also by the Glen Alden Coal Co. (see Fig. 2).

In the field of preparation, the introduction of the Menzies cone separator is the outstanding development of the year. This separator (see Fig. 3) embodies the water-balance principle of automatic regulation. The coal is washed in a cone surrounded by manifolds which deliver streams of water to all parts of the cone except near its top. Raw coal enters a well around the vertical shaft of the agitator and is carried down by the walls of the well into the cone. Upwardly rising water and agitator arms stratify the raw feed into its various gravities; the clean coal rises and passes out over the top of the cone to the dewatering screens, while the slate, bone and other impurities fall against the inrush of water through the tubular section at the bottom of the cone into an inclined scraper conveyor, which elevates and discharges it by a chute at the end of its travel.

The refuse conveyor is in a casing which is watertight, and connected to the casing is a standpipe with a "V" notch weir at the top (as shown in the illustration) to the right of the separator. When refuse or middlings accumulate within the cone, they retard the passage of water from the conveyor casing through the tubular section into the bottom of the cone. This increases the head of water in the conveyor casing to such an extent that the water flows through the "V" notch weir in an increasing quantity and correspondingly decreases the flow of water through the tubular section at the bottom of the cone. When upward flow or velocity of water through the tubular section is decreased, the refuse falls through the tubular section into the conveyor. After discharging refuse from the cone, the resistance to the flow of water through the tubular section decreases and the head of water in the conveyor casing decreases to such an extent that little or no water passes through the "V" notch weir; consequently increasing the upward flow or velocity of water through the tubular section. This results in less refuse being discharged into the conveyor and in the maintenance of a bed of middling materials within the cone, on top of which the pure coal floats or stratifies.

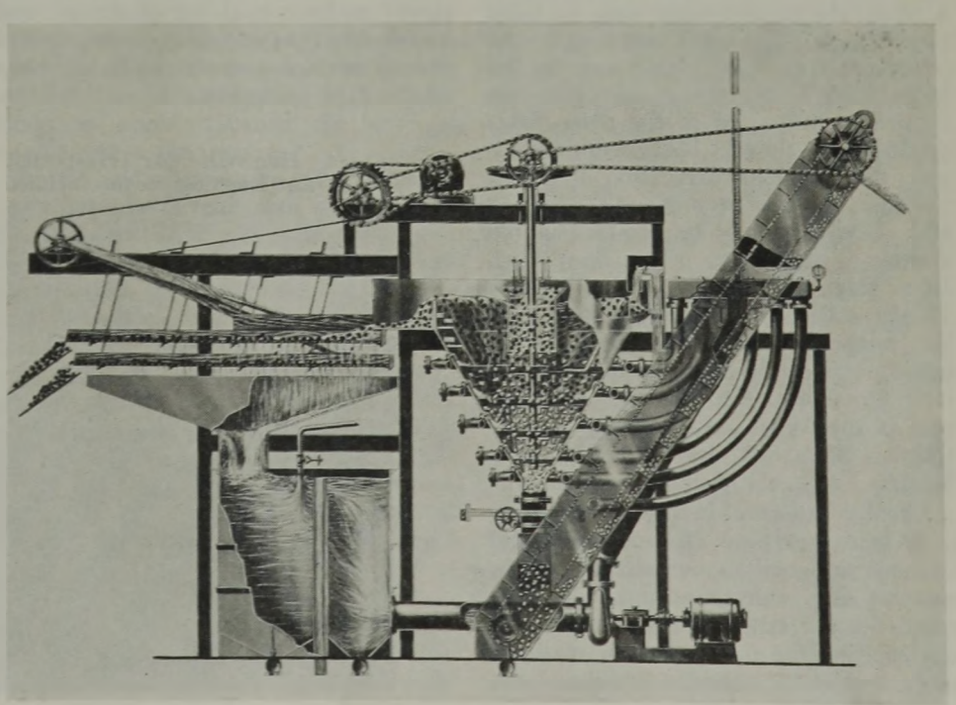
Thus, whenever the density of the fluid in the cone becomes excessive, due to impurities in the feed, less water enters the cone, a quantity of refuse is discharged and the specific gravity is reduced to the desired figure. If, however, the feed is inadequate, the fluid in the cone makes little resistance and the water rushes into the cone in such volume that little refuse can escape and the specific gravity builds up to the required standard. By careful adjustment, the cone is enabled to work with equal efficiency regardless of the volume of feed or its specific gravity. It is, therefore, self-adjusting, with its required specific gravity automatically determined by the variable velocity of a rising current of water.

Though the quality of the feed and of the product will set the capacity of any unit, the capacity of the Menzies separator is said to be, roughly, one ton per hour per square foot of area of the top of the cone. A 6-ft. separator will clean about 28 tons per hour and an 8-ft. separator about 50 tons. Ten to fifteen gallons of make-up water is sufficient for the operation of the unit, and from 30 to 60 gal. per ton of cleaned coal is circulated by the pump. Average power consumption is said to be 1 to 1½ hp. per ton of cleaned coal per hour. Eight installations having a total capacity of 350 tons per hour were made during 1934.

At the preparation plants of the Lehigh Navigation Coal Co., Rockwood drives have been introduced. Other changes in drive methods and accessories have been few if any.

In the Northern field the basins lie somewhat symmetrically with the valleys of the Susquehanna and the Lackawanna rivers and the intake of a mine may be at a very different elevation from the discharge; one may be in the valley and the other way up on the sidehill. In the winter the air in the mine is warmer and therefore lighter than the air outside, and a natural draft causes or tends to cause the air to enter the mine in the valley and pass to the higher opening. In the summer, the air being warmer outside, the cold air falls out of the mine and draws air from the upper inlet. Consideration is being given to this natural draft which now helps, and now hinders, the fan. Two plans are available. The fan may be reversed or an effort be made to arrange that intake and return shall be at the same level, so that the natural draft will be no more disposed to travel in one direction than in the other. Whenever the intake and return are at the

Fig. 3—Cone Separator With Upward Water Current at Refuse Discharge and Device Regulating Specific Gravity.



same level, the fan readily determines in which direction the air shall go. Unfortunately, with reversal of the fan and without other underground adjustments, ascensional ventilation will be changed to descensional, which is a change not to be desired. In the Southern and Middle fields, there has been little trouble with natural draft, for the openings are more usually at approximately equal elevation, but in the Northern field much difficulty has been occasioned by these vagaries of natural draft. Water tunnels, if used for intakes, might change the situation and the natural draft they would afford might be of great value if properly utilized, though the flow of water might oppose the movement of air. Aerovane fans have been installed during the past year by many anthracite companies.

At the Greenwood mine of the Lehigh Navigation Coal Co., about 4,000 Edison Model C electric cap lamps have been replaced by an equal number of Model K lamps, increasing the illumination from 2.2 to 50 beam candlepower.

Timber practice of the Lehigh Navigation Coal Co. is to purchase some zinc-chloride-treated and some untreated timber, and leave its second-growth trees to develop, but last year almost all the large trees in one area were badly damaged by a sleet storm which was followed by frost, making cutting imperative. To salvage this timber, and at the same time to produce hardwood stump sprouts reinforced by seedlings of hard pine spontaneously supplied by nature, almost all the trees on the affected area were cut, preferably by axes and everywhere as near the ground as possible, so as to force the sprouts to start near the surface. Undesirable trees with large spreading tops also were removed, so as to get a simultaneous resurrection from a maximum number of stumps. To facilitate fire protection, slashings were arranged in parallel rows.

Some hard pines, however, preferably those with big tops, were left so that they might sprinkle their seeds over the area, also some big-topped white pines, which today are almost valueless but which may have much value in the future because of their progeny. Planting of hard-pine seedlings after cutting is of doubtful expediency because of the present fire risk and because the seedlings would be outgrown and shaded by stump sprouts. A healthy stock of hardwood sprouts has already appeared over the cut-over area. The cutting, done by a contractor under supervision of the forestry department, covered 330 acres and averaged 4,121 b.ft. per acre, including forepoling, lagging, chute and gangway timber, mine ties, railroad ties, dimension oak, pattern timber, mine boards, coopering boards, fence posts, slabs, blocking and cordwood. The Navigation company's forest fire losses were low compared with those of other land owners. The 1934 record shows: 20 fires, 106 acres burned and $75.68 net cost for fire extinguishment.

STRIPPING ACTIVITY

+ Reaches New Heights in 1934

LARGE-SCALE bituminous stripping not only continued the steady gains of the past few years in the Middle West and Southwest but also moved into the limelight in Ohio, where operations have long been conducted on a relatively smaller scale than in fields to the west. The swift upswing in the latter State is reflected not only in the installation of equipment corresponding in size to that used in the older fields (a 16-cu.yd. shovel) by one Ohio company but in an intensification of activities at a number of pits near Wellston and reconnaissances by established operators as far away as the Southwest. In addition to the Ohio installation, a 15-cu.yd. Marion shovel went into service in northern Illinois, a second at a new operation of the Alston Coal Co., near Pittsburg, Kan., and a 10-cu.yd. unit at a new operation opened up near Carrier Mills, Ill., by the Delta Coal Mining Co. in the last half of the year.

Equally important in bituminous stripping were revisions in equipment and methods designed to increase efficiency, cut cost and improve output. Developments in the latter category were exemplified by the installation of washing equipment at a number of additional operations last year. Stripping and loading were featured by a heightening of interest in: (1) the possibilities of larger dipper capacity through the use of light alloys; (2) the use of entire new units, such as the "bank machines" employed to hoist coal out of the pit and load it into cars standing on the natural ground surface (several 2½-cu.yd. units of this type being installed in the Pittsburg, Kan., field, where 2-cu.yd. units were formerly widely employed); and (3) the use of new means of transporting coal from pit to preparation plant, a change chiefly marked by a sharp upswing in utilization of trucks and trailers. Another 1934 development was the installation of a car transporter at the Huntsville (Mo.) plant of the Huntsville-Sinclair Mining Co. to fa-

Fig. 1—Huntsville Car Transporter. Spoil Is Elevated to Top of Bank by a Car Running on the Inclined Bridge. Dumping Is Automatic.

cilitate the loading of two seams of coal separated by a slight interval.

Stripping men interested in increasing dipper capacity without adding to the size of the shovel settled on the use of aluminum alloys as the best approach to the problem. Coal, it has been found, is of such a nature as to lend itself to the use of the aluminum dipper, and employment of this material for parts not subject to heavy wear allows a substantial increase in capacity, as at the Tiger No. 2 pit of the Hume-Sinclair Coal Mining Co., Hume, Mo., where a 3¼-cu.yd. steel dipper was replaced by a 5-cu.yd. aluminum dipper of approximately the same weight with satisfactory results over nearly a year's service.

Character of the overburden is a major factor bearing on the possible use of aluminum in dippers on stripping units, but in the light of experience to date it is believed that the material offers a practical solution to the problem of increasing capacity under certain conditions. The Pittsburg & Midway Coal Mining Co., Pittsburg, Kan., replaced the steel dipper on its largest unit with an experimental aluminum-alloy unit more than a year ago in the expectation that the increased payload growing out of the decrease in weight would prove an operating advantage, accompanying the installation with dipper sticks of the same material. Another aluminum stripping dipper, a 16-cu.yd. Marion unit replacing a 12-cu.yd. steel dipper, went into service approximately six months ago, and a 35 per cent increase in monthly yardage is reported. Two additional 17-cu.yd. units of the same general design have been purchased by the same company since. Dipper sticks and booms were other items scanned in 1934 with an eye to the use of aluminum in members not subject to heavy strains or shocks.

Activity in 1934 served to strengthen trailer haulage's grip on a permanent place in the strip transportation set-up. From a modest start with small units in the Pittsburg (Kan.) field about five years ago, trailer haulage has spread throughout the Middle-Western and Southwestern stripping fields, and the growth in the number of units in service has been paralleled by an increase in capacity to a point where the common unit of today is a 15-ton bottom-dumping trailer (Sanford-Day, United, Fruehauf, etc.) pulled by a 7½-ton tractor-type truck. While the growth of trailer haulage was influenced by improvements in automotive equipment, experience at a relatively large number of stripping operations, such as the Sinclair properties (*Coal Age,* October, 1934, p. 273), has put the stamp of approval on the following advantages: elimination of track and of interference between haulage units; less interference with shovel operation, particularly in turning at the end of a cut; adaptability to stripping isolated territories where the expense of laying track would be excessive; and ease with which the routine operating plan can be modified where the coal in substandard territories has to be left, to which must be added the advantages in supervision, maintenance, delivery of parts and supplies and removal of injured men arising out of the presence of a good all-weather road running into the pit.

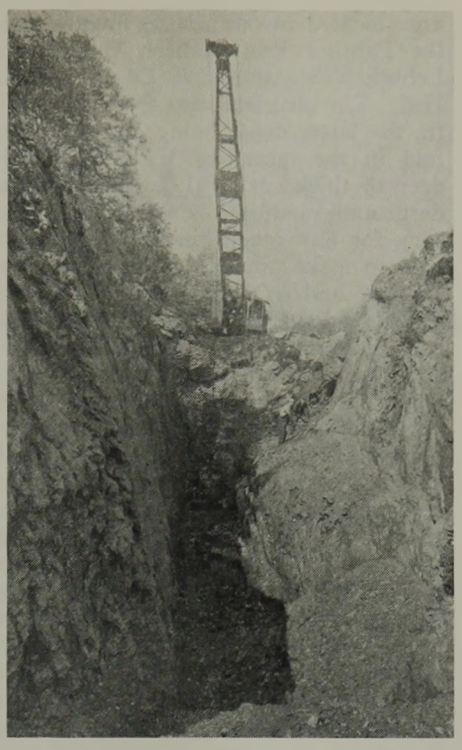


Fig. 2—Dragline Stripping at Glen Lyon in the Anthracite Region.

Where daily capacities lie in the higher brackets, however, or where the haul is unusually long, the physical problems involved in handling a large number of units at the dumping station, in the former case, or the extra cost of the added units necessary, in the second case, are held in some quarters to limit the application of trailers. Normally, the usual coal berm is dispensed with, and the trailers operate on the pit bottom. If this is naturally soft or disintegrates upon exposure, the berm is retained as a roadway.

In the field of steam-locomotive transportation, one development in 1934 was the adoption of circle haulage at the Pyramid mine of the Pyramid Coal Corporation, Pinckneyville, Ill., to increase the effective operating time of the coal-loading units. By extending the track through the pit and laying a second leg on the surface in advance of the working face (*Coal Age,* January, 1935, p. 21) trips are enabled to enter the pit at the back end and leave at the front, thus eliminating delays due to waits at passing tracks and wrecks at switches. This method involves the construction of an additional length of track approximately equal to the original track, but the extra cost is in part offset by elimination of passing tracks, while the additional benefit of practically continuous as against 75 to 80 per cent full-time loading before installation of the new system, more than overbalances the scales in favor of circle haulage, in the opinion of operating officials.

To solve the problem of stripping two seams separated by a small interval, the car transporter—a machine for stacking spoil on the top of existing banks—has been adopted at the Mark Twain mine of the Huntsville-Sinclair Mining Co., Huntsville, Mo., where the 12- to 14-in. Mulky seam is separated from the underlying 46-in. Bevier seam by 13 ft. of hard blue shale. Operations originally were based on first stripping and loading the Mulky, then turning the stripping unit and digging down to the Bevier, returning along the course of the original cut.

With the car transporter, built by the Bucyrus-Erie Co. in accordance with specifications laid down by coal-company officials, the main task of the stripping shovel is uncovering the Mulky seam. The stripping unit is followed up by a smaller shale-loading shovel and the transporter, the latter (see accompanying illustration) taking the shale from the loading unit and elevating it to the top of the spoil bank.

The coal saw also made its entrance into the stripping field in 1934, the Pittsburg & Midway Coal Mining Co. employing this type of equipment at its No. 15 and 17 mines, near Pittsburg, Kan., to reduce the quantity of explosives required and increase the percentage of coarse coal. Five cuts lengthwise of the pit is the usual stint in normal operation.

Because of varying conditions, stripping in the anthracite region has, by and large, well marked regional differences. Progress has been most rapid recently in those regions where the pitch of the seam is heavy, a condition now generally recognized as favoring the dragline excavator, which usually both digs the overburden and transports it from the pit to its final place of disposition, though sometimes two draglines have to be used, the second recasting the overburden already handled once by the first. However, even where the pitch is easy, if the basin is small, a dragline excavator may be able to expose it completely and yet deposit its overburden beyond its edge. Moreover, nearly every anthracite region has some heavily pitching beds. So draglines are finding some opportunities for application in all the anthracite fields.

Some of the more level coal beds, such as are found in anticlines or basins, local or more extended, have so large an area that the stripping ground has both length and breadth, and these are most readily handled by shovels and locomotives. Were these strippings large enough, locomotives and cars might be used for coal only, and high-capacity shovels be installed for overburden,

as in the bituminous region, where the cover is moved into the space left by overburden already stripped and coal already excavated, but none of the strippings now worked would justify such large equipment, so shovels and railroad cars are used for both stripping and coal recovery. Wide strippings are common in the Northern field, and here are found many shovels and much railroad transportation of both coal and overburden, and in the Middle field, especially on Broad Mountain, small basins are common. These usually are too large, however, to permit a dragline or shovel to strip and cast the overburden beyond the coal area without the aid of separate haulage equipment.

In the early part of last year many tractors of the Linn type were purchased throughout the anthracite field for use in strippings. Thus about one-third of the road-haulage equipment of J. Robert Bazley, Inc., is Linn tractors and the other two-thirds Mack trucks; but this company has in addition three railroad stripping jobs. The Bazley firm is buying a Euclid convertible truck that will serve either as a truck or a tractor, running either on wheels or caterpillars, and the Rhoads Contracting Co. is getting two Austin trailers, which will hold 20 cu.yd. level full and will carry 28 cu.yd. heaped. These will each be attached by swivels to 5-ton Mack trucks. They will have a single rear axle with four 20-in. wheels with 12-in. tires and will dump on either side or through a bottom door. Depth of bed is 3 ft. 5 in. These trailers will be the first of their kind. The same company has an 11-ton Sterling truck with ten wheels. None of its haulage equipment is diesel-oil operated.

Aluminum booms are favored. Hill & Suender has one and the Bazley firm recently changed a 70-ft. steel boom for an 80-ft. aluminum boom and yet was able to use on it a scraper ½ cu.yd. larger than the old one. This latter firm has eight diesel excavators, six electrified and twelve gasoline. About half its digging equipment is in shovels and half in draglines, the shovels doing the heavier work. Both the Hill & Suender jobs and those of the Rhoads Contracting Co. have been described in *Coal Age,* the first in the August, 1934, issue, pp. 299-301 and 316, and the second in the January, 1935, issue, pp. 25-29. Since then the Rhoads Contracting Co. has taken over the Lykens breaker of the Susquehanna Collieries Co. It will load material from the culm banks and will strip coal, cleaning both in the breaker. Carey, Baxter & Kennedy is still operating its 12-cu.yd. Monighan dragline and its preliminary coal preparation plant on the property of the Philadelphia & Reading Coal & Iron Co., and is now stripping an adjoining property of the Lehigh Valley Coal Co. with a Monighan dragline equipped with a 7-cu.yd. bucket.

A large stripping in the Southern area located in one of the fingers from the Panther Run basin is that of the Lehigh Navigation Coal Co. at Summit Hill. The coal bed runs from 50 to 400 ft., the latter depth being due to a deep fold in the measures. The extremely deep or thick coal will be mined by underground methods, as the slopes necessary for any other kind of mining are held to make any but underground operation undesirable, especially as the slopes tend to fracture for some distance back from the point of excavation. This stripping has been greatly enlarged since it was described in *Coal Age,* April, 1929, pp. 203-205. The equipment is being supplemented by a 320-B Bucyrus 7½-cu.yd. shovel from the abandoned Cranberry stripping which will handle overburden. It has two 4-cu.yd. 120-B Bucyrus electric shovels, working on overburden, one K-55 Link-Belt gasoline 2-cu.yd. dragline, loading coal, one 37 Marion convertible shovel with a 1¾-cu.yd. dipper bucket or a 1½-cu.yd. scraper bucket, loading coal, and one ½-cu.yd. unit gasoline shovel for utility purposes, grading on the dump, cleaning up spills, etc. Overburden and coal are handled by thirteen locomotives: a 65-ton Heisler locomotive, six 60-ton Heislers and one 55-ton Heisler geared locomotive, two 55-ton Vulcan rod locomotives, one 50-ton Baldwin rod locomotive, one Vulcan rod locomotive and one 40-ton American locomotive.

For drilling it has two Ingersoll-Rand wagon drills, fourteen 6-in. well drills—five gasoline-driven and the rest electric—and six more 6-in. well drills will be added. Twenty-nine 30-cu.yd. dump cars are provided and three more will be used to further supplement the transportation capacity. One standard-gage track shifter is being used, as already stated in the article to which reference has been made. An Armstrong drill sharpener is used to keep the 6-in. drills in shape. The rock and other spoil go to several dumps. At times A. C. Mack trucks have been used, and today eight A. B. Mack trucks are salvaging coal on the old South dip section of the stripping. A screening plant has been provided to clean the coal preparatory to sending it to the Lansford and Coaldale breakers. The operation runs three shifts and employs 350 to 375 men. With the wagon drills mentioned, holes can be drilled at considerable angles from the vertical, thus saving explosive, labor and shoveling where sloping ground has to be scaled off.

Without stripping, much coal would inevitably be lost and many companies today would be obliged to close down their mines if strippings did not furnish them with less expensive coal to help them balance their books. If their strippings were closed down, their tonnages would greatly decline, for few companies are able to drive enough development underground to maintain their present tonnage, and certainly could not make sufficient progress to enlarge their underground capacity sufficiently to meet the demands if stripping were to cease.

Consequently, stripping, far from depriving men of work, is providing opportunity, often in areas where that opportunity has been denied, as at Shamokin and Lykens, by the closing of exhausted or unprofitable mines. Legislation favoring the prohibition of stripping, therefore, is undesirable. It would result in increasing the production cost and in raising the selling price. As anthracite faces substitution, such an increase would be deplorable. Moreover, all exposed or lightly covered coal is subject to fires, and fires once started spread far and wide, damage property and shorten the life of the region, which already is none too well assured. Fires have already occurred in shallow coal beds and mine workings, destroying millions of tons of coal, depriving men of work, and in one case making a town almost uninhabitable. Control of surface fires is almost impossible, whereas fires in deep workings can be sealed or flooded and otherwise extinguished.

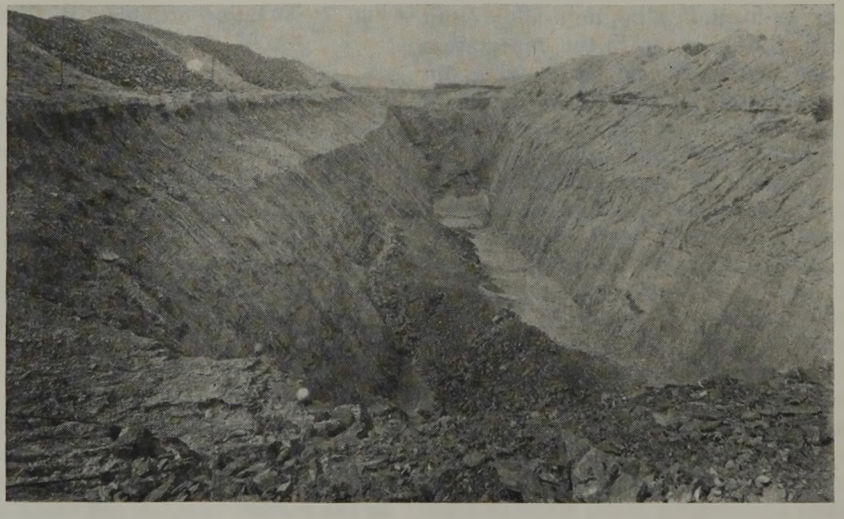


Fig. 3—Richards Stripping. Coal Has Been Removed at Near End and Is Now Being Mined in Rear. Shows Present Road Into Stripping and Dividing Rock in Seam Being Dumped at Near End to Make New Road.

BITUMINOUS FIELD

+ Alive to New Ideas and Applications

ALL ACTIVITIES entering into bituminous coal mining were represented by advances in technique and equipment in 1934, with mechanization of loading, from the twin standpoints of gains in installed capacity and improvements in equipment and methods, again heading the parade. Higher wages, shorter hours, irregular operation, with its attendant emphasis on the benefits of concentration of working places characteristic of mechanization, exhaustion of the thicker seams, greater recognition of the economic value of mechanization equipment and higher coal prices all combined to accelerate the trend to mechanical loading and at the same time leave their mark on other activities and equipment involved in coal-getting.

Steady progress along paths marked out by previous experience featured the application and operation of mobile loading machines in 1934, with the old high-wage fields—Illinois, Indiana and the Rocky Mountain region—as usual, leading in the use of such equipment. In the Eastern and Southern regions, where hand loading always has been far more general than machine loading, the shortening of the working day and the upward revision of wages prior to and following the writing of the codes made many producers in the past year investigate the possibilities of mobile loading equipment.

Keeping pace with the development of more efficient operating methods and meeting the problems arising from the spread of mobile loaders into territories and mines having less favorable conditions, manufacturers offered many new models in 1934. These were of two general types: lower-capacity machines for thin coal or for mines where other adverse conditions make the more expensive higher-tonnage machines relatively unprofitable, and large, high-capacity equipment for still further increasing unit tonnage where conditions permit them to be used.

With one or two exceptions, mobile loaders have been installed to operate in workings embodying some modification of the room-and-pillar system, the chief modification in the Middle West, where pillars commonly are not recovered, being the adoption of a system designed to leave the smallest possible pillar consonant with safe operation and surface support. From lengthy experience have been evolved two major systems: (1) wide rooms with thin, rectangular pillars, and (2) narrow rooms with pillars which are wide and almost square. The later system characterizes the widely used checkerboard system, in which the number of crosscuts is increased and their driving is made an integral part of the coal-producing plan, thus augmenting the number of working places in a given territory. In lieu of the familiar right-angle system, many companies have adopted the advancing "fir-tree" plan of mining, in which rooms are turned at such an angle to the entry as will increase curve radius and make it easier to move equipment with safety at higher speeds.

With, as already indicated, a reasonable degree of stabilization in mining systems, operators have turned their attention to other factors entering into mobile-loader efficiency — chiefly car-changing methods and face preparation, both with the purpose of shortening loader delays and making them more infrequent. How successful the improvements have been in these directions and in the revision of mining systems may be gaged by the fact that averages of 330 to 360 tons per unit in seven hours are increasingly common, against 300 tons or so in eight hours two or three years ago. And in two instances of record, mobile loaders with a crew of thirteen men have produced 545 tons in eight hours (New Hope mine, Linton-Summit Coal Co., *Coal Age*, April, 1934, p. 126) and 504 tons in seven hours, also with a thirteen-man crew (American No. 2 mine, Knox Consolidated Coal Corporation, *Coal Age*, January, 1934, p. 3).

Where mobile loaders are employed, face-preparation methods necessitate, in the last analysis, a balancing of the benefits of a larger coarse-coal yield against the benefits accruing from a larger unit output. At mines where working height does not limit the size of the lumps a machine can load, it has been found that with seasoned crews the same productivity can be obtained with an increase in size if loading technique is modified. Most operators, however, prefer a middle course in which the proportion of the largest size is reduced and efforts are concentrated on increasing the output of intermediate grades. This enables the loading machine to produce more coal and at the same time raises the proportion of sizes now most in demand. Seasonal variations also are a factor in face-preparation methods, and at a number of operations have been reflected in harder shooting during the summer to favor a large output per loading machine.

To solve the face-preparation problem in mechanical loading, revisions in cutting, drilling and blasting practices have been the means of attack. This has been done by relocating drillholes, by changing the position of the cutting-machine kerf and by providing additional free faces through the introduction of shear cuts, thus reducing the shooting burden. Thus coal is brought down with less explosive, without excessive fragmentation and without "checking" the coal around the holes.

At mobile-loader operations gathering transportation was characterized by intensified efforts toward a reduction of car-changing time, one of the chief sources of delays in operation. Because of the nature of the mining plans generally employed, loading is primarily a one-car-at-a-time activity, except in such cases as the track-across-the-face layout used occasionally, the New Hope and Peerless mines, where special four-rail, three-track and six-rail, three-track layouts were adopted to allow spotting two cars at a time, and mines employing certain modifications of the checkerboard, notably New Monarch, Consolidated Coal Co. of St. Louis (*Coal Age*, January, 1934, p. 12), where three cars are spotted at a time for loading. Consequently, most operations depend on the establishment of changing tracks in the nearest crosscut and on making up trips on the entry or in an adjacent place, which may be reached either by going out on the entry or, where the places are deep enough, through pick-up tracks laid through crosscuts.

The practice of "picking up" rooms

on either side of a place was adopted by still more operators in 1934, the pick-up roads in a number of instances being treated as separate haulways. Disposition of the track back of the pick-up roads varied with the ideas of the various operators, some removing it for transfer to the working places, thus cutting down the quantity of steel, ties and supplies in service, while others preferred to leave it in place for storing empty and loaded cars, materials and track-mounted equipment when not in service.

A car transfer has been devised by the American Mine Door Co. which enables a car to be shunted bodily sidewise from one room track to another or to one side. It consists of cross-track set between the rail of the first track and another cross-track extending at right angles to the first room track over to the second room track, or to a standby point. A small transfer truck thus loaded is pushed over the two cross-tracks till it reaches the second room track or to a standby position. If there is a second room track, the car can readily be run off the transfer truck and the truck removed, leaving first and second room tracks clear, but usually with such transfer no second room track will be required.

In Tennessee, only the Moore Coal Co., Devonia, is using a mobile loader for coal loading in rooms. The Dean seam worked at this mine is about 7½ ft. thick and carries a rash parting 8 to 10 in. thick, 28 to 30 in. above the floor. This mine has been under development for some years and entries have been extended to their limits. During this development, room driving was held in abeyance, this phase of operation being undertaken in August of last year. Room width is 22 ft.; centers, 40 ft. The rash parting, which is soft, is cut out by track-mounted arcwall machines and is loaded in cars for disposal on the surface. The kerf and the floor are thoroughly cleaned by laborers before the coal is shot. Four air-cushioned shots are fired in the thin bottom bench with permissible powder, every care being taken not to disturb the floor. The top bench is brought down with three holes charged with pellet powder. All shots are fired with fuses, which are cut in such lengths that the coal in the bottom bench will be lifted before the top coal is forced down. Such a round of shots dislodges 40 tons of coal, which is loaded by a track-mounted machine, for which the average daily stint is 320 tons in seven hours from eight rooms. One locomotive serves this machine, delivering cars of 4-ton capacity. The machine crew comprises eight men, as follows: one loading-machine operator; one helper; three men who drill holes, shoot the coal and load machine cuttings; and three men who pick removable impurities out of the shot coal, lay track and set timber.

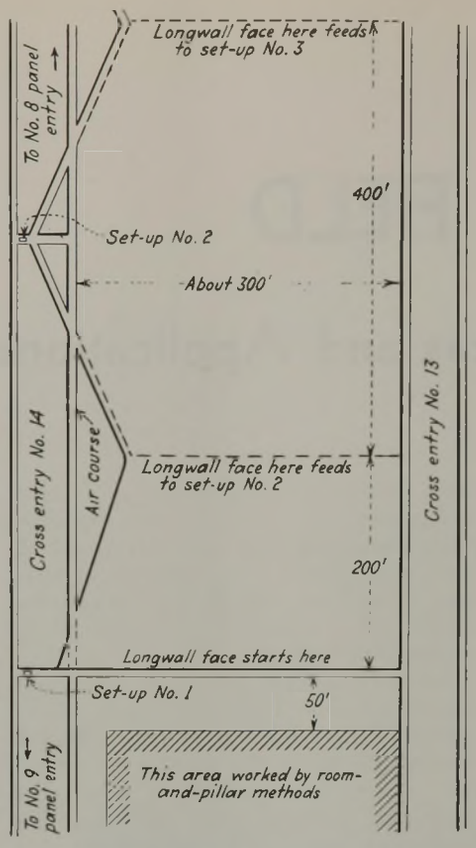


Fig. 1—Sketch Showing Methods of Operating Longwall Face at Whitwell, Tenn.

It should be added that the Pruden Coal Co., Pruden, Tenn., is loading coal—and also rock—in entry development, also with a track-mounted machine.

The Black Diamond Coal Mining Co., Whitwell, Tenn., joined the mechanical-loading list with two scraper loaders, each operating on a face about 300 ft. long. Ordinarily, the roof has a good immediate top of slate, but in some sections timber must be placed within 4 or 6 ft. of the face to protect the workers. In cases where the roof will not stand for 12 ft. from the face, a chain conveyor is used. The panel entries are driven on approximately 2,400-ft. centers and what were room entries on about 400-ft. centers.

About half the coal in No. 13 Room Entry had been removed by room-and-pillar methods when the scrapers were introduced. A narrow road, so located as to leave a 50-ft. pillar between the old room workings and the road, was driven between No. 13 and No. 14 room entry. One of the two faces mentioned was then opened off by taking a slab off the entire length of the rib between the aircourse of No. 14 and the roadway of No. 13. By successive advances, the longwall face was pushed forward 200 ft. The approach to the longwall face from the room roadway was made angling and a constantly growing pillar accordingly was being left against the aircourse. In consequence, a new set-up was made about 400 ft. further along the haulageway of No. 14 room entry and an angular place was driven by hand to meet the end of the longwall face. The coal was then diverted from the face to this oblique passage. It is purposed to extend the face another 400 ft., or 200 ft. beyond the new set-up, before another set-up is made and later advance the longwall face another 400 ft., driving a scraper way back to the face as before.

The 39-in. Sewanee seam is mined and the roof appears to settle down nicely behind the face. Another longwall face has been opened up between room entries Nos. 14 and 15, which is worked in much the same manner. Both faces deliver to the No. 14 entry, but the points of delivery are 400 ft. apart and the coal loaded in cars from one unit goes out at one end of the entry and the coal from the other goes out at the other end, thus eliminating interference. An output of 200 tons is anticipated from each unit per 7-hour day. Fig. 1 gives a rough idea of the method, the regular crosscuts being omitted.

Conveyor mining, judged both from the number of installations and interest in this method of mining thin seams efficiently and economically, moved up to a position scarcely less important than that held by the mobile loader in the thicker seams. In West Virginia, one of the best examples of the trend in 1934, many operators began to operate thinner seams and found that the introduction of conveyors was essential if the new seams were to compete with mines having thicker beds. So successful were many of the low-coal companies in operating conveyors that many of those who have coal thick enough for car service at the face are beginning to conclude that conveyor methods hold great possibilities for them also. The main difficulty in low places is getting posts to the face. This can be solved with a reversible conveyor.

Activity in new fields in 1934 was paralleled in regions where conveyors are an accepted method of mining. Operations in the Paris and Spadra districts of Arkansas, for example, not only continued the use of conveyors on longwall faces but added new units. Scow mining operations, in which a block of unbroken coal is dropped on a scow, or steel pan, at the face and hauled by ropes to a loading point to be placed by a hoist on a flat mine car, were intensified by the operators employing this system, and conveyor and scow mining together accounted for about 85 per cent of the output of the field.

Submarine No. 2 mine of the Clinton Coal Co., Clinton, Ind., was the latest addition to the list of conveyor operations in northern Indiana. It is mining the Fourth Vein, which is 3 ft. 9 in. thick. Four rooms constitute a unit, for which the equipment consists of a 300-ft. main, or mother, conveyor, one 114-ft. cross conveyor, three 100-ft. room conveyors and four 14-ft. face conveyors, all chain units, four shortwall

cutters, one portable electric drill and one gathering locomotive hauling to the shaft bottom.

Each panel is split by a three-heading entry with sixteen rooms on each side, but only one group of four rooms is worked at a time; one group on the right side being followed by a group on the left. Retreat work is the rule in every panel, the entry being driven to its end and rooms necked as it advances. Pit-car loader units are employed in entry driving, and as the entry advances loading stations are shot down in the middle road. These loading stations are located opposite the necks of rooms 1, 4, 5, 8, 9, 12, 13 and 16 and allow maximum flexibility in the choice of the loading station for use in working any particular group of rooms. As the entry chain pillars are cut through opposite the room necks on both sides of a loading station, one station can be used in working eight rooms, four on one side of the entry and four on the other. Track being laid in all three headings, passing and storage facilities always are available.

Developments in cutting in 1934 were featured by a wider use of equipment designed to cut a thinner kerf—of which the outstanding examples are the Bowdil cutter and Sullivan coal saw. In addition, standard types of cutting machines were offered with blades narrowed down to allow the cutting of kerfs as low as 3 in. Many applications of the coal saw were based on the premise that additional cuts—either horizontal or vertical, or both—would facilitate the breaking down of the coal and yet would not add to the quantity of cuttings; also, that in thinner seams the same cutting could be done with a decrease in the percentage of the coal going into the bugdust.

Coal-saw applications in 1934 covered a wide range of problems: (1) simple cutting and shearing; (2) cutting, shearing and snubbing; (3) cutting out impurity bands; (4) cutting and use of the breaker pad to protect drawslate and weak roof; and (5) cutting in the bottom for roadways. Application also included the use of both the breaker pad and explosives, the major objective in most of the latter cases being a reduction in the quantity of explosives used per ton. A southern Indiana mine offers possibly the outstanding example of the versatility of the saw. In a seam 4 ft. thick an undercut, a shearing cut and a snubbing cut are made in rooms, the latter being pulled out and the coal shot with explosives. The snubbing cut is made by starting the blade in about 12 to 14 in. above the undercut and angling it down to meet the lower kerf at the back. Two holes, each loaded with a 4-oz. stick of powder, are used to break down the coal in a 20-ft. place. In addition, the saw is used at the present time to cut out the hard fireclay bottom in the rooms. Cutting the 6-ft.-wide roadway usually is the first operation in a place, the dull chain from the previous place being employed in making four shearing cuts 12 to 14 in. deep in the bottom, which is then dug up by hand.

Heat-treatment, hard-surfacing and the use of alloy steels as a means of prolonging bit life continued to attract attention throughout the country, and particularly in the Middle West, where earlier experiments with heat-treating carbon steel were reflected in the installation of additional units. Heat-treating at the No. 48 mine of the Peabody Coal Co., Cass, Ind., allowed a change from bit steel costing 3.85c. per pound to one costing 2.75c. At the same time consumption was reduced from 15,000 lb. in the period from August, 1933, to March, 1934, when 224,811 tons was produced, to 5,295 lb. in the period March to November, 1934, when heat-treated bits cut 166,623 tons. Costs of bits per ton declined from 2.13c. to 1.13c. per ton, including sharpening and machine repairs. At the Dresser mine, Walter Bledsoe & Co., Terre Haute, Ind., heat-treatment has reduced steel consumption 40 per cent, and has cut sharpening cost from $6.16 to $3.84 per thousand tons. Since the introduction of heat treatment, the number of points used per ton of coal cut has dropped 50 per cent to 1.06.

Seven bituminous installations of Airdox were made in Illinois and Indiana, and one in the anthracite region at the operations of the Philadelphia & Reading Coal & Iron Co. The several advantages stressed for the system include ability to vary the breaking force in accordance with the conditions surrounding each shot, which, together with the gentler action of the air, increases the yield of coarse coal, affords greater safety and improves the condition of the place after shooting. On the other hand, adoption of air shooting involves the purchase and maintenance of another piece of equipment, which may intensify the interference between units operating in the working section.

Two of the bituminous units are stationed at the Standard Coal Co. mine, Wheatland, Ind., one of the first to install the Airdox system. These units late last year were "shooting" an average of 170 to 180 holes in seven hours for four mobile units, and additional installations were scheduled to "shoot" the entire mine output. Shell capacity is 200 cu.in., requiring a 3-in. drillhole, and the slack percentage in the sections in which the units are stationed has been reduced 10 to 15 per cent, with a corresponding increase in the yield of coarse coal, largely in the 2- to 6-in. range.

Under difficult shooting conditions an Airdox unit at the Herrin No. 7 mine of the Consolidated Coal Co. of St. Louis, "shooting" for two mobile loaders, is said to have reduced the output of 2-in. screenings slightly over 10 per cent. Originally, a 180-cu.in. shell was employed, but, in view of the difficult conditions encountered, capacity was changed to 300 and finally to 400 cu.in., the latter shell having a diameter of 4 in. and requiring a two-man drill. Because of the large lumps shot down, loader output dropped when air shooting was first introduced, but is now back to standard. At the Royalton mines of the Franklin County Coal Co., where the Energy air-miner was developed, screen tests indicated a rise of from 44.30 to 54.15 per cent in the yield of sizes above 2 in. and a decrease of from 55.70 to 45.55 per cent in the yield of grades under 2 in.

Colorado is beginning to follow Utah's lead in the introduction of Cardox, the latter State, in turn, having followed the Middle West. No shots may be fired in the mine while employees are present under the Colorado law, and at least one company in the northern lignite field has for this reason definitely introduced Cardox and others are experimenting with it, for it enables "shots" to be fired at any time. But northern lignite operators list other advantages. Their coal is relatively friable and the carbon-dioxide "explosive" gives a product that is larger and retails at a higher price. By permitting shooting throughout the working shift, it allows a large tonnage to be obtained from a small number of working places, and thus when slack times occur during the spring and summer months there are fewer places to be maintained and cost of maintenance decreases. Utah also is making more installations.

Powder manufacturers continued the development of explosives designed to meet the dual requirement of increased lump and easier handling of the broken-down material. Five new permissible explosives were offered during the year by E. I. du Pont de Nemours & Co. with velocities ranging from 6,200 to 11,200 ft. per second and counts of from 135 to 185 1¼x8-in. cartridges per 50 lb.

A pellet powder characterized by greatly reduced smoke and fumes has been developed by the Hercules Powder Co. with a count of 125 8-in. cartridges each consisting of four 2-in. pellets. The formula of the powder differs from that of the time-honored black powder, but it has a similar pushing action. This company also is introducing black powder packed in paper bags in place of kegs, which bags are shipped in wooden boxes.

Desiring to get increased duty from its locomotives, the Peabody Coal Co. took one rated at 12 tons and weighted it down to 15 tons, applying forced ventilation by means of a blower. The gear ratio will be changed to increase its speed, thus making it as powerful as a modern 15-ton locomotive. The same company has smoothed down the corrugations on hoist drums resulting from

irregular rope wear by a method involving the use of old ropes and abrasives to grind down the rough surfaces (*Coal Age*, August, 1934, pp. 320-321). Animal haulage is being displaced in the mines of the Utah Fuel Co., Castle Gate, Utah, by permissible storage-battery locomotives. Trolley locomotives are confined to main haulage and intake entries. Thus far, Castle Gate No. 2 is completely equipped with permissible machinery. All electric drills, mining machines and mechanical loaders in Castle Gate are of permissible type.

Last year, the Berwind-White Coal Mining Co. added three more 38-ton haulage locomotives at its Windber (Pa.) operations. These are duplicates of those installed in 1928, and bring the total up to five. Any one of these is practically equal to any two locomotives used in any other coal-mining operation.

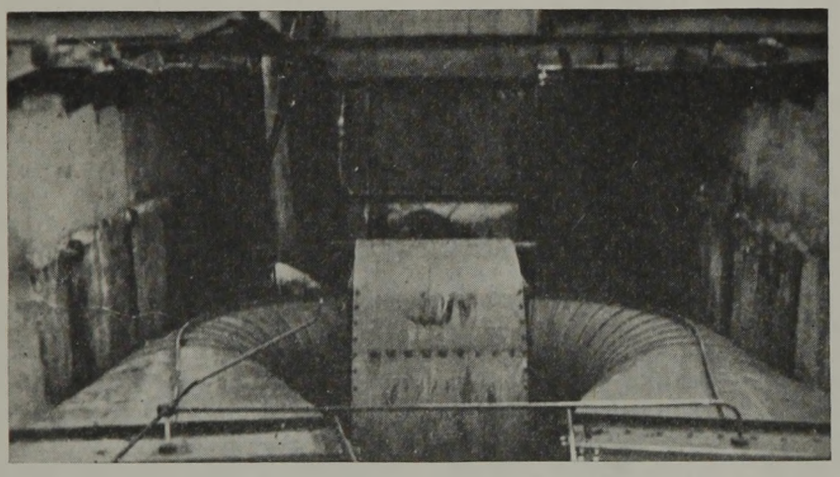


Fig. 2—Fan Constructed by Pennsylvania Coal & Coke Corporation Co.

They are equipped with three 130-hp. forced-ventilation motors and semi-magnetic contactor control. A normal trip consists of 50 to 60 loaded cars, each having a weight of about 3½ tons. The locomotive is required to haul this trip up a maximum gradient of 5.6 per cent and to move it over a distance of about 4 miles one way on an average gradient of 2.8 per cent against the load, making a round trip every hour. On the maximum gradient, it will pull 50 cars at about 7½ miles per hour. Average speed over the entire distance is about 9½ miles per hour.

Wireless mining still continues at the mines of the Carter Coal Co., Coalwood, W. Va., which installed two permissible Mancha Hercules A locomotives, equipped to use a 54-cell, 33-plate Exide Ironclad battery or 39-plate Philco battery. A Mancha permissible power truck designed to use a 110-cell, 27-plate Exide Ironclad battery, also was installed in 1934.

A track-mounted compressor with tampers for ballasting ties has been installed at the Willow Grove (Ohio) mine of the Hanna Coal Co. for use on the main-line track, which is located in a roadway that has been extensively gunited and is kept in the pink of condition. During the year the Bethlehem Steel Co. introduced two steel ties; one for 16- to 30-lb. rails is said to be 93.5 per cent stronger than the tie it replaces and only 3 per cent heavier, the greater strength being obtained by a deeper and more troughlike corrugation along the length of the tie. The length and area of the lip of the revolving clips have been increased, strengthening the grip on the rail. The other tie, for 30- to 40-lb. rails, is 28 per cent stronger than its predecessor and 3¼ lb. heavier, for the same reasons.

Alabama reports the installation of many new steel cars. Roller-bearing wheels are making much progress through the mining fields. A new double-cup bearing for mine cars was developed by Timken in place of two single cups, affording a further reduction of lubricant losses and more complete exclusion of grit and water. With these mountings a car need not be shopped when a wheel has to be replaced.

In Maryland, an accident with T-iron rails as roof supports has caused the introduction of steel of other cross-section in their place, but, unless closely placed and properly braced from member to member, any steel support may have to resist side movement from falls and any light section will be unable to resist it. Maryland also is showing more interest in the treatment of timber. Everywhere the short life of timber and its still shorter effective life is causing resort to preservation or the substitution of gunite or steel.

A new development in timber preservation is the addition of sodium bichromate to zinc chloride with additional material, the value of which has been determined by investigation. All preservatives change their character in the course of time, reacting with the wood in which they are embedded. Tests have shown that with a 0.64-lb.-per-cubic-foot impregnation, 95 per cent of the chlorine in the zinc chloride will be leached under conditions that leach only 76 per cent of the zinc. With chromated zinc chloride having a 0.69-lb.-per-cubic-foot impregnation, 70 per cent of the zinc, 93 per cent of the chlorine and 4 per cent of the chromate will be leached under the same conditions. Clearly the chromation reduces the leaching effect considerably. Standard accelerated service tests on saplings set in the ground made by the Grasselli Chemical Co. and the Wood Preserving Co. conjointly show the results given in the accompanying table.

Life of Timber Treated With Preservative Salts Under Tests Which Accelerate Deterioration

Treatment	Preservative lb. per cu.ft.	Average Index of Condition 23 Mo.
Chromated zinc chloride	0.838	89
Zinc chloride	0.865	24
Sodium fluoride	0.550	2
Proprietary salt No. 1	0.390	23
Proprietary salt No. 2	0.347	15
Untreated controls	0.000	0
Coal-tar creosote	7.650	93

The new product can be painted when dry, and when used in higher concentrations is as fire-resistant as wood treated with equal quantities of ammonium phosphate.

Ventilation is taking a new lease of life after years of neglect. Placement of intakes and returns near the points to be ventilated, use of multiple intakes and returns, unidirectional ventilation for operation and bidirectional ventilation mainly for development, new types of fans with backward blading or straight flow, more splitting, sometimes with splits that do not afterward unite, are making ventilation more effective and less costly.

At the Pennsylvania Coal & Coke Corporation's Gallitzin shop, J. F. MacWilliams, electrical engineer, has reconstructed a fan of a standard centrifugal type 3 ft. 6 in. wide and 6 ft. in diameter (see Fig. 2). The angle irons supporting the blades were trued so as to permit of closer clearance between wheel and casing, eliminating reentrance of air; the hubs were tapered to afford smoother air flow and the fan was balanced to reduce vibration. The fan was given curved inlets of an inside diameter of 5 ft. 6 in., these being laid on a framework of ⅜x¾-in. bar steel hoops, twelve to an inlet. These hoops are supported by four angle irons. The sheet steel was cut by an oxyacetylene torch to shape required and electrically welded to the inside of the hoops.

The fan-wheel shaft is 16 ft. 9 in. long and extends through the casing of the inlets, permitting the placing of bearings entirely outside the airway. Shaft diameter at the wheel is 8 in., tapering to 5½ in. at the bearings, which are barrel roller type. The stack rises 20 ft. above point of cut-off and measures at the top 8 ft. x 10 ft. 9 in., with an average évasé expansion of 13 deg. The mine has an equivalent orifice of only 9.8 sq.ft., which will be increased to 40 sq.ft. upon completion of ventilation drift, when tests will be made.

In the past year the Bureau of Mines

revised Approval Schedule 6-B on permissible electric cap lamps to permit the use of higher current bulbs of greater candlepower that reduce the burning time to not less than 10 hours, as compared with a previous burning time requirement of at least 12 consecutive hours on one battery charge. This revision was made to meet the shortened working hours under NRA codes in bituminous mines.

A Q-type battery for lamps, and a larger W battery with sponge-wood separators have been developed by the Koehler Mfg. Co. to eliminate leaking batteries. With a battery containing 250 c.c. (nearly 10 liquid ounces) of free corrosive solution, only about 40 c.c. in the two cells is free, the rest of the solution being carried in the pores of the spongy wood.

In the Thick Freeport field and other sections the MSA Methane Detector has been used to detect methane concentration as low as 0.01 per cent and thus to afford indications by which air splits, air to main returns, development and gob sections may be regulated.

Relative to safety administration, nothing new has transpired, though progress in general has been made, with interferences sometimes from adverse action by miners stimulated by erroneous implications of NRA legislation. However, much of the ground lost has been recovered. The Cool Cap of the Portable Lamp & Equipment Co. has been developed in two styles, one with the Southwester brim and one with hard brim. The flexible type permits the bearer to carry posts and track materials on either shoulder without disturbing the hat, and the hard brim protects neck and shoulder as well as head. A public-speaking amplifier has been installed in the underground safety chamber at Willow Grove mine of the Hanna Coal Co.

Recognition is being given to the bad effect of too much dust, even coal dust and limestone dust being harmful if breathed in excessive quantity. In the closing months of 1934, the MSA Comfo Respirator was approved by the U. S. Bureau of Mines and introduced for mine use. Many are being used by sand dryers, motormen, coal cutters, tipplemen and rock-drillers and others whose work lies in dusty atmospheres.

Many companies during the past year have paid their miners on a weight instead of a car-loaded basis and a large number of scales has been installed. A tamper-proof beam inclosure has been devised by the Streeter-Amet Co., which prevents tampering with the tare weight. This inclosing cover can be sealed by both weighman and checkweighman, enabling the work of weighing to be performed to the satisfaction of both with the other away. Methods of printing time of arrival of trip, number of cars in trip and their origin, weight of coal and check number of miner on a recording strip, as developed by the Toledo Scale Co., are making headway at mines.

At Bankhead, Walker County, Alabama, the Crane Creek Coal Mining Co. has developed a new slope, No. 2, which is 400 ft. long, and, being conveniently located, will be equipped with a 36-in. belt to deliver the coal to the preparation plant. The coal seam ranges from 4 to 5 ft., and the area to be mined covers about 5,000 acres. Sanford-Day drop-bottom steel cars will be used. No decision has been made as to the method of operation, whether by the room-and-pillar system or by longwall. Some of the mines may be operated by the latter method. A daily output of 1,500 tons is anticipated. The Brookside Pratt Mining Co. has installed flight conveyors for a semi-longwall system at its two mines, Blossburg and Carbon Hill, and the Galloway Coal Co. has installed drag scrapers at its Mill Creek Mines.

RESEARCH PROJECTS

+ Hurdle Financial Stringency

WITH the Anthracite Institute discontinuing financial support for hard-coal research projects at Pennsylvania State College and the U. S. Bureau of Mines severely hampered by lack of funds, coal research faced unusual difficulties last year. Looking to the future, however, the brightest development was the formal organization of Bituminous Coal Research, Inc. Unfortunately, this formal initiation of a national project which has been under discussion for the past two years came so late that the new institution could play no active part in the developments of last year.

Despite these adverse circumstances, *Coal Age's* annual survey of research developments shows 168 projects in 1934—a decrease of only one when compared to 1933. Even this total probably is an understatement, because the number embraced must depend to some extent on methods of tabulation, decision of border-line cases and the completeness of the returns. Almost every manufacturer, for example, is making or promoting tests of his equipment, but little regarding these projects is known, and reports, if made at all, are available only after completion of the study.

A service water heater, based on an entirely new principle of combustion, was developed by the Anthracite Institute. Without mechanical parts, it permits a firing interval of 110 hours without attention and is so constructed that there is no possibility of clinker. Several sizes of heaters have been placed in field operation with pronounced success. The U. S. Bureau of Standards last year adopted the Anthracite Institute Laboratory's code for stoker approval as the United States standard for construction, installation and performance.

During its tests on the flotation of coal, it was found by the Northwest Experiment Station, U. S. Bureau of Mines, with the University of Washington, that ferrous and ferric sulphates, when used in a hydrogen-ion concentration between 4.5 and 6.9, were the most suitable pyrite depressive reagents. After ferric sulphate has come in contact with pyrite in coal sludge in this range of concentration, its action depresses pyrite even if the pulp is then made alkaline by lime or other alkaline reagents.

The agitation froth flotation method for cleaning fine sizes is better adapted to the treatment of slightly weathered or oxidized coal than the vacuum process of froth flotation, and with high-, medium- or low-ash coal is somewhat more efficient than the vacuum process; that is, more clean coal of a given ash content was recovered by the method involving agitation. The only advantage of the vacuum process

with the coals tested and equipment used lay in the ease with which the froths from relatively coarse feeds were dewatered.

At the same station, a new method was developed for estimating the grindability of coal—to wit, grinding the coal to the same fineness required for use as pulverized fuel and determining the gross energy needed to obtain this result. Methods based upon the new surface produced by grinding are inaccurate, because it is impossible to determine the area of new surface produced in the sub-sieve sizes by methods suitable for use in the average laboratory. The method, as published in the Transactions of the A.I.M.E., Vol. 108, 1934, pp. 267-294, has been applied to over 50 coals and has given concordant and reproducible results.

Because, in the preparation of coal, use of wire-cloth screens with square apertures is increasing, a study was made by the same station into the relationship between round-hole and square-hole screens. Knowledge of this relationship is valuable whenever wire cloth is to be substituted for punched plate while still retaining the recognized trade size of product. Screening tests of both types of screens gave an average ratio of square hole to round of 1.23. Thus, if a given square-hole screen is to retain the same percentage of exactly similar coal as a round-hole screen, the holes in the latter screen must have a diameter 1.23 times as great as the lengths of the sides of the holes in the square-hole screen.

Petrographic studies made at Pennsylvania State College of seven samples of coal and three samples of washery refuse after concentration of the mineral matter by float-and-sink test found pyrite, kaolin minerals, prochlorite, muscovite, quartz and gypsum in all samples, calcite in 9, limonite and magnetite in 7, penninite in 3, diaspore, rutile, tourmaline, siderite and zircon in 2 samples, and garnet and hematite in 1 sample.

In burning practice, the temperature at which volatile matter is evolved is important in determining the characteristics of a coal. Recognizing this, the department of mining and metallurgy, University of Kentucky, has devised a new method for determination of volatile matter in coal, in which not only is the total volatile matter determined but an entire curve constructed relating temperature with gas evolution. It is thought that this method will give a much better correlation between laboratory tests and actual burning practice than the present standard method, and this supposition has been borne out in the work so far accomplished.

Coal cleaning at the Montana School of Mines is based on what is known as petrographic separation, as well as true refuse elimination. Coal that will not coke, and some that has even a fair percentage of ash, is separated as a middling and a concentrate obtained that will coke and is low in ash. From a Bozeman coal that had 16 per cent ash

Coal Researches in Progress or Completed in 1934 or Planned for 1935

Air Pollution: Smoke Abatement

Elimination of Sulphur From Gas and Smoke. Pitts. Exp. Sta., B. of M.
Recovery of Sulphur Dioxide From Boiler Furnace Gases.* Univ. of Ill.
Smoke in Air of New York and Environs.* Stevens Inst. of Tech.
Smoke Abatement and Air Pollution.* Mellon Inst.

Briquetting of Coals (See Surveys)

Better Binders for Briquetting Coal.* Battelle Mem. Inst.
Briquetting Alabama Lignites Without Binder.* Ala. Polytechnic Inst.
Briquetting Coal Without Binder.* Va. Polytechnic Inst.
Briquetting of Illinois Coals After Heating to Incipient Carbonization.* Ill. G. S. Div.
Briquetting of Illinois Coals Without Binder.* Ill. G. S. Div.
Vegetable Binder for Lignite Briquets.* Univ. of N. D.

Carbonization and Distillation of Coal (See Also Surveys)

Carbonizing Characteristics of Coals of Tennessee Valley.* TVA.
Carbonizing Properties of American Coals.* B. of M.
Carbonizing Properties of American Coals.* Pitts. Exp. Sta., B. of M.
Determination of Yields and Analyses of Gases From Low-Temperature Distillation of Coal. Colo. Coll.
High-Vacuum Distillation of Coals.† Carnegie Inst.
Influence of Rate of Heating and Maximum Temperature on Properties of Products Obtained From Coal.* Carnegie Inst.
Low-Temperature Carbonization of Coal. Colo. Coll.
Low-Temperature Carbonization of Coal in Relation to Oil and By-product Yields of Cannel Coals.* Univ. of Ky.
Mechanism of Thermal Decomposition of Coal.* Ohio State Univ.
Principles Involved in High-Vacuum Fractional Distillation. Carnegie Inst.
Production of a Low-Ash, Largely Anthraxylous Coking Coal With Non-Coking, Relatively Low Ash, Largely Attrital Coal. Mont. School of Mines.
Properties of Coke.* Pitts. Exp. Sta., B. of M.

Chemical Tests of and With Coal

Analysis and Composition of American Coals* B. of M.
Controlled Oxidation of American Bituminous Coal by Potassium Permanganate.* Lehigh Univ.
Deoxygenation of Coal With Aqueous Alkali.* Carnegie Inst.
Halogenation of Coal. Carnegie Inst.
Hydrogenation of Coal* Penn. State Coll.
Low-Temperature Oxidation of Coal.* Carnegie Inst.
Microchemical Analysis of Coal and Coal Products.* Carnegie Inst.
More Accurate Determination of Volatile Matter in Lignite.* Colo. Coll.
New Method for Determination of Volatile Matter in Coal.* Univ. of Ky.
Oxidation Velocity Studies on Anthracite.* Penn. State College, with Phila. & Reading C. & I. Co.
Solvent Extraction of Coal.* Carnegie Inst.

Combustion of Coals and Coal Products

Adaptation of Household Stokers to Lignite.* Univ. of N. D.
Burning Characteristics of Bituminous Coals in Fuel Beds (1934).* Battelle Mem. Inst.
Burning Characteristics of Fuels in Domestic Heating Furnaces.* Pitts. Exp. Sta., B. of M.
Burning of Coal for Domestic Heating with Forced Draft.* Frost Research Lab.
Burning of Coal in Small Stokers. Motorstoker Corp.
Combustion of Culm with Detroit Rotostoker.* Va. Polytechnic Inst. with Detroit Stoker Co.
Design of Service Water Heater. Anth. Inst.
Effect of Inorganic Materials on Combustion.* Pitts. Exp. Sta., B. of M.
Effect of Moisture on Combustion of Coal.* Ohio State Univ. with Battelle Mem. Inst.
Effect of Soot Deposits on Efficiency of Boilers.† Pitts. Exp. Sta., B. of M.
Effect of Tempering Coal on Its Combustion.† Battelle Mem. Inst.
Heat Transfer in Furnaces.* Yale Univ.
Influence of Fusibility of Ash on Maximum Rate of Combustion of Bituminous Coals. Univ. of Mich.
Mechanism of Combustion.* Yale Univ.
Mechanism of Combustion of Solid Fuels.* Carnegie Inst.
Methods for Determining Cinder in Exit Flue Gases of Stoker-Fired Boilers. Brooklyn Edison Co., Inc.
New Methods of Determining Unburned Hydrocarbons in Flue Gases. Brooklyn Edison Co., Inc.
Operation of Redler Conveyor. Anth. Inst.
Relation of Acid to Base Ratio in Ash of Coal to Fusion Temperature.* Univ. of Ky.
Relation of Heat Transfer in Small Round Cast-Iron Boiler When Stoker- and Hand-Fired.* Univ. of Ky.
Secondary Air-Mixing Devices for Domestic Furnaces.* Pitts. Exp. Sta., B. of M.
Use of Coal Mined Along Norfolk & Western R.R. in Domestic Stokers. N. & W. R.R.
Use of Fuels in Brick Kilns.* Pitts Exp. Sta., B. of M.

Equipment and Material for Mines

Air-Measurement Instruments (1934).* Pitts. Exp. Sta., B. of M.
Composition and Properties of Explosives and Explosive Materials.* Pitts. Exp. Sta., B. of M.
Fan-Performance Charts (1934).* Pitts. Exp. Sta., B. of M.
Kinetics and Mechanism of Explosion and Combustion Reactions.* Pitts. Exp. Sta., B. of M.
Physical and Chemical Tests of Explosives for Use in Mines.* Pitts. Exp. Sta., B. of M.
Relationship Between Round- and Square-Hole Screens for Coal.† N.W. Exp. Sta., B. of M.
Safety Fuse.* Mellon Inst. with Ensign-Bickford Co.
Safety of Electrical Equipment in Mines.* Pitts. Exp. Sta., B. of M.
Wire Rope. Committee A.S.M.E. with Bureau of Standards and Eng. Found.

Fusibility of Ash (See Also Surveys)

Clinkering of Coal Ash.* Penn. State Coll. with Central Pennsylvania Coal Producers' Association.
Effect of Sodium Carbonate on the Fusibility of Coal Ash.* Univ. of Mich.
New Methods of Determination of Ash-Fusion Temperature.* Ohio State Univ.
Relation of Chemical Constituents to Fusibility of Coal Ash.† Ohio State Univ.
Softening or Fusing Temperatures of Ash.* Commercial Testing & Engineering Co.

Gas—Use, Manufacture, Purification and Treatment (See Surveys)

Enrichment of Coke-Oven Gas by Catalytic Treatment.* Carnegie Inst.
Gas Yields and Analyses From Cracking of Low-Temperature Tars.* Colo. Coll.
Influence of Sodium Carbonate on Water-Gas Reaction.* Univ. of Mich.
Pretreatment of Coal for Recovery of Volatile Products and Special Gases. National Electric Heating Co., Inc.
Production of High-Hydrogen Water Gas From Lignite-Carbonization Gas.* Univ. of Minn.
Production of High-Hydrogen Water Gas From Younger Coal Cokes.* Univ. of Minn.
Sulphur Dioxide From Stack Gas With Recovery of the Dioxide.* Utilities Research Commission, Inc.

Other Uses for Coal and Its Byproducts

Decolorizing Carbon From Alabama Coal and Lignites.* Ala. Polytechnic Inst.
Mechanism of Formation of Motor Fuels, Etc., From Ethylene.* Pitts. Exp. Sta., B. of M.
Resinification of Lignite Tar Acids With Reference to Varnish.* Univ. of N. D.
Suitability of North Dakota Lignite for Activated Carbon.* Univ. of N. D.
Synthesis of Hydrocarbons From Coal Gas and Water Gas.* Pitts. Exp. Sta., B. of M.

*Items starred indicate that work on such projects was still continuing at the end of 1934. †Items marked with a dagger were concluded in 1934. Figures shown in parentheses indicate year in which particular research project was started. Absence of notation indicates that informant failed to indicate status of project.

was obtained a concentrate having good coking qualities and only 5 per cent of ash.

Several institutions are studying subsidence; some by actual field observation, as the Bureau of Mines and the Department of Mines of Kentucky, one by gyratory and photo-elastic methods and others in other ways. The School of Mines, West Virginia University, is measuring deformations in pillars by a compressometer to determine, if possible, the exact nature and magnitude of the stresses in coal pillars and to ascertain also how far back from the pillar lines deformations in coal pillars can be detected. Studies in the compressibility of the coal of the Pittsburgh bed at Bruceton, Pa., by the Bureau of Mines come under the same general category.

Within the first half of the year the College of Engineering, West Virginia University, hopes to analyze completely the water from some 500 mine openings that were air-sealed about a year ago, to ascertain whether there has been any decrease in the acidity of the effluent waters as a result of the sealing. Earlier studies fail to give the time element, which is desirable in this regard.

Wire-rope studies have been fraught hitherto with much dissatisfaction. At last a committee of the A.S.M.E. believes, or perhaps hopes, that it has established certain fundamental facts from which a practical code is now being formulated for trial by a group of elevator-rope inspectors. Tests on discarded rope are being continued for this committee at the U. S. Bureau of Standards in order to obtain further check data.

Experiments in the reactions of coal with chlorine and bromine, described as "halogenation of coal," thus far have enabled only products to be isolated and identified that could be prepared more effectively and cheaply from materials other than coal, declares the Coal Research Laboratory, Carnegie Institute of Technology. However, further experimentation may permit other and more valuable products to be isolated, and the facts obtained in any event will be of a fundamental value.

Edenborn coal was heated at constant rates of 0.7, 1.4, 2.7, 5.5, 10.9 and 21.8 deg. C. per minute to temperatures of 1,000, 700 and 540 deg. C., and it was found by the same laboratory that the faster the coal was heated the more tar it produced and the less coke and gas. This is interpreted to mean that, at rapid rates of heating, the material driven off the coal by heat cannot decompose to gas and coke before being distilled out of the apparatus. If the decomposition of the preformed tar is the cement by which the solid product is bound into a coherent mass, then these facts line up with observed data that hardness of coke decreases with increased rates of heating. Experiment showed that rate of heating during the so-called plastic range was not the controlling factor in determining the hardness of the coke, and the experimenters are endeavoring now to find just when it is that slow heat produces the desired coke hardness.

Coal Researches in Progress or Completed in 1934 or Planned for 1935

Physical Tests for Coal, Including Agglutination (See Pulverized Coal)

Development of Method for Determining Friability of Coal (1930).† N. W. Exp. Sta., B. of M., with Univ. of Wash. Also (1932).* Fuel Research Laboratories, Canadian Dept. of Mines.
Development of Method for Determining Grindability of Coal (1932).* Fuel Research Lab. Canadian Dept. of Mines. Also Fuel Engineering Co., Foster Wheeler Corp., Babcock & Wilcox Co., N. W. Exp. Sta., with Univ. of Washington, Carnegie Tech.
Effect of Storage on Agglutinating Properties of Illinois Coals (1933). Ill. G. S. Div.
Plasticity of Coal.* Pitts. Exp. Sta., B. of M.
Standardization of Method for Determining Agglutinating Power of Coal.* Pitts. Exp. Sta., B. of M.

Preparation of Coal (See Also Surveys and Miscellaneous)

Air-Table Performance.* Battelle Mem. Inst. with Jeffrey Mfg. Co.
Jigging Development.* Battelle Mem. Inst.
Launder Processes for Cleaning Coal.* Battelle Mem. Inst.
Losses of Good Coal in Washery Refuse.* South. Exp. Sta., B. of M., with Univ. of Ala.
Mechanical Methods of Cleaning Coal.* N. W. Exp. Sta., B. of M., with Univ. of Wash.
Operating Methods and Cleaning of Iowa Coal.* Iowa G. S.

Pulverized Coal and Pulverization

Improvement of Pulverizers, Burners and Furnaces.* Babcock & Wilcox Co.
Methods for Determining Grindability of Coal.* N. W. Exp. Sta., B. of M., with Univ. of Wash.
Removal of Ash as Molten Slag From Powdered-Coal Furnaces.* Pitts. Exp. Sta., B. of M.

Purification of Mine Water

Disposal of Waste Waters From Mines.* Pitts. Exp. Sta., B. of M.
Effect of Sealing of Coal Mines.* Dept. of Civil Eng., W. Va. Univ.
Sampling of Mine Waters for Complete Chemical Analysis.* Iowa G. S.

Safety (See Equipment and Material for Mines)

Behavior of Coal Dusts as Regards Propagation of Flame.* Pitts. Exp. Sta., B. of M.
Bumps.* Dept. of Mines, Ky.
Compressibility and Crushing Strength of Pittsburgh Coal Bed.* Pitts. Exp. Sta., B. of M.
Gas Masks, Respirators and Breathing Apparatus for Use in Mineral Industries.* Pitts. Exp. Sta., B. of M.
Ground Movement and Subsidence Caused by Removal of Coal.* Pitts. Exp. Sta., B. of M.
Inflammability of Coal Dust.* Pitts. Exp. Sta., B. of M.
Inflammable Limits of Gases and Vapors.* Pitts. Exp. Sta., B. of M.

Surveys (See Also Miscellaneous)

Botanical Constituents of Illinois Coal. Ill. G. S. Div. with National Research Council.
Briquetting of Iowa Coals.* Iowa State Coll.
Chemical Characteristics of Banded Ingredients of Illinois Coals (1932).* Ill. G. S. Div.
Classification and Standardization Studies of Illinois Coals. Ill. G. S. Div.
Coal-Mine Haulage in West Virginia. W. Va. Univ.
Coal Mine Subsidence as Measured by Compressometer.* W. Va. Univ.
Coal-Mine Subsidence in Illinois.* Ill. G. S. Div. with Federal Land Bank of St. Louis.
Distribution of Banded Ingredients in Float-and-Sink Fractions of Illinois Coals.* Ill. State G. S. Div.
Effect of Mixing Iowa Coals on Fusion Point of Ash.* Iowa State Coll.
Field Investigation of Coal Washing Methods in Washington.* N. W. Exp. Sta., B. of M. with Univ. of Wash.
Fusibility of Iowa Coal Ash.* State Univ. of Iowa.
Gas, Coke and Byproduct Properties of Illinois Coals.* Ill. G. S. Div.
Mapping of Structure of Illinois Coals (1928).* Ill. G. S. Div.
Method for Determining Smoke-Producing Tendencies of Iowa Coals.* State Univ. of Iowa.
Pennsylvania Bituminous Coal With Reference to Utilization.* Penn. State Coll.
Physical and Chemical Properties of Washington Cokes (1934).* N. W. Exp. Sta., B. of M., with Univ. of Wash.
Physical Constitution of Illinois Coal (1931).* Ill. G. S. Div.
Rate of Degradation of Iowa Coals in Storage and Formation of Humic Acids.* State Univ. of Iowa.
Reclassification Studies of Virginia Coals.* Va. Polytechnic Inst. with B. of M.
Stratigraphy of Coal Measures in Iowa.* Iowa G. S.
Study of No. 6 Bed in Southern Illinois.* Ill. State G. S. Div.
Total Sulphur and Varieties of Sulphur in Illinois Coals.* Ill. State G. S. Div.
Ventilation of Coal Mines.* Pitts. Exp. Sta., B. of M.
Washability of Coal Beds of Washington.* N. W. Exp. Sta., B. of M., with Univ. of Wash.
Washability of Iowa Coals.* State Univ. of Iowa.

Tar and Tar Products (See Also Surveys)

Identification and Quantitative Isolation of the Components of the Phenolic Fraction of Coal Tars or Extracts.* Carnegie Inst.
Neutral Fractions of Low-Temperature Tars and Extracts.* Carnegie Inst.
Preparation of Dibasic Acids from Phenols.* Carnegie Inst.

Miscellaneous

Anthracite (1932).* Mellon Inst.
Bacteria in Coal Before and After Heating.† Columbus Laboratories.
Behavior of Loose Material Under Pressure.* Columbia Univ.
Bituminous Research Planning.* Penn. State Coll. with Coal Div. A.I.M.E.
Classification of Coals.* B. of M.
Cleaning of Coal by Froth Flotation.† N. W. Exp. Sta., B. of M., with Univ. of Wash.
Competitive Position of Illinois Coals and Other Fuels (1933).* Ill. G. S. Div.
Composition of Mine Atmospheres.* Pitts. Exp. Sta., B. of M.
Condition of Water in Coals of Various Ranks.* Penn. State Coll.
Dedusting Plant Fines for Fusain to Be Used in Carbonization Practice.† Ill. G. S. Div. with CWA.
Design of Furnaces for Use of Iowa Coal for House Heating.* Iowa State Coll.
Development of New Apparatus for Investigating Roof Strains.* Columbia Univ.
Distribution of Unit Coal Calorific Values in Franklin and Williamson Counties, Illinois.* Ill. G. S. Div.
Effect of Storage on Composition of Illinois Coals (1933).* Ill. G. S. Div.
Flotation of Coal.* Penn. State Coll.
Flow of Air in Mine Passages.* Univ. of Ill.
Ground Movements and Subsidence.* Penn. State Coll.
Literature Survey of Coal.* Penn. State Coll.
Microstructure and Petrographic Analysis of American Coals.* B. of M.
Mineral Matter in Coal.* Penn. State Coll.
Mine Roof, Pillar and Artificial Support Behavior.* Columbia Univ.
Petrology of Mineral Constituents of Coal.* Ill. State G. S. Div.
Physical and Chemical Characteristics of Commercial Fines Involving Effect of Gravity Separation and Size Separation on Distribution of Banded Ingredients.* Ill. G. S. Div. with Eng. Exp. Sta., Univ. of Ill.
Physical Evidences of Coal Weathering.* Ill. G. S. Div.
Pretreatment of Coals to Produce Smokeless Fuel for Industrial and Domestic Consumption. National Electric Heating Co., Inc.
Radiation.* Yale Univ.
Separation and Determination of Fusain in Coal.* Ohio State Univ.
Specific Heats of Gases at High Temperatures by Explosion Method.* Pitts. Exp. Sta., B. of M.
Stress Distribution in Mine Roofs and Pillars.* Columbia Univ.
Subsidence.* Columbia Univ.
Treatment of Local Lignite to Prevent Slacking in Storage. Colo. Coll.
Use of Ash-Correction Formulas in Calculation of Mineral-Matter-Free Coal Values.* Ill. G. S. Div.
Utilization of Illinois Coal-Mine Wastes.* Univ. of Ill.

POWER AND EQUIPMENT

+ Step Ahead of Increasing Demands

EFFECTIVE progress in the electrical and mechanical departments of coal companies, the outcome in part of the stress and realignments of recent times, marked the past year; and the period was not without its quota of new developments and improvements. Underground distribution improved appreciably. Without expenditures in copper that would be excessive and unproductive, the losses in distribution of electricity were reduced to such a degree as to facilitate the work of inside labor and to raise the operating efficiency of equipment. A secondary product of that betterment in distribution was a lowering of power costs by improved power factor, reducing demand and cutting heat losses in conductors and equipment. Growth in the use of synchronous-motor drives is highlighted by an installation of a 600-hp. unit operating a mine fan, the largest synchronous motor thus applied. A power saving of about $1,000 a month results from this application.

Larger copper, return circuits of lower resistance and substations relocated closer to load centers featured the improvements in underground distribution systems. Appreciation of d.c. feeders of large capacity as an absolute necessity for efficiently meeting the conditions which higher wages and shorter hours, with the mechanization and further concentration of mining which these conditions impose, is evidenced by the miles of shiny new copper of 500,000-, 750,000- and 1,000,000-circ.mil sizes that made its appearance in the mines. The electrical engineer's contention that "copper is the cheapest investment that can be made in mining equipment, because its maintenance and depreciation can be made almost nothing" was corroborated during the year at a mine opened but eleven years ago and worked continuously at such a high rate of production that it is now practically finished. The local superintendent who has been in charge throughout the life of the mine states that the original copper-feeder cable is being recovered with practically no loss and is being reinstalled in other mines of the company.

Wider adoption of the shorter type of bonds, better maintenance of bonding and installation of heavier track steel increased the conductivity of mine tracks. A new tool-steel U-bolt bond for semi-permanent tracks was provided by the Bertrand P. Tracy Co. This bond takes the place of the two center track bolts by which the fishplates or angle bars are held. High-pressure electrical contact between nuts and rails is maintained by a heavy flat spring installed on the side opposite the bolt heads. Although made of steel, the bonds offer a fairly low resistance because they are short. The worthless practice of installing worn-out wire hoisting ropes to serve as auxiliary return conductors seems to have disappeared even among marginal mines.

Substation relocations completed during the year evidenced rapidly increasing favor for underground-cable a.c. feed lines instead of overground transmission lines and boreholes. In some instances, the underground installation was less costly than the estimated cost of surface transmission. Operating advantages of properly installed underground cable are lower maintenance cost, less chance of interruptions and elimination of lightning risk on the substation equipment, this latter being especially important if motor generators are used.

Of the two types of cables being installed in underground passageways to feed substations — lead sheath with metallic armor and the non-metallic protected cable—the former, which is much higher in first cost, has found nevertheless the widest application. Use of a mounted shearing machine to cut the cable trench in the mine bottom beside the track has become standard practice in bituminous mines where such machines are available. Because of the close proximity of the conductors in a cable as compared to the spacing necessary on a transmission line the reactance is lower and for that reason it is feasible to use conductors of slightly smaller area in a cable than on a line. Most of the cable installations were made with permanent joints, but a few were made with special plug-type junction boxes intended to facilitate testing and repairing in case of trouble.

For borehole and shaft installations, the use of cable with non-metallic covering showed a relative gain during the year, especially in the anthracite fields. Even in places where the cables are subjected constantly to dripping water, the type with high-grade rubber insulation over conductors and with outer coverings of tape or braids saturated with asphaltic compound is considered entirely satisfactory by several companies. Lengths up to 700 ft. are suspended in shafts with the entire weight supported by the copper conductors. As compared to the metallic protected cable the advantages are lower cost per foot, lower cost of installation, practicability of using a lighter supporting structure and less risk of dropping the cable during installation.

Lower power costs per ton of coal produced were achieved by a number of companies. There were few if any rate changes, but the power companies cooperated more than ever before in pointing out ways and means of reducing power costs—for instance, by improving power factor and bettering the d.c. distribution. Most bituminous mines now use somewhere between 3 and 7 kw.-hr. per ton and the usual cost range lies between 5 and 14c. per ton, with a large majority approaching the lower figures. Anthracite mines vary more widely, but most of them now fall in the range between 15 and 35 kw.-hr. per ton. Demand limiters continued in favor with smaller companies, especially in the bituminous fields.

Capacitor installations led in power-factor-correction jobs at bituminous mines but were not numerous at anthracite operations. Several recent installations were reported to be effecting savings which will return the investment within a year. An improvement in the construction of capacitors which lightens their weight and reduces their dimensions was announced by the General Electric Co. This change was made possible by the development of Pyranol, a non-inflammable cooling and insulating liquid. Experience during the year revealed an instance where installation of capacitors caused a resonance and consequent heating of equipment. Though an unusual case, it was easily corrected. It apparently can happen only on a Y-grounded neutral system.

Besides the motor-generator substation unit, mine-drainage and coal-wash-

ing plant pumps, mine fans, cleaning-plant blowers and stationary air compressors offer possibilities for the synchronous motor to be used for furnishing both mechanical power and reactive kilovolt-amperes for power-factor correction. In the anthracite fields, which are already well supplied with synchronous motors, progress was confined principally to new installations of mine pumps; the largest of record being installed during the year was a 700-hp. unit at Morea mine of the Mill Creek Coal Co.

The few synchronous motors installed at bituminous mines were confined principally to ventilating fans. The Pond Creek Pocahontas Coal Co., Bartley, W. Va., installed a 600-hp. 0.8 power-factor motor to replace the steam-engine drive formerly used on the fan. The boilers, no longer needed for fan operation, are being utilized to full capacity during cold weather to heat intake air and thus prevent formation of ice in the skip and auxiliary mine shafts.

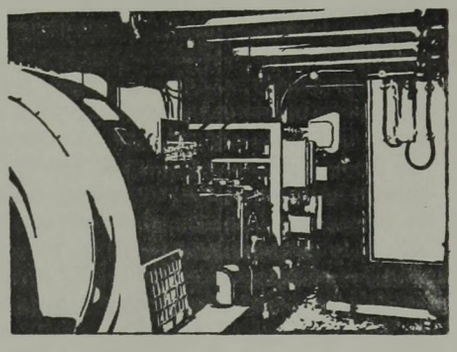
In a few weeks the mine load of the Logan County division of the West Virginia Coal & Coke Co. will be switched to a new generating plant located near Omar. An installed capacity of 7,000 kw. marks this plant as the largest undertaken by a coal mining company in several years. Fuel will consist principally of plant refuse and track cleanings shipped from the several mines. Condensing water is to be conserved by use of a cooling tower.

In the anthracite field, one new generating plant containing 2,250 kw. of generating capacity was put into service. This plant is at Jeddo, Pa., near Hazleton, and is owned by the Jeddo-Highland Coal Co. Boilers are operated at 450 lb. pressure and 125 deg. F. superheat. Low-pressure steam for the other turbine and for operating a hoisting engine and other items of steam-driven equipment is bled from the second stage of the high-pressure turbine. Deficiency is made up by an automatic reducing valve, and the steam going to the hoisting engine has its temperature reduced by a de-superheater. Fuel consisting of the lowest grade product of the breaker is burned on Coxe chain-grate stokers.

Plans for additional power plants at bituminous mines were retarded during the year by the higher realization for slack coal, by government threats against existing power rates and by the actual reductions in power costs resulting from improved load characteristics. Reports from several individual plants put into commission during the previous year indicate satisfactory savings are being effected, and in most instances it is expected that in less than five years the savings effected will offset the investment. In so far as new plants are concerned, hand-firing seems to have passed completely out of the picture, but under certain conditions non-condensing reciprocating engines are still being installed instead of turbines.

Several of the coal-preparation plants built during the year at bituminous mines were equipped with factory-assembled dustproof cabinets for centralized control of motors and lighting. Covers of starter compartments are bolted down against sponge-rubber gaskets. Branch circuit fuses are eliminated in favor of overload relay protection. The cabinet, containing all starters and carrying the panel on which the pushbuttons are grouped, is installed at a location in the plant convenient to the man in charge of control. Complete protection of starters from dust will eliminate the principal difficulty that has been experienced with automatic equipment in dusty locations. Field-construction cost of wiring is reduced, for the job becomes a simple matter of connecting the various motors to the designated terminals of the centralized control cabinet.

The appearance in increasing numbers of gear motors with built-in speed reducers for the driving of preparation-plant machinery and other coal-mining equipment marked another definite step in simplification, space reduction and reduced maintenance of power drives. Additional plants were equipped with electro-magnets to pick tramp iron from stoker coal, but in too many instances these installations were of an inferior design of chute magnet which will



likely be replaced in a short time with magnets of greater efficiency. Importance of complete elimination of tramp iron from stoker coal has indicated the fallacy of allowing first cost to prevent the installation of the most efficient magnet available.

Another noticeable improvement in preparation plants consisted of additional installations of better lighting above picking tables. In practically every case these have followed plans recommended to the coal industry several years ago by engineers of the Westinghouse Lamp Works after extensive experiments and service tests to determine the best type of equipment. Mazda lamps of 200- or 300-watt capacity are mounted in dust-proof porcelain reflectors fitted with day-blue dust covers. The usual spacing of units is on 24-in. centers, and the height above the table 30 in. This provides an average picking-surface illumination of 30 foot-candles or more.

Rubber belts for material handling were used in increasing number. In northern West Virginia, the Consolidation Coal Co. installed two long belt conveyors to carry mine and tipple refuse up hillsides to replace track and car haulage over round-about routes encumbered by stiff gradients. One of these conveyors is 900 ft. long between centers and the other 400 ft. Slope haulage, underground conveyor mining and the general handling of materials in preparation plants accounted for miles of rubber belting installed during the year. The Duplex system of belt conveying, a departure from established design, was announced by the Boston Woven Hose & Rubber Co. A power belt pulls the load and supports the weight. On the back of this belt rides another belt designed as a wear sheet. The object is to get away from junking a whole belt when only the covering is worn out.

In the contention that locomotive-tire filling by arc welding is a safe and economical practice, an affirmative could be furnished by listing the many additional instances of companies adopting that practice. The welding of bands or strips of stock metal into the grooves of tires or onto the treads of rolled-steel wheels that are worn deeply gained such favor that now only the most skeptical will declare against it. Turning the tire to secure proper seating for the wearing band or strip is an important part in the technique of successful practice. Another precaution in either type of tire welding is to supervise properly the original application of the tire so that the shrinkage allowance suffices to prevent an unnecessarily tight fit, which might cause breakage by the strains thus created.

In the anthracite fields tires usually are welded in a large commercial repair shop. Here an automatic arc-welding machine is kept busy 24 hours per day. Bands or strips are not used and all filling is by electrode. To reduce strains a gas flame is played continuously against the tire as it is revolved during welding. In Illinois, the Peabody Coal Co. added automatic peening-hammer devices to its automatic tire-welding equipments. This treatment effectively relieves the shrinkage strains that otherwise are left in the metal. Added to the roll of large bituminous operators which now arcweld tires is the Pocahontas Fuel Co. The work is done by hand, using $\frac{1}{8}$-in. electrodes, and on all tires badly grooved filler strips are used.

During 1934 the tires were turned for the first time on two 40-ton haulage units which, when installed in 1929 by Consolidation Coal Co., at Monongah, W. Va., were far ahead of standard practice, in that every feature, such as anti-friction bearings throughout, ventilated motors, rolled-steel wheels and

high-clearance gear cases, was incorporated in the design with the object of reducing maintenance cost. A recapitulation of maintenance costs over the five years shows an average of approximately ½c. per ton, as against 1½c. per ton for the 10-ton locomotives which the larger units replaced. Each of the 20-ton locomotives making up the 40-ton tandem units is equipped with two 150-hp. motors. Tires of the 10-ton locomotives formerly employed had to be turned every three to four months. Thus the year has brought to light an excellent example of what suitable equipment can accomplish in reducing maintenance cost.

Two manufacturers of mine-duty batteries announced design improvements. The Electric Storage Battery Co. now incorporates in the Ironclad Exide battery the Mipor separator, a resilient vulcanized-rubber sheet having microscopic pores allowing diffusion of electrolyte but preventing passage of active material. "Armored kathanode" construction was introduced by the Gould Storage Battery Co. Permissible electric cap lamps with smaller and lighter batteries also made their appearance during the year.

One of the radical changes in underground equipment is the Vulcan Iron Works (Wilkes-Barre, Pa.) new shaker conveyor which is equipped with Westinghouse changing-speed d.c. motor and control. Approximately 30 of these units are now in use in the anthracite region. The drive has the typical mechanical differential motion, but motor speed changes add to the effect, thus adapting the conveyor to pitches up to 16 per cent. Contactors operated by cams on the mechanical motion change the motor speed from 1,100 r.p.m. to approximately 500 r.p.m. and back again to 1,100 at the rate of 65 complete operating cycles per minute. Rapid decrease of motor speed is effected by opening of the line contactor and application of dynamic braking to aid natural braking when the kinetic energy of the motor is driving the conveyor pan on the return stroke.

Other underground equipments were improved by a general increase in the use of anti-friction bearings, better dust protection and more efficient lubrication of all wearing parts. Lighter weight for portable equipment gained a step by development of a 1½-hp. Jeffrey permissible electric coal drill weighing only 38 lb. The new patented Stephens mining machine bit consists of a two-piece holder fitting into the standard chain block and containing in a recess between the halves at the outer end a reversible cutter bit of heat-treated alloy steel.

Mine pumping advanced toward lower cost by installation of turbine-type deep-well pumps at a number of bituminous mines. Maintenance of this type of unit for handling water not severely corrosive to steel piping is low and the arrangement often serves to reduce attendance. By installing two 150-hp. deepwell pumps at the top of the 395-ft. Scarbro shaft, the New River Co., of West Virginia, reduced the normal season pumping labor from three man-shifts to one.

At anthracite mines, several centrifugal pumps were installed with steam-turbine drives. In most instances in which this was done plenty of steam was available, all equipments excepting turbines were on hand and attendants were available to make full-automatic operation—applied thus far only to electrically driven pumps—of small advantage.

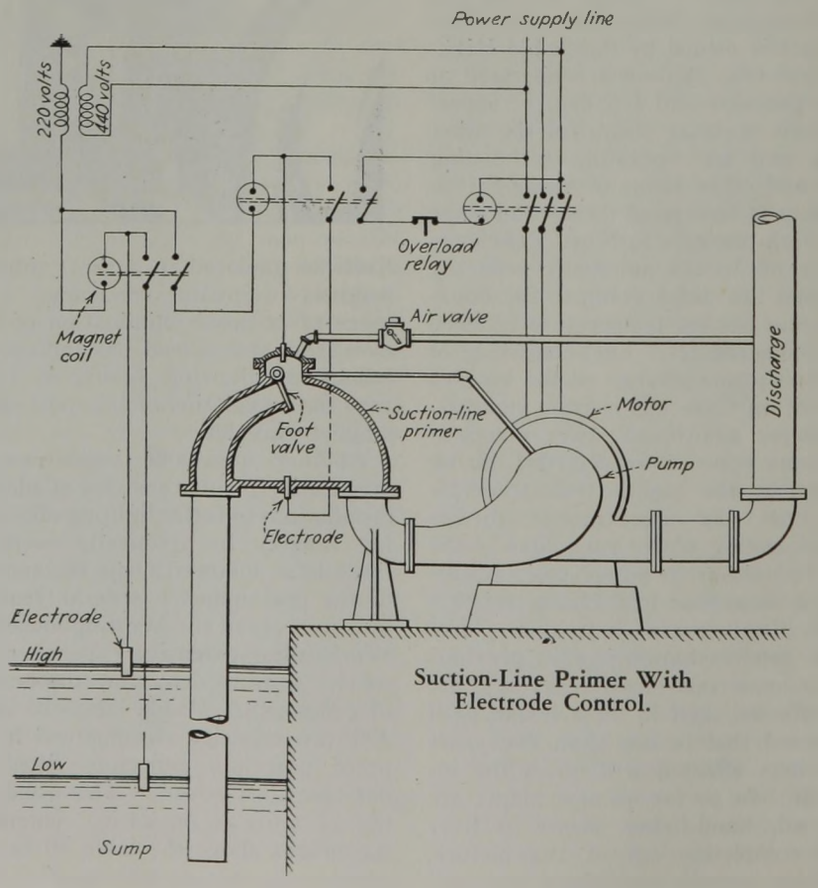
Last year Barrett, Haentjens & Co. developed electrode control for the Hazleton suction-line primer. It has the advantage that the float is eliminated, thus doing away with a packing gland that was continuously subjected to discharge column pressure, and also that the primer is more completely filled and emptied, thus reducing the number of pump starts necessary to effect priming. Two of these primer and full-automatic control equipments are now being installed at an anthracite mine.

Solenoid brakes find many applications to drives for handling coal and refuse, and 1934 marked the announcement by the General Electric Co. of a new disk-type brake. As compared to the common shoe-type solenoid brake, advantages claimed for this device are greater life, less attention required because of more surface and lower pressure, and less power needed because of the shorter air gap.

Numerous cases of lightning damage to motors of substation conversion sets indicate that there is room left for much progress in lightning protection. When a motor wound for 2,300 volts or a higher voltage is operated from a line of the same voltage, which extends for a mile or several miles from the transformer station or from the power source, and passes perhaps over high hills, the best lightning protection available has proved to be none too certain. In one instance, where in spite of installation of the latest type of arresters having excellent ground connections, lightning continued to do damage, the addition of a small three-phase capacitor at the substation, connected between lines and ground, afforded successful protection during the lightning season of 1934. This installation was made by the Hanna Coal Co. of Ohio on a 4,000-volt Y-grounded system.

Men in charge of electrical equipment at mines welcomed the recommendation made during the year by a committee of the American Institute of Electrical Engineers as to short-time safe overloading of transformers for emergency duty or for infrequent regular duty—for instance, the occasional operation of certain pumps and hoists. Loads several times normal rating are considered safe for duties of a few minutes to one-half hour.

In all, rapid progress by recently proved routes rather than by startling deviations characterized the year just closed.



Suction-Line Primer With Electrode Control.

MINE SAFETY RESULTS

+ Last Year Close to 1933 Record

By J. W. FINCH
Director, U. S. Bureau of Mines

The coal mining industry of the United States is to be congratulated on the progress which has been made during the past several years in the reduction of accidents both fatal and non-fatal, both major and minor. No longer are newspapers devoted many times yearly to headlines describing mass destruction of underground workers and emphasizing the dangerous character of the work of the coal miner. Slowly but surely our coal mines are working toward the removal of the stigma attached to having the poorest safety record of the major employing industries and it now appears as though the time is not far in the future when coal mining will take its place along with railroading and other occupations formerly held to be extra hazardous but which in recent years have reached and maintained safety performance which once would have been considered little short of miraculous.

WHEN the safety record of the coal mining industry of the United States for 1933 was reviewed it was found that the year had to its credit at least two outstanding achievements, the lowering of the all-time rate of occurrence of fatalities per million tons of coal produced and holding major disasters to one, the latter being the best record of its kind since 1880. While 1934 cannot quite equal the safety performance of 1933 in the fatality rate, as shown by Table I, prepared by the Demographical Division of the Bureau of Mines, it will be seen that the difference is decidedly slight.

In the occurrence of major explosion disasters, 1934 has equally as good a record as 1933 in so far as the number of such disasters is concerned, there being but one each year, but the one major explosion which occurred in 1934 cost seventeen lives, while the one in 1933 cost but seven. However, 1934 had at least one more major disaster, namely: a fire in a bituminous mine where five persons were asphyxiated; in addition six persons were killed on the surface near a coal mine by the explosion of some black blasting powder, but the circumstances surrounding this affair make its inclusion in statistics as a mine accident doubtful.

Conceding that 1933 had by a considerable margin the best safety record in the history of coal mining in the United States, the year 1934 certainly takes its place as the next best, and the pace set by both 1933 and 1934 is one which 1935 will unquestionably find difficult to equal. However, numerous trends indicate that since about 1930 or 1931 the coal mines of the United States, both anthracite and bituminous, have at last found the way to operate with definitely decreased accident occurrence as compared with past performance, and good judges of accident-prevention work are of the opinion that the downward tendency in coal-mine accident rates is likely to continue for some years to come, though possibly with some recessions in individual years.

Table I shows that while bituminous mining had almost 4 per cent higher fatality rate in 1934 than in 1933, anthracite mining had almost a 4 per cent lower fatality rate on a tonnage basis, with the rate for the coal mines of the United States as a whole somewhat less than 3 per cent higher in 1934 than in 1933. The rate for the country at large for 1934 was about 26 per cent lower than in 1930, 13 per cent lower than in 1931 and 15 per cent lower than in 1932; hence, although about 3 per cent higher than in 1933, the fatality rate on a tonnage basis for 1934 was materially lower than in 1930, 1931 and 1932.

The causes of the accidents during the eleven months January to November 1934 are shown in Table II. The figures for 1934 in the table will be increased when fatalities during December are reported and when figures for earlier months are revised, due to deaths that will result in 1935 from accidents in 1934 that had not proved fatal when the preliminary reports were made.

Table II reveals at a glance at least one reason why our coal-mining fatality rate for both 1933 and 1934 has been relatively low: in 1933 but 40 persons were killed in our coal mines from explosions (major plus minor) and in the eleven months of 1934 (January to November, inclusive) but 42 deaths are recorded from these causes (data for December not being available at this writing). Formerly 200 to 400 or more were killed annually in explosions of gas or dust in our coal mines. Table II indicates that in 1933 and 1934 there was but one major disaster each year, both being in bituminous mines. The table shows that in local explosions in bituminous coal mines twenty persons were killed in 1933 and but fourteen in the first eleven months of 1934, while anthracite mines had the exceptionally good record of operating through both 1933 and 1934 without a major explosion diaster and had but thirteen killed from minor explosions in 1933 and but eleven in the first eleven months of 1934.

Pennsylvania bituminous mines, with almost one-fourth of the coal miners of the United States and producing about one-fourth of the country's coal, and with many dangerously gassy and dusty mines, now have the enviable record of having operated since March 21, 1929, or 5¾ years, with but one major explosion disaster (September, 1933, with seven fatalities). The anthracite mines of Pennsylvania, some of them dangerously gassy and employing about one-fifth of the coal miners of the United States, have not had a major explosion disaster since May 29, 1931, or more than 3½ years. West Virginia coal mines, employing only a slightly fewer number of workers than the bituminous mines of Pennsylvania and producing only a slightly lower tonnage of coal, include many dangerously gassy and

dusty properties, but have not had a major explosion disaster since Nov. 3, 1931, more than three years. Alabama, with various dangerous natural conditions in its coal mines, has not had a major explosion disaster since Dec. 28, 1931, more than three years. Colorado, with many unsafe mines and a very bad past record of explosions, has avoided major coal-mine disasters since May 27, 1927, more than 7½ years. Other coal mining States, such as Utah, Wyoming and Oklahoma, with bad past explosion records now have had several years of operation without any mine explosions. Apparently our coal-mining people, both anthracite and bituminous, have learned how to avoid the much-dreaded explosion disaster, and this is the more gratifying because this is the kind of accident which until a very few years ago was thought to be inherent in the operation of coal mines.

Table II also indicates that another class of supposedly necessary coal-mine accidents, those due to haulage, also are controllable and in 1934 showed a marked decrease. Haulage accidents resulted in but 163 fatalities in the coal mines of the United States for the 11 months of 1934 (January-November, inclusive), against 194 in 1933. This material decrease in number has been achieved jointly by the anthracite and bituminous mines and in the face of a material increase in tonnage. In recent years, haulage accidents have been increasingly difficult to control or reduce and it is gratifying to note that in 1934 there were fewer haulage fatalities than in 1933, when accident occurrence in our coal mines was at the lowest point in the present century.

In 1930 the Bureau of Mines made its first attempt to assemble nation-wide statistics on the occurrence of non-fatal accidents in coal mining. Table III gives available data on both fatal and non-fatal accidents from 1930 to 1934, inclusive.

In bituminous mining it will be seen that the deaths in 1930 were 1,619 and that this figure had been cut to 833 in 1933 and to 926 (estimated) in 1934. In anthracite mining, the death list of 444 in 1930 was decreased to 231 in 1933, and to 259 (estimated) in 1934. The table also shows that in bituminous mining the fatality rate of 3.46 per million tons produced in 1930 was reduced to 2.50 (final) in 1933 and to 2.59 (estimated) in 1934 and the death rate per million man-hours fell from 2.16 in 1930 to 1.48 (tentative) in 1933 and 1.53 (estimated) in 1934. In anthracite mining the fatality rate per million tons fell from 6.40 in 1930 to 4.66 in 1933 and to 4.50 (estimated) in 1934, hence, the anthracite mines apparently continued their downward trend of fatal accident occurrence in 1934 as compared with preceding years including the banner year 1933. The fatality rate per million man-hours of exposure in anthracite mines decreased from 1.76 in 1930 and 1.84 in 1931 to 1.52 (tentative) in 1933 and 1.46 (estimated) in 1934.

From the above it will be seen that anthracite mining has continued to improve its fatality rate through 1934 and that the slight increase in the rate for the coal-mining industry of the United States as a whole is due to recessions in the bituminous industry as compared with the performance of 1933.

Table III indicates that fatalities in the coal mines of the United States fell from 2,063 in 1930 to 1,064 in 1933 and to 1,185 (estimated) in 1934. That this heavy drop in fatal accidents was not due entirely to decreased employment in our coal mines is shown by the fact that the rate of occurrence of fatal accidents fell materially in 1933 and 1934 as compared with 1930 and this is true whether measured on a tonnage basis or by man-hours of exposure. The fatality rate on a tonnage basis for 1930 was 3.84; 2.78 for 1933, and 2.85 (estimated) for 1934, while the fatality rate on a man-hour basis was 2.06 in 1930 and had fallen to 1.49 (tentative) in 1933 and to 1.52 (estimated) in 1934.

Data on non-fatal accidents are not yet available for 1933 or 1934 but there is good reason to believe that both years will show improvement over the records of the previous years (1930, 1931 and 1932) in which such information has been compiled on a nation-wide basis by the Bureau of Mines. Table III shows, however, that both the number and the rate of occurrence of non-fatal accidents (injuries) decreased materially from 1930 to 1931 and from 1931 to 1932.

The year 1934, with its partial emergence from the throes of the long drawn-out depression, has been marked in many, if not most, lines of human endeavor by greatly increased occurrence of accidents and accident rates; coal mining, on the other hand, in 1934 established a safety record unequaled by any other year except 1933 and the difference between the year 1933 and 1934 is so small as to be almost nil. The best feature of this safety record of 1934 is that it leaves in its wake influences and tendencies that may confidently be expected to carry into and through 1935, with establishment of a better record in 1935 than in 1933 or 1934.

Table I—Fatality Rates, 1930-34

	Death rates per million tons			Death rates per million man-hours		
	Bituminous	Anthracite	Total	Bituminous	Anthracite	Total
1930	3.46	6.40	3.84	2.16	1.76	2.06
1931	2.83	6.42	3.31	1.81	1.84	1.82
1932	3.09	4.99	3.36	2.00	1.59	1.90
1933	2.50	4.66	2.78	1.48*	1.52*	1.49*
1934 (est.†)	2.59†	4.50†	2.85†	1.53†	1.46†	1.52†

*Rate computed on a number of man-hours that is subject to slight revision; but such revision, if any, probably will not change the death rates as here given.

†The estimates for 1934 were computed on a basis which gives rates probably slightly higher than final figures will show. Final figures for 1934 will not be available until late in 1935.

Table II—Number of Coal-Mine Fatalities, by Causes

Causes	Year 1933			Jan.-Nov., Inclusive, 1934*		
	Bituminous	Anthracite	Total	Bituminous	Anthracite	Total
Falls of roof and coal	458	119	577	465	136	601
Haulage	162	32	194	139	24	163
Gas or dust explosions:						
Local explosions	20	13	33	14	11	25
Major explosions	7	...	7	17	...	17
Explosives	24	10	34	23	15	38
Electricity	46	7	53	48	4	52
Machinery	23	2	25	15	3	18
Surface and Miscellaneous	93	48	141	81	45	126
Total	833	231	1,064	802	238	1,040

*Figures for 1934 are preliminary and subject to revision.

Table III—Accident Statistics for Coal Mines, 1930-1934

	Men employed	Production (short tons)	Man-hours of exposure	Killed	Injured	Deaths per million tons	Deaths per million man-hours	Injuries per million man-hours
Bituminous								
1930	493,202	467,526,299	750,149,205	1,619	71,217	3.46	2.16	94.94
1931	450,274	382,105,326	595,979,561	1,080	53,975	2.83	1.81	90.57
1932	406,380	309,709,872	479,447,331	958	39,352	3.09	2.00	82.08
1933	418,703	333,630,533	563,800,000*	833	†	2.50	1.48*	†
1934	†	357,800,000*	604,400,000*	926*	†	2.59*	1.53*	†
Anthracite								
1930	150,804	69,384,837	252,542,576	444	32,604	6.40	1.76	129.10
1931	139,431	59,645,652	208,414,569	383	26,374	6.42	1.84	126.55
1932	121,243	49,855,221	156,943,999	249	19,620	4.99	1.59	125.01
1933	104,633	49,541,344	152,300,000*	231	†	4.66	1.52*	†
1934	†	57,600,000*	177,200,000*	259	†	4.50*	1.46*	†
Bituminous and Anthracite								
1930	644,006	536,911,136	1,002,691,781	2,063	103,821	3.84	2.06	103.54
1931	589,705	441,750,978	804,394,130	1,463	80,349	3.31	1.82	99.89
1932	527,623	359,565,093	636,391,330	1,207	58,972	3.36	1.90	92.67
1933	523,336	383,171,877	716,100,000*	1,064	†	2.78	1.49*	†
1934	†	415,400,000*	781,600,000*	1,185‡	†	2.85*	1.52*	†

*Tentative. †Not yet available. ‡Tentative and estimated.

BITUMINOUS PREPARATION

+ Drives for Higher Quality and Greater Efficiency

BITUMINOUS preparation developments in 1934 were largely directed along two paths: construction of entire new plants to replace outmoded operations and revision of equipment and practices at existing plants to enable them to conform to present-day standards of performance. Both activities reflected the growing trend toward shipment of more and smaller sizes, as well as demands for a cleaner, better-prepared product, which were met, in general, by installation of additional mechanical-cleaning capacity, crushing equipment and auxiliary screening and handling facilities.*

Illinois, where the way had been marked out by strip operations in the past, held the center of the stage in mechanical-cleaning installations in 1934, with five separate plants, two located at stripping operations and three at deep mines. The first of the strip plants was that of the Fidelity No. 11 mine, United Electric Coal Cos., which started construction of a 600-ton washing plant for 3x0-in. coal early in 1934.

Major equipment in the new Fidelity washery includes two two-box primary launders in parallel, followed by two sizing shakers for making 3x2-, 2x1¼-, 1¼x¾-, ¾x⅝- and ⅝x¼-in. sizes; a 48-in. rewash launder followed by a vibrating screen to separate out the plus 1-in. material, which is crushed and returned to the system, while the minus 1-in. goes to the sizing shakers; and a free-discharge unit followed by additional "Gyrex" vibrators to separate out the minus 48-mesh material, the ¼-in. x 48-mesh size going to three Carpenter centrifugal dryers, where the surface moisture is reduced to not over 7 per cent before the material joins the ⅝x¼-in. size from the main shakers.

The second Illinois strip washery was the new Delta Coal Mining Co. installation, Carrier Mills, consisting of washing equipment with a capacity of 200 tons per hour in a preparation plant with an over-all capacity of 400 tons per hour. Two other Sinclair strip properties were improved by the addition of washers in 1934: Huntsville-Sinclair Mining Co., Huntsville, Mo., 150 tons of 3x0-in. coal per hour; Hume-Sinclair Coal Mining Co., Hume, Mo., 150 tons per hour, 6x0-in. At West Mineral, Kan., the central cleaning plant of the Pittsburg & Midway Coal Mining Co., strip operator, passed through another year of satisfactory operation at 600 tons per hour, employing Wuensch differential-density cones for 8x¾-in. and Norton washers for ¾x0-in. coal, supplemented by Denver flotation units and filters for recovering 2-mm. material and a D-L-O heat dryer for all coal under 1¼ in.

Activity among the Illinois deep-mine operators culminated in the letting of a contract for a combination wet and dry plant with a capacity of 1,000 tons per hour to serve the Nos. 1 and 2 mines of the Bell & Zoller Coal & Mining Co., Zeigler.

A second wet and dry plant was under construction at the end of the year at the Majestic mine of the Crerar-Clinch Coal Co., DuQuoin, operated by the Peabody Coal Co. Equipment consists of an air-operated jig with a capacity of 105 tons per hour for the 3x⅝-in. size and a pneumatic separator for treating the ⅝x0-in. material at the rate of 50 tons per hour, supplemented by American dedusting and dust-collecting equipment for removing the minus 48-mesh dust, which is separated into two sizes. Peabody also installed an air-operated jig with a capacity of 100 tons per hour at its Taylorville operation, and purchased three dedusting units with a capacity of 150 tons per hour to remove fine material from ⅝x0-in. coal at its Harco mine.

Indiana entered the lists with two dry-cleaning plants in 1934, both exemplifying one of the major trends in late years: installation of facilities for the beneficiation of a particular portion of the output. The Ingle Coal Co., for example, installed air-flow cleaners, vibrators and dust-collecting equipment for cleaning and handling ¾-in. slack at the rate of 100 tons per hour, while the Knox Consolidated Coal Corporation started construction of an air-sand plant with a capacity of 25 tons per hour for cleaning 2x1¼-in. coal at its American No. 2 mine. One mechanical cleaning plant each also was installed in Kentucky, Michigan, Ohio and Pennsylvania—the first named being a dry plant, while Alabama made a number of jig installations.

Southern West Virginia made seven mechanical-cleaning installations in 1934, five of them in the low-volatile field. One high-volatile installation was a semi-portable washing unit including sand-flotation equipment with screens and necessary auxiliary equipment with a capacity of 90 to 100 tons of 4x⅛-in. coal per hour for the Island Creek Coal Co. In the same field, the West Virginia Coal & Coke Corporation purchased a pneumatic separator and dust-collecting equipment for its No. 5 mine. The unit will clean 1¼x0-in. coal at 65 tons per hour.

Low-volatile installations included a three-compartment diaphragm jig with a capacity of 90 tons of 3x⅝-in. coal per hour at the Amigo Coal Co. mine; a hydroseparator and auxiliary equipment with a capacity of 50 tons of stove coal per hour for the Lillybrook Coal Co.; and air-operated jig installations at the following operations: Gulf Smokeless Coal Co., 7x⅛-in. coal, 175 tons per hour; New River & Pocahontas Consolidated Coal & Coke Co.; and the Slab Fork Coal Co. The Gulf Smokeless plant included one of the several installations of vertical-pick breakers made during the year, in this case for breaking lump to 7 in. before washing, and, together with the Hume-Sinclair installation mentioned above, offered concrete evidence of the ability of jigs to operate successfully on coal up to 6 or 7 in. in size.

Tennessee was the site of another of

*Preparation developments in the anthracite region are discussed in the article beginning on p. 57 of this issue; the annual tabulation of new installations, both anthracite and bituminous, including equipment details and capacities of specific installations referred to in the body of this article, appears on p. 77. In addition to those listed in the tabulation, the following Roberts & Schaefer contracts were received too late for inclusion: Bell & Zoller Coal & Mining Co., Zeigler, Ill., supplementing Chance equipment, Stump air-flow cleaner, sizing vibrators and dust-collecting equipment, 240 tons per hour; Dawson Daylight Coal Co., Dawson Springs, Ky., 300 tons per hour; High Splint Coal Co., High Splint, Ky., Stump air-flow cleaner, sizing vibrators and dust-collecting equipment, 100 tons per hour; Pennsylvania Coal & Coke Corporation, Ehrenfeld, Pa., 450 tons per hour.

the several combination plants built in 1934, the Pruden Coal & Coke Co. installing two diaphragm jigs and two air launders, the latter preceded by a Blaw-Knox dedusting unit modified for heat-drying the feed, reflecting the trend to the position that excess moisture causes coal and refuse to stick together, and that drying therefore is a necessary preliminary if maximum efficiency is to be attained.

In mechanical cleaning by wet washing, fine coal, as in past years, constituted a major problem, which was solved in many cases by bypassing the smaller material around the washer where its quality permitted or, in some cases, by the installation of supplementary dry-cleaning units. Where wet-washing is employed for the entire range of sizes, however, the general tendency is to waste the extremely fine material, although equipment for recovery and beneficiation of this material has been installed at a few plants, notably the Pittsburg & Midway operation already mentioned. The Pittsburgh Coal Co., in western Pennsylvania, on the other hand, is using a small and a large Dorr thickener in series for the extreme fines, the underflow from the small thickener going to the clean coal, while the underflow from the large unit goes to the refuse pile and the overflow to the circulating water system.

In most installations of washing equipment handling the entire range of sizes down to zero, operators placed their dependence on the normal dewatering facilities incident to washer operation, although in a few cases the increased interest in other forms of moisture removal was reflected in the installation of heat dryers, mechanical dryers or filters for the finer sizes normally offering the most difficulties from the standpoint of moisture content. Last year also witnessed an increase of interest in the substitution of vibrating screens for shakers in dewatering service, which was paralleled by development of improved methods of applying wedge wire to this type of screening equipment to prevent loosening of the wires. The New River & Pocahontas installation mentioned above furnishes an example of this application, discharge from the washer, with the slack removed, being handled on a new Link-Belt high-speed horizontal vibrator modified to use the Abbe Engineering Co.'s "Rima" wedge-wire sieves.

Wedge-wire sieves have been the subject of some complaint in the past because of premature slot enlargement growing out of loosening of the screen. As a result of research to overcome this condition, a number of installations last year included a new method of supporting the wedge wire developed by the Abbe company to maintain slot width indefinitely, plus new profiles to increase life and longer spacing between crossbars to increase open area. Experiments with duralumin wedge wire were carried on by one bituminous company in 1934. In addition to the decrease in weight, life, in some cases, was found to be longer than phosphor-bronze. "Rima" wedge wire also was offered in "USS 17" and other stainless steels, one company, according to reports, finding that this type of wedge wire, costing twice as much as phosphor-bronze, had four times its life.

Redler Installation at New Orient.

Vibrators also registered another advance in general screening service, particularly in the smaller sizes, a number of operators adopting this type of equipment for rescreeners. As in the past, wire mesh was generally employed, although perforated plates moved farther into the picture for certain applications, as did the long-mesh wire cloth (Abbe "Harp-Screen"), adopted by a number of operators because of the possibilities of classification with smaller openings.

Although interest was widespread, Illinois again held the field in the number of actual installations of dedusting equipment for the beneficiation of the smaller sizes, particularly sizes destined for stoker use. What to do with the dust, however, still constituted a major problem.

Control of the fusion-temperature of ash was the subject of considerable investigation in 1934, and in this connection some companies have found that removing the material below 20-mesh has resulted in a material improvement in the final product. As a corollary, interest in the use of chemicals to modify the burning characteristics of coal, particularly from the standpoint of reducing clinkering troubles through modification of the character of the clinker, was reflected in investigation by a number of operations, which in some cases proceeded to the stage of adoption.

Increased installation of crushing facilities is reported from almost all sections of the country, reflecting the growing trend toward smaller sizes, as well as revisions in practice to meet seasonal changes in demand. A further factor reported from Utah was the increased inroads of wagon mines in the lump market, thus reducing the outlets of the larger companies and forcing them to resort to crushing. The Rocky Mountain region also entered the lists with an unusual departure in tipple design, the National Fuel Co. installing a plant at its Puritan mine specifically designed for removal to another site upon completion of operations on the present site (*Coal Age,* January, 1935, p. 16). Facilities include crushing equipment for breaking down lump in summer, truck-loading equipment for all sizes, and Manierre and Ottumwa box-car loaders. (The manufacturer of the latter equipment offered during the year the MDL loader, a medium-capacity scraper line model.)

Trucking activity registered another advance in 1934, which was reflected in the spread of facilities designed to meet the conditions peculiar to this method of shipping, chiefly installation of storage bins and special types of loading booms, as at the Crapo operation of the Consolidated Coal Co., Michigan (*Coal Age,* November, 1934, p. 411).

In addition to improvement of screening plants and installation of crushing facilities, operations in the Paris field of Arkansas were marked by the installation of two plants designed to handle the large masses of coal produced by scow mining. At one plant, where the slabs as mined generally are 8 ft. long, 4 ft. wide and 22 in. thick, equipment has been installed for shearing off an inch or two of bone on the top of each slab, which then goes to a breaker consisting of a row of vertical picks for reducing the slabs to chunks before screening. Movement of the slab and operation of the picks is synchronized to insure regularity in the size of the chunks. Jewell Coal & Mining Co. also started construction of a new steel slope tipple in 1934 completely equipped to handle scow-mined coal, cleaning and breaking devices following the designs of the company.

As indicated in preceding paragraphs, reconstruction of existing plants for producing and loading additional sizes was a major feature in preparation developments in 1934, particularly in the case of plants based on hand-picking. In general, such reconstruction was based on increasing the number of loading points without increasing the number of loading tracks, which in most cases was accomplished by installation of auxiliary conveying and loading equipment to transport the coal to a point sufficiently far from the original loading point to allow two or more cars to be loaded on the same track at the

same time. In several instances such reconstruction was accompanied by the installation of slack bins to increase flexibility of loading arrangements.

A suspended drive for eliminating shock in the operation of shaker screens, thus allowing a lighter tipple structure, was a feature of the No. 63 tipple of the Consolidation Coal Co., Monongah, W. Va., which went into operation last year (*Coal Age*, July, 1934, p. 277). In this plant, the entire shaker drive, consisting of electric motor, V-belt connection and crankshaft, is mounted on a platform suspended from the tipple structure and free to swing about 1 in. from normal either way. Inertia of the platform and drive mass, plus the action of gravity, opposes the tendency to movement when the screen is loaded. Consolidation also contracted for the largest hand-picking and screening plant reported during the year for installation at Van Lear, Ky.

In improving coal-handling equipment, a number of operators turned to the Redler conveyor in 1934 because of its ability to elevate as well as convey and also to act as its own feeder. Reduced degradation, comparatively low investment cost, high capacity compared to over-all cross-sectional dimensions, adaptability to installation where space is limited and ability to negotiate small-radius curves are additional advantages cited by various users, which include the following: Sahara Coal Co., Mine No. 1, Harrisburg, Ill., conveying various sizes of screenings, including 2x0-in., 16 ft. horizontally from a track hopper and elevating them 35 ft. at a maximum rate of 100 tons per hour; Mine No. 3, recirculating $\frac{5}{8}$x0-in. middling product from a small cleaning unit, 5 tons per hour; Chicago, Wilmington & Franklin Coal Co., New Orient mine, West Frankfort, Ill., four units in a dedusting plant; and the Crab Orchard Improvement Co., Eccles, W. Va., one unit elevating $\frac{1}{2}$-in. screenings from a car-unloading point to the clean-coal belt from the cleaning plant for blending purposes at a rate of 90 tons per hour.

Two of the New Orient conveyors are 17-in. units feeding raw $\frac{5}{8}$x0-in. screenings to the deduster. Each has a capacity of 165 tons, the coal being fed onto a short horizontal section, which turns up at an angle of 32$\frac{1}{2}$ deg. for 47 ft., then vertically to the discharge point about 30 ft. above the feed. Over-all dimensions are 19x21 in. and the operating speed is 93 f.p.m. When $\frac{5}{8}$-in.x10-mesh coal is being made, the 10x48-mesh material is handled by a 15-in. unit (over-all dimensions, 18$\frac{3}{8}$x16 in.), which moves the coal horizontally 27 ft. and then turns up vertically to elevate the material 40 ft. to another 15-in. distributing unit installed horizontally across the length of the storage bin. No delays have been encountered in fifteen months' operation.

COAL'S 1934 CONSTRUCTION RECORD

THE 1934 RECORD of installation of new coal-preparation facilities is given by companies in the table below. This record covers both the bituminous and anthracite industries, and includes rebuilt plants and major installations in existing structures.

This summary of new construction in 1934 was made possible through the cooperation of the following manufacturers of equipment (abbreviations used in the table follow the names in parentheses): Allen & Garcia Co. (Allen & Garcia); American Coal Cleaning Corporation; Blaw-Knox Co.; Chance Coal Cleaner (Chance); Deister Concentrator Co.; Deister Machine Co.; Dorr Co.; Fairmont Mining Machinery Co. (Fairmont); Heyl & Patterson, Inc. (Heyl & Patterson); Hydrotator Co. (Hydrotator); Jeffrey Mfg. Co. (Jeffrey); Kanawha Mfg. Co. (Kanawha); Koppers-Rheolaveur Co. (Rheolaveur); Link-Belt Co. (Link-Belt); McNally-Pittsburg Mfg. Corporation (McNally-Pittsburg); Menzies Separator Co. (Menzies); Morrow Mfg. Co. (Morrow); Pittsburgh Coal Washer Co. (Pittsburgh Coal Washer); Roberts & Schaefer Co. (Roberts & Schaefer); Robins Conveying Belt Co. (Robins); United Iron Works Co.; and the Wilmot Engineering Co.

New Preparation Facilities in 1934*

Coal Company	Plant Location	Capacity, Net Tons per Hour	Preparation Equipment
Amigo Coal Co	Amigo, W. Va	180	Jeffrey[1]
Bell & Zoller Coal & Mining Co	Zeigler, Ill	1,000	Robins[2]
Big Bend Coal & Clay Co	Center Point, Ind	300	Morrow
Canonsburg Coal Co	Canonsburg, Pa	500	Roberts & Schaefer
Consolidated Coal Co	New Lothrop, Mich.	200	Link-Belt
Consolidation Coal Co	Van Lear, Ky	600	Fairmont
Covington Coal Co	Tahona, Okla	200	.....
Delta Coal Mining Co	Carrier Mills, Ill	400	Link-Belt[3]
Federal Coal & Coke Co	Grant Town, W. Va.	150	McNally-Pittsburg[4]
Glen Alden Coal Co	West Nanticoke, Pa.	30	Menzies[5]
	Scranton, Pa.	150	Chance[2]
Gulf Smokeless Coal Co	Wyco, W. Va.	175	McNally-Pittsburg[4, 6]
Hanna Coal Co	Piney Fork, Ohio	350	Link-Belt[3]
H. E. Harman Coal Corporation	Grundy, Va.	450	Roberts & Schaefer
Hocking Valley Mining Co	The Plains, Ohio	250	Robins
Houston Collieries Co	Kimball, W. Va.	125	McNally-Pittsburg[4]
Hume-Sinclair Coal Mining Co	Hume, Mo.	150	McNally-Pittsburg[4]
Huntsville-Sinclair Mining Co	Huntsville, Mo.	150	McNally-Pittsburg[4]
Ingle Coal Co	Little, Ind.	100	Roberts & Schaefer[7]
Island Creek Coal Co	Holden, W. Va.	100	Robins[2]
Jamison Coal & Coke Co	Farmington, W. Va.	350	Robins
Jefferson Co	Smithfield, Ohio	250	Fairmont
Kehoe-Berge Coal Co	Pittston, Pa.	300	Chance[2]
Knox Consolidated Coal Corporation	Bicknell, Ind.	25	Hydrotator[8]
Lehigh Valley Coal Co. (Spring Mtn.)	Hazleton, Pa. (2)	100	Menzies[5]
Lehigh Valley Coal Co. (Hazleton Shaft)	Hazleton, Pa. (2)	100	Menzies[5]
Lillybrook Coal Co	Lillybrook, W. Va.	50	Kanawha[2]
McKeesport Coal & Coke Co	McKeesport, Pa.	125	Link-Belt[3]
National Fuel Co	Frederick, Colo.	500	Allen & Garcia
New Byrne Coal Co	Fairmont, W. Va.	300	McNally-Pittsburg[4]
New River Co	Skelton, W. Va.	350	Pittsburgh Coal Washer
New River & Pocahontas Consolidated Coal & Coke Co	Caples, W. Va.	350	Heyl & Patterson[3]
O. & W. Coal Co	Dunmore, Pa.	50	Menzies[5]
Oakmont Smokeless Coal Co	Oakmont, W. Va.	75	Fairmont
Old Hickory Block Coal Co	Brazil, Ind.	100	Morrow
Peabody Coal Co	DuQuoin, Ill.[10]	105	McNally-Pittsburg[6]
		50	American[11]
	Harco, Ill.	150	Allen & Garcia[12]
	Taylorville, Ill.	100	Link-Belt[3]
Pruden Coal & Coke Co	Pruden, Tenn.	130[13]	Jeffrey
Raymond City Coal Co	Raymond City, W. Va.	250	Allen & Garcia
Rich Hill Coal Co	Hastings, Pa.	150	Kanawha
River Seam Coal Co	Booth, W. Va.	300	Roberts & Schaefer
Robert Gage Coal Co	Unionville, Mich.	200	Link-Belt[14]
Rosedale Coal Co	Maidsville, W. Va.	250	Fairmont
Scotia Coal & Coke Co	Brooklyn, W. Va.	150	Kanawha
Slab Fork Coal Co	Slab Fork, W. Va.	100	Link-Belt[3]
Stevens Bros. Coal Co	Garrison, N. D.	200	McNally-Pittsburg
Suffolk Coal Co	Scranton, Pa.	30	Menzies[5]
Susquehanna Collieries Co	Nanticoke, Pa.	50	Menzies[5]
Tennessee Consolidated Coal Co	Palmer, Tenn.	250	Morrow
Truax-Traer Coal Co	Elkville, Ill.	200	McNally-Pittsburg
United Electric Coal Cos	Fidelity, Ill.	600	Rheolaveur
Warner Collieries Co	Tiltonville, Ohio	125	Morrow
Webb Coal Mining Co	Garrison, W. Va.	300	Morrow
West Virginia Coal & Coke Corporation	Omar, W. Va.	65	American[11]
Westmoreland Coal Co	Yukon, Pa.	260	Roberts & Schaefer
Wheeling Valley Coal Co	Warwood, W. Va.	300	Fairmont
Winding Gulf Collieries	Winding Gulf, W. Va.	200	Kanawha

*Also includes rebuilt plants and major installations of preparation equipment in existing structures; installation of more than one cleaning unit is indicated after address.

[1]Including Jeffrey 3-compartment diaphragm jig for 3x$\frac{1}{4}$-in. coal, 90 tons per hour. [2]Including Chance sand-flotation equipment. [3]Including Link-Belt-Simon-Carves coal-washing equipment. [4]Including Norton vertical-pick breaker. [5]Menzies cone separators. [6]Including Norton coal-washing equipment. [7]Stump air-flow cleaner, sizing vibrators and dust-collecting equipment. [8]Air-sand cleaning equipment; joint contract with Stephens-Adamson Mfg. Co. [9]Including Menzies hydro-separator. [10]Majestic mine, Crerar-Clinch Coal Co. [11]American pneumatic separators. [12]Dedusting installation, including three Algar dedusters. [13]Clean-coal output from two Jeffrey two-compartment diaphragm jigs and two Jeffrey pneumatic tables. [14]Including Link-Belt-Simon-Carves washer, 3x0-in. coal, 100 tons per hour.

BRIQUETTING

+ Moves Further Into the Limelight

ONE possible method of solving the perennial problem of disposal of fines is conversion into a higher-priced fuel by briquetting. While such installations must be related to raw-fuel supply and available markets, several coal companies considered the possibilities sufficiently attractive to warrant additions to old plants or the installation of new plants in 1934. With the output of the new facilities coupled with increased activity at existing plants, indications point to another increase in production in 1934, although there still remains a considerable margin under the peak production of 1,212,415 tons in 1929, including a minor percentage of briquets made from other fuels, chiefly petroleum coke.

While briquet production in Europe is counted in the millions of tons, abundant supplies of good coal at a reasonable price, difficulties with earlier briquetting equipment and methods and the cost of the process have prevented a comparable growth in the United States. Nevertheless, as C. T. Malcolmson, then briquetting engineer, Roberts & Schaefer Co., pointed out in a paper read before the International Railway Fuel Association in 1909, the history of briquetting in this country goes back to 1870, when E. F. Loiseau erected a plant at Port Richmond, Philadelphia, making 8-oz. briquets out of a mixture of 92 per cent anthracite and 8 per cent clay. In 1876, the Delaware & Hudson Canal Co. built a plant at Rondout, N. Y., to utilize anthracite fines with a binder of pitch from gas-house tar. A third plant, with a short life, was built at Mauch Chunk, Pa., shortly afterward, the next important operation being the Mahanoy City (Pa.) plant of the Anthracite Pressed Fuel Co., using anthracite culm with an English pitch binder made from coke-oven tar to produce an 18-lb. briquet; later, the weight was cut to 2 lb. The plant was designed for the production of railway fuel, but operation was hampered by the high ash of the raw fuel and the excessive cost of the binder. In 1892, Ware B. Gay installed a plant near Richmond, Va., for briquetting Virginia anthracite slack, using a coal-tar pitch, and in the same year the National Eggette Coal Co., of New Jersey, built a plant at Huntington, Ark., using a mixture of Arkansas semi-anthracite and bituminous coal and a hard pitch and coal-tar binder. All of these plants, it was pointed out, finally failed because of competition from cheap coal; inexperience in preparing the raw fuel, which generally was too dirty; cost of the process; and inability to get a uniform pitch of the proper specifications.

By 1907, however, the first year in which a regular canvass of the briquetting industry was undertaken by the federal government, output had increased to 66,254 tons, valued at $258,426. Then, as now, bituminous compounds, chiefly asphalt and coal-tar pitches, were the most popular types of binders. Weights of individual briquets in 1907 varied from 2 oz. to 4 lb. Two years later, two of the oldest briquetting firms in the country—Stott Briquet Co., Superior, Wis., and the Standard Briquet Fuel Co., Kansas City, Mo.—began operations, the former briquetting a mixture of 84 per cent anthracite fines, 4 per cent bituminous slack and 9 per cent coal-tar pitch, and the latter a mixture of Arkansas semi-anthracite slack and 5 to 6 per cent coal-tar pitch. In the same year, the Lehigh Navigation Coal Co. began briquetting 94 per cent anthracite culm with 6 per cent of coal-tar pitch at its Lansford (Pa.) plant, which continued in operation until 1926, being succeeded by a plant at Keasbey, N. J., operated by a subsidiary. The Berwind Fuel Co. started its plant at Superior in 1912, operating on a mixture of 94 per cent Pocahontas slack and 6 per cent coal-tar pitch. In 1929, the Berwind Fuel Co. of West Virginia erected a second plant at Berwind, in the Pocahontas field. On the West Coast, the Pacific Coast Coal Co. began operations at Renton, Wash., in 1914, briquetting bituminous slack and subbituminous coal. All of the above plants still are operating on substantially the same raw fuels.

United States Production of Fuel Briquets

Year	Net tons	Value
1907	66,524	$258,426
1908	90,358	323,057
1909	139,661	452,697
1911	218,443	808,721
1912	220,064	952,261
1913	181,859	1,007,327
1914	250,635	1,154,678
1915	221,537	1,035,716
1916	295,155	1,445,662
1917	406,856	2,233,888
1918	477,235	3,212,793
1919	295,734	2,301,054
1920	567,192	4,623,831
1921	398,949	3,632,301
1922	619,425	5,444,926
1923	696,810	5,898,698
1924	580,470	4,986,622
1925	839,370	7,128,404
1926	995,332	8,533,179
1927	970,468	7,985,165
1928	947,423	7,705,617
1929	1,212,415	9,515,205
1930	1,028,865	8,028,736
1931	698,316	5,260,585
1932	470,604	3,458,663
1933	530,430	3,498,280

The majority of the early plants were located in the Eastern States and operated on anthracite fines. Between 1912 and 1914, however, the Central States moved into the lead in production, which they have since maintained except for one year—1920. Early development also was characterized by the construction of plants at various transfer points, notably the docks, to utilize degradation and dust made in rehandling coal. Within the past five years, however, there has been a noticeable trend toward the installation of plants by coal companies at mines which they operate, including, in addition to those mentioned above: Henriette Coal Mining Co., Dunlo, Pa., and the Lehigh Briquetting Co., Lehigh, N. D. (1929); Winding Gulf Collieries, Davy, W. Va. (1930); Covington Coal Co., Tahona, Okla. (1931); Raleigh-Wyoming Mining Co., Glen Rogers, W. Va. (1932); and the Superior Smokeless Coal & Mining Co., Tahona (1933).

Last year, the Lehigh Briquetting Co., which operates a lignite carbonizing and briquet plant using the char as the raw fuel, embarked on a construction program involving the installation of equipment to double carbonizing capacity and including briquetting machinery to correspond. Late in the year, the Paris Purity Coal Co., Paris, Ark., started the installation of a Glenn Smith Fuel Co. press with a capacity of 4 tons per hour to make 3x3x3-in. cubes out of $\frac{3}{8}$-in. slack, employing a standard

briquetting binder with an asphalt base. Another 1934 development was an announcement by the Illinois Geological Survey of the development of a process for briquetting Illinois screenings without the use of an artificial binder.

All authorities agree that the binder, due to its effect on the ash content, burning qualities, hardness and weathering qualities of the finished product, is one of the most important factors in briquet production. As noted above, bituminous compounds have successfully held their place against all other types, thereby, by inference, demonstrating their superiority in the majority of cases. The major change has been in type, most plants today, particularly those recently built, employing an oil-residuum (asphaltic pitch) binder, either alone or in combination with other materials, usually of a vegetable origin, such as corn flour and starch. Early plants, as noted, largely employed coal-tar pitch, with asphaltic pitch as an added starter, supplemented by pitches of other origins and other types of binders. The major source of present-day asphaltic binders is the oil refinery. A desirable characteristic is a low free-carbon content.

Conditioning of the raw fuel and binder before briquetting is a major factor in operation and usually involves drying the raw fuel, crushing, preheating the crushed coal and binder, followed, in some cases, by further mixing in separate units, and tempering. At at least one new plant, however, employing a standard briquetting unit, drying has been eliminated, and the entire cycle of preheating, mixing and tempering is performed in two relatively small mixers mounted above the press. Low-ash raw fuel is a prime necessity in briquetting, and in a number of cases has led to washing. In other cases, contemplated installations of briquetting equipment have been held up pending eventual installation of cleaning equipment. Briquets, as indicated above, cover a wide range of sizes, but upper limits are being lowered in accordance with the prevailing trend in the coal markets of the country.

Reflecting the growth in the industry, briquet distribution has steadily widened, shipments in 1933, according to the U. S. Bureau of Mines, going into 41 States, the District of Columbia, Alaska and Canada. States consuming over 10,000 tons of domestic briquets in 1933 were, in order, as follows: Minnesota, Wisconsin, Massachusetts, North Dakota, Oregon, South Dakota, Iowa, Washington and Pennsylvania. Imports of briquets in 1933 totaled 42,395 net tons, 41,891 tons being discharged at or near Boston, Mass., and 504 tons at New York.

WAGE AGREEMENTS

+ Stabilize Bituminous Operation in 1934

WITH collective bargaining firmly established as the ruling principle in relations between miners and operators in practically all of the major producing fields of the country, labor developments in the bituminous industry last year were featured by adoption of the 7-hour day and 35-hour week, accompanied by increases in basic rates in all fields except Division II and parts of Division V, and the perfection of machinery for settling of disputes arising out of the application of collective-bargaining provisions in fields where this had long been an accepted principle, as well as in regions where the union sway had never been strong or was entirely lacking.

By accepting the 7-hour day, bituminous coal mining became the first major industry to install a working day under eight hours. The way for this action was prepared by Art. V (g) of the bituminous code, which provided for an investigation by NRA to determine before Dec. 1, 1933, the practicability of shortening the work day, revising wage differentials in the various divisions and districts and further increasing or maintaining wages and employment without imposing undue burdens on the industry.

While this study was supposed to serve as a guide for a joint conference of representatives of the operators, the miners and the NRA to determine what, if any, revisions in hours, wages and differentials might be necessary in the light of preliminary experience, it was never presented. As a matter of fact, extended discussion of the question was obviated by inclusion of the shorter day and higher wages in the Appalachian agreement negotiated to replace the old agreement expiring March 31 and applying to all regions in Division I except Michigan, western Kentucky and the southern low-volatile fields, which was immediately followed by the proposal of a code amendment incorporating the 7-hour principle and wage increases in all fields of the country, except as noted above. This amendment, sponsored by a number of subdivisions in Division I, was offered on March 30 and promulgated on March 31 under the guise of an "emergency."

Under the March 31 order, basic inside day rates were increased as follows: Division I—southern high- and low-volatile fields, including the Georges Creek-Upper Potomac field, $4.20 for eight hours to $4.60 for seven hours; northern West Virginia, $4.36 to $4.60; Pennsylvania, Ohio, northern West Virginia Panhandle and Michigan, $4.60 to $5; western Kentucky, $4 to $4.60; Division II—Vanderburgh and Warrick counties, Indiana, temporary rate of $4 allowed deep-mine operators increased to $4.57½; Division III—Alabama, Georgia and Hamilton and Rhea counties, southern Tennessee, $3.40 to $4.60; other southern Tennessee counties, $3.84 to $4.60; Division IV—Kansas, Missouri, Arkansas and Oklahoma, $3.75 to $4.60; Division V—New Mexico, $4.48 to $5.10; southern Colorado, $4.44 to $5.10; northern Colorado, $5 to $5.25; North and South Dakota, $4 to $4.50, with corresponding changes in the outside day rates in each field.

No change was made in the basic day rates in other fields throughout the country, beyond the stipulation that the same wages should be paid for seven hours as for eight. These fields, and the basic inside day rates, were: Indiana (except as noted above), $4.57½; Illinois, $5; Wayne and Appanoose counties, Iowa, $4.56; other Iowa, $4.70; Utah, $5.44; northern and southern Wyoming, $5.42; Montana, $5.63; Washington, $5.40.

Piece-work rates under the March 31 order were subject to the following increases: pick mining, 10c. per ton; machine mining, 8c.; cutting, 1c.; and yardage and deadwork, 9 per cent, except in northern West Virginia, the Southwest and Alabama, Georgia and southern Tennessee, where additional increases were ordered to maintain parity between day and piece earnings. Rates and conditions of the March 31 order were promulgated subject to a further hearing on April 9.

Alabama commercial operators, who had signed an agreement similar to the captive-mine contracts adopted by steel

Table I—Hourly Rates (in Cents per Hour) for Inside Day Labor

(Does not include machine-loading and strip scales, which are given elsewhere. Union districts corresponding to the various fields are given in parentheses)

Classification	Alabama (20)*	So. Tennessee (19)	So. High- and Low-Vol. (30, 28, 19, 17, 16)**	Ohio, Pa., No. W. Va., No. W. Va. Panhandle (2, 3, 4, 5, 6)***	Michigan (24)	Indiana (8, 11)	Illinois (U. M. W., 12; P. M. A. 1)	Wayne and Appanoose, Iowa (13)	Other Iowa (13)	Kansas-Missouri (14)†	Ark.-Okla. (21)	So. Colorado-New Mexico (15)††	Northern Colo. (15)†††	No. and So. Wyoming (22)‡	Utah (22)	Montana (27)	Washington (10)
Basic scale‡‡	54.2	60.4	65.7	71.4	71.4	65.5	71.4	65.1	67.1	57.1	57.1	72.8	75	77.5	77.7	80.5	77.1
Airmen										57½							
Bailers, water			[1]62.3									71.7					
Barnmen														72.5		78.1	
Bosses													2				
Blockers, shaft bottom							67⅝										
Bonders	54¼	60½	65.7	[3]71.4			71¾							77.5			
Helpers	47¼		[4]62.3														
Brakemen			[5]65.7	[3]71.4										75.5			
Bratticemen	54¼	60½	[4]65.7	[6]71.4								72.8	[7]75		77.7	82.1	
Helpers	47¼	56¼	[4]62.3	[8]68													
Cagers, head																82.1	
Cagers		61½	[9]65.7	71.4	71.4		71¾	65½	[10]67½	57¼	57½		75		80		71¾
Helpers		56¼	[11]62.3	[8]68													67½
Car builders		60¼															
Car distributors or signal men			[1]62.3														
Chainers	47¼																
Chock pullers	47¼																
Chute starters																	67½
Couplers	47¼		[12]62.3	[8]68			67⅝						75				
Boys								47⅞	47⅝	42⅝	42⅝			49.5	50.3	59.3	
Crab operators					71.7												
Crew helpers		57½															
Doodlers		49½	[13]51.4														
Drillers	56¼		65.7	[14]71.4					67½		[15]61¾	72.8	[16]75	85.5	82.3	81.4	
Hand, after machine										57½							
Helpers			[17]62.3												75.4	77.6	
Drillers, rock		60½	68.0	73.7													
Helpers		56¼	[4]62.3														
Drilling-machine runners										57½							
Drivers	47¼	56½	65.7	71.4	71.4	65.5	[18]71¾	65½	[10]67½	57½	57½	72.8	[16]75	77.5	77.7	80.4	71¾
Spike team	49½		[14]65.7	[19]75		68.9			69¾	58[20]		[20]72.8				82.1	
Dummy makers															50.3		
Dumpers, inside			[14]65.7														
Helpers			[14]62.3														
Electricians	64¼												80	79.5			
Head or first class																	77½
Second class																	70
Repairing large loaders and cutters							85⅝										
Apprentices and helpers	50½						71¾						75				64⅜
Engineers	47½													77.5		77.6	75⅝
Elec. or steam, slope or auxiliary											57½						68½
Tail-rope, men											57½						
Tail-rope boys											47⅝						
Examiners, mine							85⅝										
Face and wall bosses	62																
Firebosses	65½										65	86	[21]78½				
Fire runners											57½						
Flaggers		42⅝	42.8	[14]48.6			42⅝									59.3	
Gas men										62⅝				91.5			
Gin men			[22]51.4														
Greasers	47¼	56⅜	42.8	[14]48.6									57⅜			59.3	
Boys										42⅜	42⅝			49.5	50.3		
Grippers							71¾										
Hoist (elec.) ops., boys											47⅜						
Hoistmen												72.8	[16]75		80		
Linemen												[23]72.8					
Loaders, after machine										57½							
Machine haulers				[24]71.4	71.4		71¾			57½	57½						
Machine runners	63¼	61½	[25]68	[26]82.1	[27]69.7	28		73	73	62⅜	64⅜	77.4	[28]78½	97	[30]91.4	83.7	
Helpers	51½	60½	[31]65.7			28		69⅜	[12]69⅜	59⅜	60	77.4	75	85.5	85.7	77.6	
Shovelers								69⅜	69⅜								
Bosses													80				
Crew repairing machines								[33]67½	[33]67½	62½							
Machinists											60						
Head or first class											65⅝						77½
Second class																	70
Helpers	50½																67⅜
Masons and bricklayers												72.8		[34]77	80		
Mechanics															80		
Men driving slopes											61⅜						
Handling slate and refuse			[1]62.3				67⅝										
Throwing back horsebacks, conv. mining							81¾										
Handling hh. 2d time							67½										
Miners by the day				[35]71.4	69.7			67½	[36]69⅜	[37]60⅜	61⅜			77.5		82.9	77½
Taken from face	54¼	60½	65.7	71.4	75.4			67½	67½	60⅜		72.8		78.5	78.8		
Loaders																	67½
Doing deadwork outside regular duties			[22]62.3							60⅜							
Cleaning cuttings, coal or clod										57½							
Unskilled	47¼																
Motormen	52½	61½	68	73.7	74.3	73.4	[18]77½	69⅜	69⅜	62½	57½	72.8	75	77.5	80	80.4	71¾
Muckers	47¼	49½	[22]51.4												75.4		
Nippers												72.8	64⅜		75.4	77.6	
Oilers							67⅝	42⅝	42⅝				57⅜				
Parting and connection men																77.6	
Boys																	48⅜
Pick carriers																59.3	
Pickers, slate		56½															
Pipemen		58½	[22]62.3		71.4		67⅝	66		57½		72.8			77.7	77.6	
Head or first class																81.9	77½
Second class																	70
Helpers		49½	[22]51.4														67½
Pullers, empty car, shaft bottom							67⅝										

Included in Union Contracts for Various Bituminous Fields

(Does not include machine-loading and strip scales, which are given elsewhere. Union districts corresponding to the various fields are given in parentheses)

Classification	Alabama (30)*	So. Tennessee (19)	So. High- and Low-Vol. (30, 28, 18, 17, 16)**	Ohio, Pa., No. W. Va., No. W. Va. Panhandle (2, 3, 4, 5, 6)***	Michigan (24)	Indiana (8, 11)	Illinois (U. M. W., 12; P. M. A. 1)	Wayne and Appanoose, Iowa (13)	Other Iowa (13)	Kansas-Missouri (14)†	Ark.-Okla. (21)	So. Colorado-New Mexico (15)††	Northern Colo. (15)†††	No. and So. Wyoming (22)‡	Utah (22)	Montana (27)	Washington (10)
Pumpmen	47½	56½	62.3	[3]68	71.4			63½	63½		57½	71.7	75	75.5	75.4	81.9	67½
Pushers								63½		57½	57½						
Repairmen, car		56½															
Conveyor							71.4										
Machine															80	82.1	
McGinty														77.5		82.1	
Pulley																80	
Rock-dusters	47½											72.8					
Rockmen	54½														77.7		
Head															80		
Helpers	47½																
Rollermen	47½											72.8			77.7		
Roperiders												72.8	67	77.5	77.7	77.6	71¾
Main rope																82.1	
Rope splicers														77.5		82.1	
Section men	62																
Shot chargers after machine										57½							
Shotfirers and shooters	56½		[3]68	[3]971.4		[4]087.9	86		67½	62¾	64¾	82.9	78½	85.5	[4]185.7	81.4	
Rock and slate			[11]65.7				78½										
Shot examiners									80½					85.5			
Sinkers, shaft							78½	69¾	69¾	60¾	65	77.1	78½			83.6	
Shift leaders	54½						84½										
Snappers			[4]265.7	[4]371.4													
Spotters																	67½
Spraggers		56½	[44]65.7	[3]71.4			67¾										
Boys										42¾	42¾						
Sprinklers												64.1			75.4		
Stoppings builders							67¾										
Substation attendants	47½																
Switchers																	71¾
Switch throwers		42¾	42.8	[14]48.6			42¾										
Boys														49.5	50.3		
Timbermen	54½	60½	65.7	71.4	71.4		71¾		67½	57½	57½	72.8	[7]75	77.5	77.7	82.9	77½
Head									67½						80		
Helpers	47½	56½	62.3	[3]68					63½			71.1			75.4	77.6	67½
Timber packers																	67½
Pullers														85.5			
Trackmen	54½		65.7	71.4	73.9		71¾		67½	57½	57½	72.8	[7]75	77.5	77.7	82.9	77½
Head		60½						67½							80		
Helpers	47½	56½	62.3	68	69.1				63½	54¾	53½	71.1			75.4	77.6	67½
Trappers	47½	42¾	42.8	48.6		37.3	42¾	42¾	42¾	32	32½	54.4	48½	49.5	50.3	50	48¾
Old men				[19]52.1													
Tripriders	47½	56½		[24]71.4	71.4	67	[18]71¾	65½	[10]67½		57½			77.5			
Trimmers, car	47½																
Utility men		49½															
Water haulers				[24]71.4	71.4		71¾		67½	57½	57½						
Weighmen	59½																
Wiremen	54½	60½	65.7	71.4			71¾					72.8			80		
Helpers	47½	56½	62.3	[3]68											75.4		
Yardmen	47½																
Other inside labor	47½	46¾	62.3	68	69.1	65.5	67¾	63½	63½		53½	64.1	75	75.5	75.4	77.6	67½

*Commercial agreement; Alabama captive-mine agreements correspond, in general, to the commercial agreement.

**Includes the following fields: Big Sandy-Elkhorn, Harlan and Hazard, Kentucky; southern Appalachian, Kentucky-northern Tennessee; Greenbrier, Kanawha, Logan, New River, Pocahontas-Tug River, Williamson and Winding Gulf, southern West Virginia; also Georges Creek-Upper Potomac, Maryland-West Virginia.

***Includes the following fields: Columbiana, Coshocton, eastern Ohio, Hocking, Massillon and Salem-Leetonia, Ohio; central Pennsylvania, Somerset County, western Pennsylvania and Thick Vein Freeport, Pennsylvania; northern West Virginia; and the northern West Virginia Panhandle.

†Cherokee and Crawford counties, Kansas; Barton County, Missouri.

††Rates as they may apply at mines covered by the Colorado-New Mexico and Colorado Fuel & Iron Co. agreements.

†††Rates as they may apply at mines covered by the northern Colorado and Rocky Mountain Fuel Co. agreements.

‡Rates as they may apply at mines covered by the northern Wyoming, southern Wyoming and Union Pacific Coal Co. agreements.

‡‡Basic scales in each field correspond with those established by the bituminous code.

[1]Big Sandy-Elkhorn only. [2]Per month, $108.30. [3]All districts except Hocking. [4]Big Sandy-Elkhorn, Harlan, southern Appalachian and low-volatile districts only. [5]All districts except Harlan.

[6]Hocking and northern West Virginia; eastern Ohio and northern West Virginia Panhandle, 68c.; specific scale not included in other districts. [7]Alpine mine, 67¾c. [8]Northern West Virginia only. [9]All districts except Big Sandy-Elkhorn and Harlan. [10]Subdistrict No. 4, 66⅔c.

[11]Low-volatile districts only. [12]Low-volatile districts only; Harlan, 65.7c.; specific scale not included in the other high-volatile agreements. [13]Southern Appalachian only. [14]All districts except Hocking, eastern Ohio and northern West Virginia Panhandle. [15]Including shooting, day-wage mines.

[16]Also 67c. [17]Big Sandy-Elkhorn, Harlan and southern Appalachian districts only. [18]Handling mantrips, 50c. per day extra. [19]Hocking only. [20]Colorado Fuel & Iron Co., three or more mules, 74½c.

[21]Alpine mine, 80⅝c. [22]Harlan and southern Appalachian only. [23]Colorado Fuel & Iron Co., 72.1c. [24]Hocking, eastern Ohio and northern West Virginia Panhandle only. [25]All districts except Georges Creek-Upper Potomac.

[26]Coshocton and Massillon only; eastern Ohio and northern West Virginia Panhandle, 73 7c.; specific scale not included in other agreements. [27]Deficient work only. [28]Chain-machine operator and helper, 72 3c.; puncher operator, 74.7c.; helpers, 65.5c.; rates apply only to opening new mines and deficient work. [29]Alpine mine, 71⅝c. [30]Cutting, shearing and drilling machines, 97.1c.

[31]Harlan, southern Appalachian and low-volatile districts only. [32]Helpers, Subdistrict No. 4, 67½c.; shovelers, 69¾c. [33]Each hour after 30 minutes. [34]Northern Wyoming, 77½c. [35]Reopening old workings, central Pennsylvania and Somerset County mines only.

[36]Deficient entries, narrow work and room turning; cleaning up falls at face, over 3 in.; scrapping excess bottom; loading rock to get at coal; also at other work when place is not available, 67½c. [37]When using own tools, shall receive 11c. extra per day. [38]Hazard, Harland and southern Appalachian only. [39]Northern West Virginia only. [40]Pick mines, $1.071.

[41]Or $180 per month. [42]All districts except Big Sandy-Elkhorn, Harlan and low-volatile. [43]All districts except eastern Ohio and northern West Virginia Panhandle. [44]All districts except Big Sandy-Elkhorn and low-volatile.

companies in that State and western Pennsylvania earlier in the year, on March 16 immediately went into the federal court for a temporary injunction preventing application of the order, but even with this protection were unable to reopen operations shut down April 6 due to opposition from the miners. Southern Tennessee, most of northern West Virginia, a large part of western Kentucky and the Southwest (strippers excepted) closed down on April 2 or shortly thereafter in protest against the new scales, and temporary stoppages occurred in a number of other fields in the East and Middle West as a result of misunderstandings, preparations for the change-over or failure to sign new agreements immediately in certain fields. Most of the latter interruptions were cleared up within a relatively short time.

Table II—Hourly Rates (in Cents per Hour) for Outside Day Labor

(Does not include strip scales, which are given elsewhere. Union districts corresponding to the various fields are given in parentheses)

Classification	Alabama (20)*	So. Tennessee (19)	So. High- and Low-Vol. (30, 28, 19, 17, 16)†	Ohio, Pa., No. W. Va., No. W. Va. Panhandle, (2, 3, 4, 5, 6)†	Michigan (24)	Indiana (8, 11)	Illinois (U.M.W., 12; P.M.A., 1)	Wayne and Appanoose, Iowa (13)	Other Iowa (13)	Kansas-Missouri (14)†	Ark.-Okla. (21)	So. Colorado-New Mexico (15)†	Northern Colorado (15)†	No. and So. Wyoming (22)†	Utah (22)	Montana (27)	Washington (10)
Basic scale‡	40	1466/7	51.4	57.1	265.4	60	57.1	57.1	57.1	50.4	50.4	58.6	60.7	3	64	68.9	4583/7
Aerial tramway operators			554.8														
Armature winders	623/4														82.3		
Barnmen																6	
Bathhouse men													7				
Beltmen (washery)		466/7															
Bit sharpeners		50	54.8	860.6													
Blacksmiths	591/2	613/7	968	1071.4	74.3	62.5	69	1167 1/2	1167 1/2		60	72.1	1276 3/7	77	77.7	84.3	
Head and first class			1368	1473.7						62 1/2	64 3/7			83	84.6		80
Second class			565.7	1571.4						59 2/7							70
Helpers	40	491/7	1654.8	1767.9			60			54 3/7	53 1/7	62.1	60	67	68.6	71	64 2/7
Boilermakers														1884			
Boommen			1954.8														
Box-car loader operators													2071 3/7	73.5	74.3		
Box-car shovelers													53 3/7	71.5		73.7	
Brakemen																71.1	
Head																74.7	
Bunker-machinery tenders																	67 1/7
Cagers																	67 1/7
Helpers																	64 2/7
Car cleaners			2151.4	857.1													
Car droppers			2154.8	860.6								62.1	2264 2/7		68.6		64 2/7
Head															70.8		
Carpenters	51 1/2		568	2365.7	72.9		62 2/7 to 71 3/7				54 4/7	69.3	61 3/7	78.5	80	83.6	
Head and first class															80		80
Second class																	68 3/7
Helpers	40		554.8												68.6		58 4/7
Chainers	40																
Choppers																	64 2/7
Chunkers								57 1/7	57 1/7								
Coal inspectors																72	
Coaling-station operators				2457.1													
Couplers	40		2551.4	2648.6				476/7				58.6			64	59.3	43 4/7
Boys														49.5	50.3		
Couplers, supply motors			955.4														
Couplers, yard		426/7	942.8														
Crusher operators			2551.4														
Drill boys																52.6	
Drivers								57 1/7	57 1/7							72	
Cart															64		
Tram			954.8														
Drum runners		613/7	968									69.3					
Dumpers	40	50	54.8	60.6	69.1			57 1/7	57 1/7			62.1	53 3/7		70.8		64 2/7
Head																73	
Helpers			1051.4														
Dumpers, slate and rock	40	426/7	942.8														
Electricians	623/4		568									72.1	80	79.5	80		
First Class																84.3	77 1/7
Second class																78.4	70
Helpers	40		554.8									69.3	60				64 2/7
Engineers			968		66.8			67	27				2875	85.5	85.7		29
First class				3071.4		31	32			33	3456 7/8		3575			84.9	
Second class				3068		31	32			33	3453 6/8		3675			78.4	
Third class				3064.6		31	32			33	3448 7/8		7137				
And firemen, comb			2557.1	2471.4									7134				
Development																	29
Hoisting	3757 1/4		565.7	3871.4								72.1					
Steam				3080.4													
Electric				4071.4													
And substation, comb												72.1					
And power-house, comb												72.1					
Power-house			4162.8											42			29
And man-hoist, comb		613/7		2471.4													
Refuse	453/4																
Slope										4350							
And man-hoist, comb				2473.7													
Stationary, steam				3971.4													
Tail-rope								57 1/7	27	4350	53 6/7						
Boys											47 1/7						
Engineers, steam-locomotive			568									72.1					
Fanmen	40																
And substation attendants			2551.4	2457.1													
Feeder chainmen			2554.8														
Firemen			1451.4	4367.9	60.5	60	62 3/7	57 1/7	57 1/7	1050 3/7		62.9	4771 3/7	1870.5		75.9	29
And substation and fan tenders, comb				2459.4													
Fan																75.9	
Heating-plant												58.6					
Power-house		526/7	2551.4									62.9					
Helpers							60										
Foremen, top													4978 4/7				
Ginmen		426/7	942.8														
Greasers	40	426/7	3042.8	5148.6												59.3	43 4/7
Boys														49.5			
Hoistmen, inclined rock dump										51 3/7							
Slate			1054.8														
Jig and table runners		50															61 3/7
Knucklemen												60.7					
Lampmen	5245 3/4		5362.8	2465.1								67.4	5476 3/7		5572		
First class																	67 1/7
Second class																	61 3/7
Helpers			551.4														
And power-house men, comb												67.4					
And man-hoist engs., comb				2471.4													
And substation men, comb												67.4					

Included in Union Contracts for Various Bituminous Fields

(Does not include strip scales, which are given elsewhere. Union districts corresponding to the various fields are given in parentheses)

Classification	Alabama (20)*	So. Tennessee (19)	So. High- and Low-Vol. (30, 28, 19, 17, 16)†	Ohio, Pa., No. W. Va., No. W. Va. Panhandle, (2, 3, 4, 5, 6)†	Michigan (24)	Indiana (8, 11)	Illinois (U.M.W., 12; P.M.A., 1)	Wayne and Appanoose, Iowa (13)	Other Iowa (13)	Kansas-Missouri (14)†	Ark.-Okla. (21)	So. Colorado-New Mexico (15)†	Northern Colorado (15)†	No. and So. Wyoming (22)†	Utah (22)	Montana (27)	Washington (10)
Larrymen			[25]54.8														
Helpers			[25]51.4														
Linemen	52¾											72.1					
Machinists	62¾							[11]67½	[11]67½					79.5	80		
Head and first class																84.3	77½
Second class																78.4	70
Assistants															75.4		
Helpers	40													69			
Masons and bricklayers			[7]68									71.6		[30]77			64½
Mechanics				[21]74.3								72.1	76½		80		
Assistants															75.4		
Helpers				[21]68								69.3			70.8		
Men handling slate and refuse			[25]51.4									69.3					
Miners taken from face								67½						[30]78.5			
Motormen											57½					81.4	71½
Supply		54½	[9]60														
Oilers								42½				58.6				72	
Tipple			[25]51.4												64		
Car															50.3		
Boys																	
Painters												65.9					
Pickers	34¼	42½	42.8	[17]48.6							32½	58.6	[58]60		57.1	68.9	58½
Head																	64½
Boys							42½ & 57½	42½	42½	37½	28½	52.1	[30]56	49.5	50.3	50	46½
Pipemen														[60]77	77.7		
Helpers															68.6		
Prop sawers															68.6		
Helpers															64		
Pumpmen																	
Pushers, car		42½	[6]42.8										75				
Railroad-car loaders	40							57½	57½			62.1	64½				58½
Repairmen																28.6	
Helpers																70.9	
Repairmen, car	49¼	50	54.8	[6]60.6			62½ to 69½		57½			62.9	64½	68	70.8	78.6	65½
Head															75.4		
Helpers			[16]51.4	[24]57.1												70.9	
Repairmen, electrical, 1st			[25]68														
Second class			[25]62.3														
Helpers			[25]54.8														
Repairmen, tipple			[16]54.8														
Helpers			[5]54.8														
Rope cutters																73	
Rope riders															77.7		
Sand dryers	36	46½	51.4	[5]57.1													
Scalers	40																
Shaker and spiral runners																	
Slopemen, top and bottom			[25]54.8										64½		74.3		
Spraggers	40	42½	[9]42.8					47½									
Substation ops. and attendants		52½	[5]51.4														
Tablemen		46½															
Teamsters		46½	[6]51.4	[24]57.1				57½	57½			58.6	[64]60	[65]67	68.6	72.7	64½
Timber framers																72	
Timbermen			[9]42.8														
Tipple bosses													[35]71¾				
Operators			[5]54.8														
Men	40		[25]51.4	[19]60.6								58.6	[66]64½	68	70.8	71.1	
Tool sharpeners													68½		77.7	82.1	
Trackmen, incline		49¼															
Trimmers		50	[67]54.8	69.6	69.1												
Truck drivers		46½	[6]51.4	[24]57.1								59.7		[65]67	68.6	72.7	64½
Utility men		54½															
Washer operators	57¼		[5]54.8									62.1					67½
Second class																	64½
Helpers and labor	40																
Water tenders																75.9	
Watchmen	40	46½											68	63			
Weighmen	52½											67.4	[69]75				
Welders														79.5	80		
Wheelmen				[24]73.7													
Helpers				[24]71.4													
Yardmen		42½	[9]42.8														
Other outside labor			[21]51.4	57.1	65.4	60	57½	57½	57½	50½	50½	58.6	57½	[70]63.5	64	68.9	58½
Boys and old men		27½	[16]42.8									47.9					

*Commercial agreement; Alabama captive-mine agreements correspond, in general, to the commercial agreement.

†See footnotes to Table I for fields and/or agreements covered in this group.

‡With the exceptions noted, basic scales in each field correspond with those established by the bituminous code.

[1]Basic scale provided in coal code, 46.2c. [2]Basic scale in coal code, 57.1c. [3]Southern Wyoming, 63½c.; northern Wyoming, 64.9c. [4]Basic scale provided in code, 57.1c. [5]Low-volatile fields only.

[6]Over fifteen horses, $152.40 per month; under fifteen, $140; assistants, $131.50. [7]Per month, $90. [8]All districts except Hocking. [9]Harlan and southern Appalachian only. [10]Central Pennsylvania, Somerset County, Coshocton, Massillon, Salem and Columbiana only.

[11]Minimum. [12]Also 63¾c. [13]Big Sandy-Elkhorn only; low-volatile districts, 74.3c.; specific rate not given for other fields. [14]Eastern Ohio and northern West Virginia Panhandle only; Hocking, 71.4c.; northern West Virginia, 74.3c.; specific scale not included in other agreements. [15]Eastern Ohio and northern West Virginia Panhandle only; Hocking, 67.9c.; northern West Virginia, 68c.; specific rate not included in other agreements.

[16]Big Sandy-Elkhorn and low-volatile fields only. [17]Massillon and Columbiana only; central Pennsylvania and Somerset County, 68c.; eastern Ohio and northern West Virginia Panhandle, 65.7c.; specific rate not included in other agreements. [18]Also 73½c. in southern Wyoming plants operating 24 hours per day. [19]Low-volatile fields; Big Sandy-Elkhorn, 51.4c.; specific rate not given in other agreements. [20]Also 56½c.

[21]All districts except Harlan. [22]Also 53¾c. [23]Eastern Ohio and northern West Virginia Panhandle only; Hocking, 67.9c.; Columbiana, 60.6c.; specific rate not included in other agreements. [24]Northern West Virginia only. [25]Big Sandy-Elkhorn only.

[26]Coshocton, Massillon, Salem, Columbiana, eastern Ohio and northern West Virginia Panhandle; Hocking and northern West Virginia, 57½c.; specific scale not included in Pennsylvania agreements. [27]Engineers' scales appealed to National Labor Board. [28]Alpine mine, $140.18 per month. [29]Main hoisting engineer, $5.40 per day; power-house and compressor, $4.90; development, $4.70; firemen, $4.70. [30]Coshocton and Massillon only.

[31]First engineer, $167.53 per month; second engineer, $158; third engineer, $153.23, all working eight hours per day. [32]Class A mines (500 tons or more daily)—first engineer, $163.10 per month; second, $153.76; third, $149.10; fourth (if employed), $144.42; Class B (200–500 tons)—first, $158.42; second and third, $149.10; fourth (if employed), $144.42; Class C (under 200 tons)—first, $158.42; second, $146.76; each working eight hours and doing own firing; Class D (under 100 tons)—each engineer, doing his own firing, $144.42, working eight hours; engineers at mines in the course of sinking, $5.87 for eight hours. [33]First class (over 500 tons), $114.62 per month; second (300–500 tons), $109.37; third (under 300 tons), $102.36. [34]Monthly rates, first class (over 500 tons), $118.30; second (300–500 tons), $111.02;

third (under 300 tons), $101.66; rates also apply to slope engineers hoisting to tipple. [35]Also 78½c. [36]Also 71¾c. [37]Night, 51½c. [38]Salem and Columbiana only; northern West Virginia, 81.7c.; specific rate not given in other agreements. [39]Hocking only. [40]Minimum, Hocking only. [41]Big Sandy-Elkhorn only; low-volatile districts, 68c.; specific rate not given for other fields. [42]Per month, $142. [43]Or $103.84 per month; maximum, 51⅜c. per hour, or $106.75. [44]Harlan, southern Appalachian and low-volatile fields only. [45]Hocking only; Salem, 64.6c.; Columbiana, 66c.; northern West Va., 71.4c.; specific rate not in other agreements. [46]Night. [47]Also 60c. [48]Also 61½c in southern Wyoming plants operating 24 hours per day: northern Wyoming, firemen, 71½c. [49]Also 75⅔c. [50]Harlan and southern Appalachian only; low-volatile fields, 51.4c.; specific rate not given for other fields. [51]All districts but Hocking, 57.1c., and Pennsylvania fields, no scale. [52]Night, 40c. [53]Big Sandy-Elkhorn only; low-volatile fields, 54.8c.; specific rate not given for other fields. [54]Also 60¾c. and $125.12 per month. [55]Or $140 per month. [56]Northern Wyoming, 77½c. [57]All districts except Hocking (57.1c.). [58]Also 45¼c. [59]Also 44⅔c. [60]Northern Wyoming, 77½c.; pipemen at Union Pacific Coal Co. plants, southern Wyoming, operating 24 hours per day, 67½c. [61]Harlan and southern Appalachian only; Big Sandy-Elkhorn, 51.4c.; specific rate not given for other fields. [62]All districts except northern West Virginia (68.6c.). [63]Big Sandy-Elkhorn, Harlan, southern Appalachian and low-volatile fields only. [64]Also $106.20 per month. [65]Northern Wyoming, 67½c. [66]Also 57¾c. [67]Big Sandy-Elkhorn, 51.4c. [68]Per month, $127. [69]Also 71¾c. and 67c. [70]Also 55½c. at plants of Union Pacific Coal Co. in southern Wyoming operating 24 hours per day; northern Wyoming scale, 65c.

As a result of protests at a hearing April 9, coupled with developments in the field, NRA on April 22 granted reductions bringing basic inside day rates in certain fields down to the following: Alabama, Georgia and Hamilton and Rhea counties, Tennessee, $3.80; other southern Tennessee counties, $4.24; Southwest, $4.35. Northern West Virginia day rates were unchanged, but that field was granted a concession in that the extra increase to maintain parity was limited to 2½c. per ton for loading and ½c. per ton for cutting. Western Kentucky's pleas for a reduction were refused, and the concession to Alabama was accompanied by a stipulation that no sales could be made in the normal consuming markets of another district paying higher wage scales at prices less than those charged by the other district.

Like Alabama, western Kentucky refused to accept the new scale, retaining instead the old $4 rate and securing a temporary injunction in the federal court to prevent prosecution by NRA. This injunction was argued in the U. S. Circuit Court of Appeals late in the year, but decision was reserved. The Southwest also threatened court action, and as a result of this and an investigation by NRA was granted rates of $4 per day for deep mines and $4.35 per day for strip mines in an order issued June 4. This concession, however, was accompanied by the same stipulations as to "destructive invasion" as were applied in Alabama, and "in view of the situation existing" in western Kentucky, the same restrictions were applied to that field also.

New hourly inside and outside day rates adopted in the various union fields of the country as a result of the amend-

Table III—Day Scales (in Cents per Hour) for Mechanical Loading Established in Union Agreements for Various Districts

(Union districts corresponding to the respective fields are shown in parentheses)

	Alabama (20)	Big Sandy-Elkhorn (19)	Virginia (28)	Coshocton (6)	E. Ohio-No. W. Va. Panhandle (6)	Cent. Penna.-Somerset (2)	West. Penna. (3, 4, 5)	No. W. Va. (31)	Georges Creek-Upper Potomac (16)	Indiana (11)	Illinois (U. M. W., 12; P. M. A., 1)	Wayne and Appanoose, Iowa (13)	No. and So. Wyoming (22)	Utah (22)	Montana (27)	Washington (10)
Conveyors																
Operators																80.0
Operators, duckbill																85[7]
Loading and/or shoveling	50½	65.7								96[4]	[1]81¾	[2]67½	91.5		94.3	85[7]
Loading and cutting				82½									[1]85.5		[1]88.6	80
Crew members at face			[3]68													
Moving conveyors						71.4			65.7							77½
Crew leader, moving									68							
Mechanical Loaders																
Operators		68			98		[4]88.6	88.6		96[4]	100		103	97.1	[5]104.3	
Helpers		62.3			75.4			73.7		96[4]	[6]89¾		85.5	85.7	[5]90.3	
Helpers and preparation men							[4]73.7									
Operators, rock					80.6			84.6			85¾					
Clean-up men at face					71.4						81¾					
Scraper Loaders																
Holstmen													103		[7]104.3	
Helpers (rope- and scoopmen)													85.5		90	
Cutting Scales																
Operators:																
Arcwall machines															105.7	
Cutting machines					98			88.6		96¾	100		[8]97	91.4	96.9	91[7]
Helpers								88.6		96¾	100		[8]85.5	85.7	96.9	
Cutting and shearing machines							88.6									
Helpers							88.6									
Cutting, shearing and drilling machines														97.1		
Helpers														85.7		
Shearing machines					98					96¼	85¾				96.9	
Helpers										96¼					96.9	
Shearing and drilling machines															105.7	
Other Classifications																
Brushers or trimmers													[8]85.5			
Drillers										87¾	82½		[8]85.5	82.3	88.6	82[7]
Helpers														75.4		
Drill operators, track-mounted							78.3									
Helpers							68									
Drivers													[8]77.5			
Entry-driver operators											100					
Face men													85.5		88.6	80
Handlers, rock and material													75.5			
Maintenance men											[9]85¾				80.3	
Shotfirers and shooters										87¾	82½		[8]85.5	85.7	88.6	
Snubbers										87¾	82½					

[1]Also pit-car loaders. [2]Basic rate applying pending establishment of tonnage scale. [3]Up to point where footage rate applies. [4]44-C operator, 84.6c.; helper and preparation man, 73.7c. [5]Jeffrey combination loader operator, 94.3c.; helper, 88.6c. [6]Progressive scale, 89¾c. [7]Small scrapers, 88.6c. [8]Northern Wyoming only. [9]Large loading and cutting machines; conveyor repairmen, 71¾c.

Note: All labor employed in gang work on conveyor or scraper mining in the southern West Virginia low-volatile fields (not included in above table), 68c. per hour.

ments of March 31, April 22 and June 4 are shown in Tables I to III accompanying this article; strip scales, in Table IV. New tonnage, yardage and deadwork rates are given in a separate supplement folded into this issue. These tabulations are based on the text of the revised agreements and reproduce the wage scales set forth therein, except in cases where new scales have not been printed or could not be obtained, in which case the old rates have been adjusted in conformity with the provisions of the amendments cited above.

As a result of developments during 1934, formal agreements now apply in all the major bituminous fields of the country with the exception of the Tennessee-Georgia field, western Kentucky and Ray and Clay counties, Missouri, where existing agreements were not renewed, and the Dakotas. In addition, a number of Harlan County (Ky.) and Virginia operators refused to sign up again last year. Alabama and the captive mines, on the other hand, represent gains for the United Mine Workers. All agreements expire on March 31, 1935.

One goal of the United Mine Workers —universal installation of the check-off —apparently was attained in 1934, all agreements including this method of collecting dues in one form or another. Penalties for strikes or lockouts in violation of terms found their way into more agreements last year, and now apply in all fields but Alabama; Harlan and Hazard, Kentucky; the southern West Virginia low-volatile fields; all Ohio, eastern Ohio excepted; Michigan; Wayne and Appanoose counties, Iowa; Rocky Mountain Fuel Co. mines in northern Colorado; northern and southern Wyoming; and Utah.

With the settlement of stoppages growing out of the March 31 and subsequent code amendments, peaceful relations between operators and miners continued throughout the remainder of 1934 with only a comparatively few minor interruptions. The warfare between the United Mine Workers and the Progressive Miners of America continued throughout the year, however, taking an increasing toll of lives and property damage. A drift back to affiliation with the United Mine Workers gathered strength in the last months of the year, but had no appreciable effect on the insurgents' attempts to extend their sway to additional operations throughout the State, in spite of rebuffs from the divisional and national bituminous coal labor boards, the National Labor Relations Board and, in some cases, the courts.

One factor in the peaceful course of events last year was the operations of the various divisional labor boards set up under the bituminous code, supplemented by the work of the national board acting in an appellate capacity. One feature of the interpretive and adjudication work of the divisional boards was their general refusal to upset existing contracts in favor of contesting groups, particularly in Illinois, where this question figured in a number of complaints brought by the Progressives. A second feature was the general refusal of the boards to accept jurisdiction where machinery for settling the dispute in question was provided in a wage agreement or in other agreements governing relations between the operators and the miners.

Table IV—Strip Mining Scales (in Cents per Hour) Included in Various Union Agreements

(Union districts corresponding to the respective fields are shown in parentheses)

	Indiana (8, 11)	Illinois (12)	Iowa (13)	Southwest (14)
Blacksmiths	71.4	88½	67½	
Construction				68
Repair				64½
Helpers	67	81¼		
Boilermakers	71.4			
Cagers, pit				62½
Tipple				58½
Channel-machine operators	79.9		73	
Helpers	79.9			
Coal cleaners, dirt shovelers	65.4	71¾		
Coalers				62½
Construction, erecting, moving and dismantling men		57½		
Couplers	63			58½
Cranemen, stripping shovels	[1]91.6	104¼		[2]
Ditchers	65.4			62½
Drillers, coal		74		
Overburden		71¾	67½	62½
Helpers		71¾	63¾	59¾
Drillers, churn and hand, and machine power	65.4			
Surface, power	78.2			
Helpers	65.4			
Drillers and shooters			67½	
Drivers	65.4			62½
Each additional animal				1½
Hauling coal and shoveling with cars				62½
With team				79
Tram, with team				79
Dumpers	60.1			53¾
Electricians	79.9	85½	81¾	
Apprentices and helpers	65.4	71¾		
Engineers, derrick				78¾
Dragline	[1]84.6		85¾	[2]
Haulage, motormen	73.4			
Horseback excavator				[2]
Loading shovel	[1]84.6	[3]103½	85¾	[2]
Locomotive		92¼	80	63¾
Locomotive crane				[2]
Stripping-shovel	[1]84.6	[3]103½	85¾	[2]
Tail-rope				62½
Tipple				63¾
Firemen, loading-shovel		88¼	67½	[2]
Locomotive		83¾		
Stationary				53¾
Stripping-shovel	[1]78.6	101¾	67½	[2]
Flat trimmers, tipple	60.1			53¾
Greasers, boys				46
Groundmen	65.4	73¾	67¼	[4]62¼
Hostlers, night		73¾		
Pit			67½	
Tipple			62¾	
Loaders, hand, truck or conveyor			67¼	
Machinists	79.9			
Oilers, stripping shovels	[1]69.5	95¾		[2]
Oilers and greasers, shovel	65.4		67½	
Tipple			57½	
Pickers, sledge or pick			57½	
Boys			42¾	40
Pumpers	65.4	71¾	63¼	62½
Repairmen, general			67½	
Shovelers				62½
Shotfirers and shooters	67.4	74		65¼
Coal				65¼
Helpers (coal)				59¾
Sledgers	65.4			62½
Switchmen	65.4	73¾	67½	
Teamsters		71¾		
Outside pit				53¼
With team				77½
Tipplemen		71¾	57½	
Trackmen	65.4	71¾	67½	62½
Helpers			63¼	59¾
Tractor operators		73¾		63¾
Pit			67½	
Pit and surface			67½	
Surface			57½	
Tripriders	67	73¾	67½	59¾
Truck drivers		73¾	67½	63¾
Watchmen, pit			63¼	
Tipple			57½	
Water boys or carriers	51.3	71¾		46
Welders	78.2			
Other labor in pit	65.4		63½	62½
Outside pit		[5]57½	57½	53¼

[1]Monthly rate, engineers, $184.09; cranemen, $161.26; firemen, $138.48; oilers, $122.21. All work, 8 hours, except that coal loading is limited to 7 hours, the extra hour being spent by the crew in other work.

[2]Steam shovels, stripping—engineers, 8 hours per day, $179.96 per month; cranemen, $133.76; firemen, $116.97; engineers, horseback excavators, $179.96; oilers, steam shovels, $126.62; loading shovels—engineers, $179.96; firemen, $112.76; engineers, locomotive cranes or draglines, hoisting coal out of pit, $133.76; night men, steam-shovel plant, $126.63.

[3]In excess of 174 hours per month; regular scale, $180 per month of 174 hours; all other than stripping- and loading-shovel men to work 7 hours at $1.03½ per hour.

[4]Groundmen around excavator, 8 hours, 63⅜c. per hour.

[5]Except railroad-car cleaners and employees maintaining railroad tracks.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

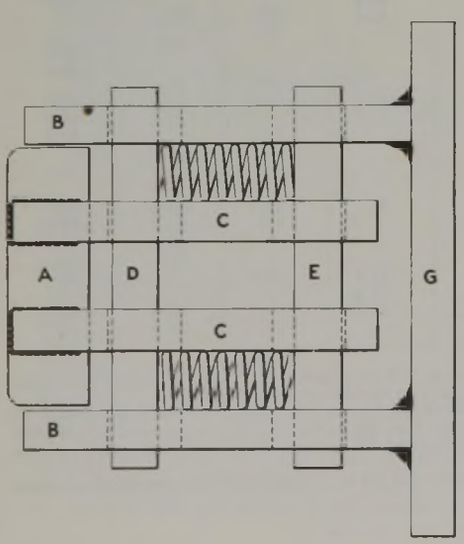
Steel Cars Were Rebuilt With Spring Bumpers

A few years ago, the Ansted mines of the Gauley Mountain Coal Co. were equipped with low-type all-steel cars instead of the wooden cars formerly used. Although these cars were a great improvement over the old equipment, the management was not satisfied with the performance because of the coal spillage over the sides due to the severe bumping when taking up or letting out the slack in a trip, and because of the repeated strains placed on the equipment due to the inherent rigidity of the all-steel car. Accordingly, W. I. Dalton, chief electrician and master mechanic, set himself to the task of designing a spring bumper and drawbar which he could build in the mine shop and apply to the existing cars at a nominal cost.

After working out a design a small-scale model was made and this met with the approval of other officials. The next step was to perform experiments to determine the approximate strength of springs required. Available stock springs were tried and a type selected which, when used in parallel, two per bumper, appeared to have the desired strength. The shop design allowed space in the bumper to add a third spring and possibly a fourth in case experience should indicate the necessity for greater strength.

Fig. 1 is a simplified drawing showing the general design. Parts are designated by letters and the same respective letters

Fig. 1—Schematic Drawing of Spring Bumper and Drawbar



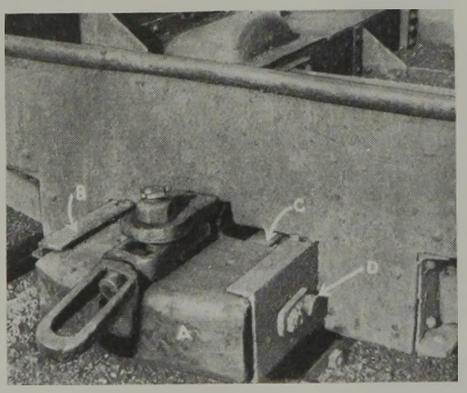


Fig. 2—Spring Bumper Which Replaced the Rigid Type.

denote the equivalent parts in the other three illustrations, made from photographs of cars that have been equipped with the spring bumper and drawbar. Parts *C* are welded to the bumper plate *A*. *D* and *E* are pins between which the springs are slightly compressed. These rectangular-shaped pins pass through slots in parts *B* and *C*. The side bars *B* are welded to part *G*, which in turn is welded to the car. All four of the slots are made 1 in. longer than the width of the rectangular pins *D* and *E*, thus allowing 1 in. of compression of the springs for either push or pull.

Used steel available from obsolete equipment was utilized in making certain items. Plates *A* were made from shells of horizontal-return tubular boilers from a power plant formerly used at Ansted but shut down many years ago. Parts *B* and *G* are channels, and parts *C* are I-beams. Pins *D* and *E* were made from drawbars of scrapped mine cars.

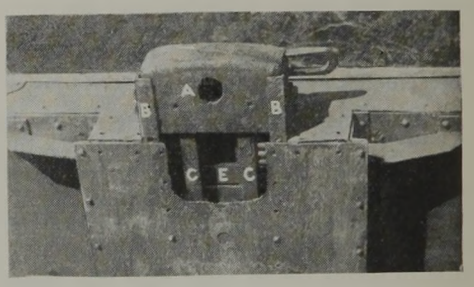
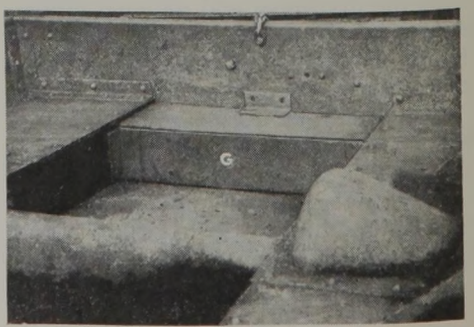


Fig. 3—Showing the Underside.

Most of the original all-steel cars have been equipped with the bumpers already. In addition 25 new cars were purchased and their specifications called for factory-built spring bumpers and buffers of the same general design. These cars, furnished by the Watt Car & Wheel Co., have been in service for several months.

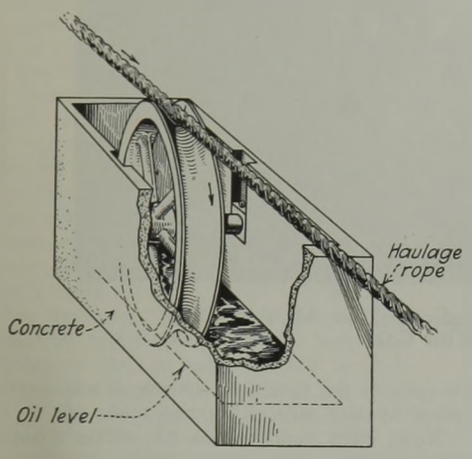
Experience with spring-bumper equipment is bearing out the contemplated advantages. Reduction of coal spillage from topped cars alone will save the cost of the improvement in a short time. The cars and hitchings are so relieved from severe shock strains that it is certain general maintenance will be considerably less. Mr. Dalton has applied for patents covering the bumper design.

Fig. 4—The Bumper Takes up Little Space in the Car.



Haulage-Rope Oiler

Burrell L. Curry, Wyano, Pa., submits the accompanying sketch of a wheel-type haulage-rope oiler. Commenting on the design, Mr. Curry points out that with high-speed ropes the wheel diameter should be increased to prevent oil-throwing. In this oiler, the wheel is supported on a shaft held in solid iron blocks by cotter pins. These blocks fit in slots in the walls of the oil chamber, thus facilitating inspection or removal of the wheel. Depth of the slots is determined by the wheel size. "Best results," says Mr. Curry, "are obtained by blasting a hole in the bottom (if installed in the mine) and placing the top of the wheel on the same level as the rope rollers."

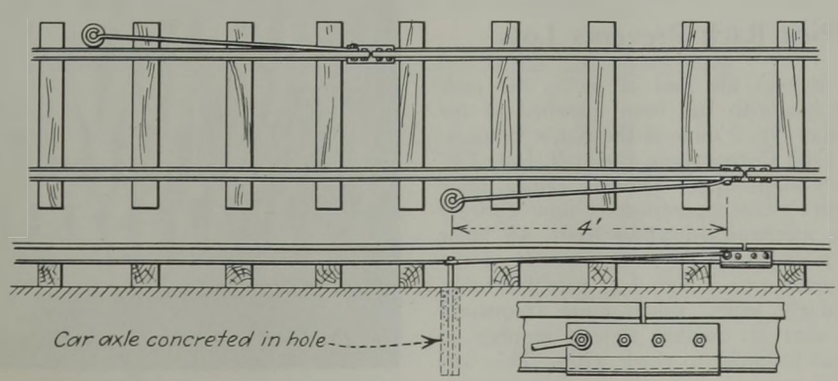


Details of Rope Oiler.

Holding Track on Hills

In working seams where gradients are heavy, track tends to slide down the hill with consequent adverse effect on alignment, points out William Cunningham, superintendent, in describing the anchoring system used at the mines of the Linton-Summit Coal Co., Linton, Ind. Holes 3 in. in diameter and approximately 3 ft. deep are drilled in the bottom. Old car axles are then set in these holes and concreted in. One end of a ¾-in. iron rod 4 ft. long is attached to the protruding end of the axle and the other is fastened to the fish plate. "Where the grade is steep," says Mr. Cunningham, "these rods should be 100 ft. apart. We find this method entirely eliminates the creeping of our track no matter how steep the grade may be, if put in before any hauling is done."

Method of Installing Track Anchors.

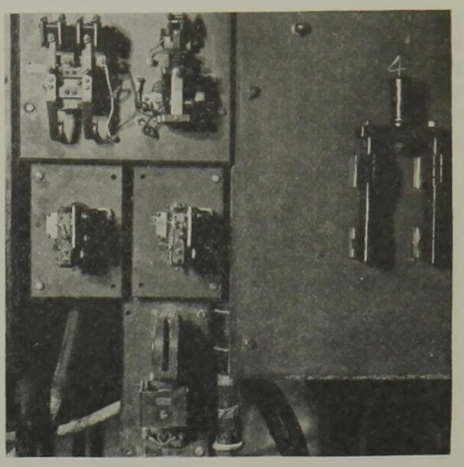


Taking Stock

Once more another year's major economic and operating developments are reviewed with an eye to the future in this, the Twenty-Fourth Annual Review and Forecast Number of *Coal Age*. The first of the year is traditionally a time for taking stock of past accomplishments as a means of correcting the course for the future. Practical operating, electrical, mechanical and safety men may well ask themselves if they have bettered their ability to cope with the unexpected problems that constantly arose in mine operation in the past year. This department is designed to help reach that objective by presenting tried and proved ideas from operations throughout the country. Your idea belongs in these pages, so send it in, together with a sketch or photograph if necessary for clearness. Acceptable ideas will bring their authors $5 or more each.

Parallel Operation Perfected By Addition of Relays

Substations of the Hanna Coal Co. mines in Eastern Ohio where motor-generator-sets are located have been equipped with auxiliary relays, contactors and switches to protect against the difficulties that arise when two machines in the same station are operated in parallel. The contactor appearing at the bottom of the illustration, which shows a section of the control board at an inside substation at Willow Grove No. 10 mine, is an automatic tie contactor connected in the equalizer between the two Ridgway generators. The circuit of the holding coil of this equalizer contactor is completed through two normally closed auxiliary contacts of the machine overload hand circuit breakers and through two knife switches that formerly were in the equalizer circuit proper.



Two Relays and a Contactor Added Below Reclosing Feeder Breaker Panel.

The object of this contactor is to open the equalizer in case a machine circuit breaker opens. Automatic opening of the equalizer prevents the reduction of series field current in the operating machine, which would be the case if the series field of the non-loaded machine were left in parallel with the first.

The two relays on individual panels just above the contactor in the illustration are Automatic Reclosing Circuit Breaker Co. type OR overload relays. Their function is to open an automatic reclosing feeder breaker in case of an overload on either machine. The overload relay in the feeder circuit is set at a capacity which protects the station as a whole against short-circuits on the line but affords little protection to one machine when the other is shut down. The addition of the two overload relays makes the one reclosing breaker serve a triple duty.

Keeping Sand Pipes Free From Water

In mines where much water must be handled and where dewatering receives its proper share of attention, the presence of water along haulageways, even in normally small quantities, still may be a source of trouble to motormen through clogging of sand pipes. To relieve the motorman of the necessity of cleaning sand pipes several times a day, the method described below was developed at the Markle-Bullers mine of the Markle-Bullers Coal Co., and has given excellent results, according to James Thompson, mine foreman, Distant, Pa.

As the position of the sand hoses on locomotives is such that mud or water is thrown up on either the front or rear hoses by the wheels or is picked up along the road, depending upon the direction of travel, the problem was to find a means of automatically protecting the hoses on either end during the time they were subject to spattering from the wheels or were likely to pick up mud or water on the roadway. The solution was based on the use of sec-

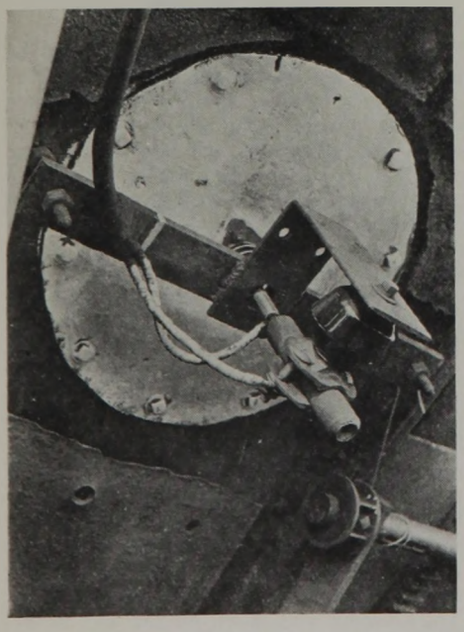
tions of old inner tubes on the hoses. These sections are 5 or 6 in. square, and a section reaching about two-thirds of the way around is wired on each hose so that the lower end comes down within an inch of the rail.

Due to the flexibility of the rubber, the section forms a fanlike extension which acts to protect the hose while the locomotive is traveling in one direction, yet allows the sand to flow freely while the locomotive is operating in the other direction. This results from the fact that while the locomotive is traveling one way, the pressure of the air, mud or water presses the rubber extension back against the opening of the sand hose on the opposite end of the machine. When direction of travel is reversed, the rubber resumes its normal position, thus giving the sand an unobstructed outlet. Naturally, this method depends on the locomotive being in motion and offers no protection when it is allowed to stand in deep water, the idea being simply that the thin rubber will flop back against the sand-hose openings on the opposite end of the locomotive when traveling in one direction, while at the same time the flow of sand from the hoses on the other end will be unimpeded.

Indicator Shows Whether Bin Is Full or Empty

To insure a proper proportion of the various sizes in mixtures shipped from the Zeigler (Ill.) No. 1 mine of the Bell & Zoller Coal & Mining Co., a bin indicator has been developed by the electrical department under the direction of Ernest Prudent, chief electrician. Junior sizes at No. 1 are stored in five cylindrical bins after rescreening, and lately a mixing belt has been installed for loading various mixtures. The proportions of the various sizes in the mixtures are governed by the opening in the bin gate, and to insure a correct mixture it is necessary that each bin contain coal while the loading is going on.

Fig. 1—A Diaphragm and Carbon Contacts Are the Heart of the Indicating System



The indicating system adopted is based on the use of a diaphragm in the bin walls. This diaphragm consists of a circular piece of old rubber belt. One contact—a carbon electrode—is attached to the diaphragm, as shown in Fig. 1, and is free to move with the diaphragm against the pressure of a spring, installed to press the diaphragm back and open the circuit when the bin is empty. The other contact, which is stationary, also is a carbon electrode. From the two electrodes the circuit is completed through a lamp installed at the discharge end of the mixing belt (Fig. 2).

When the bin is full, the pressure of the coal against the diaphragm closes the circuit through the carbon electrodes and lights the lamp, indicating that that particular bin is full. Only four bins are in use at present, and when all four lamps are burning loading can proceed from all four bins. If, during the loading period, the lamp for any bin from which coal is being taken goes out, the mixing belt is stopped until the light indicates that the bin has been refilled. Experience has indicated that this system, after initial adjustments have been completed, gives satisfactory results in service.

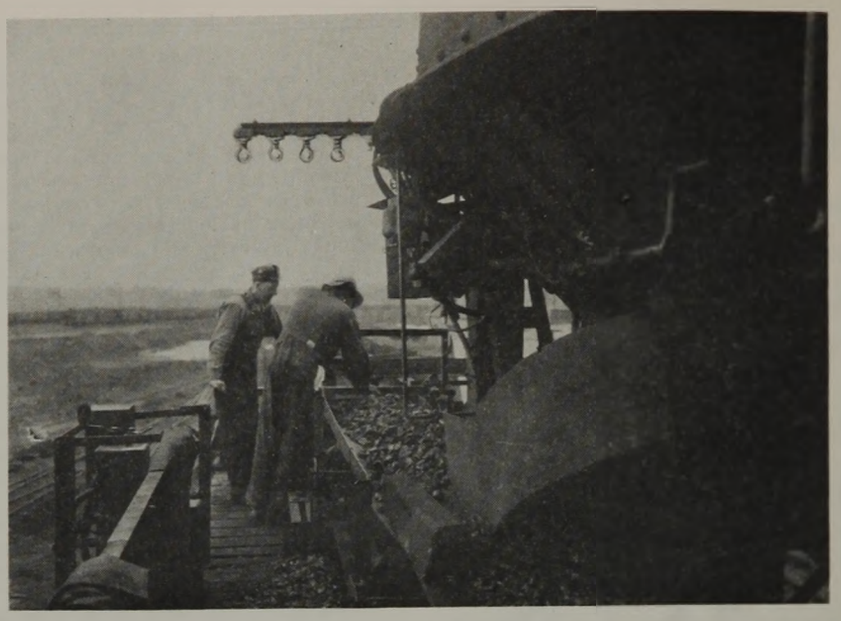


Fig. 2—Four Lights Burning Indicate That All Four Bins Are Filled With Coal

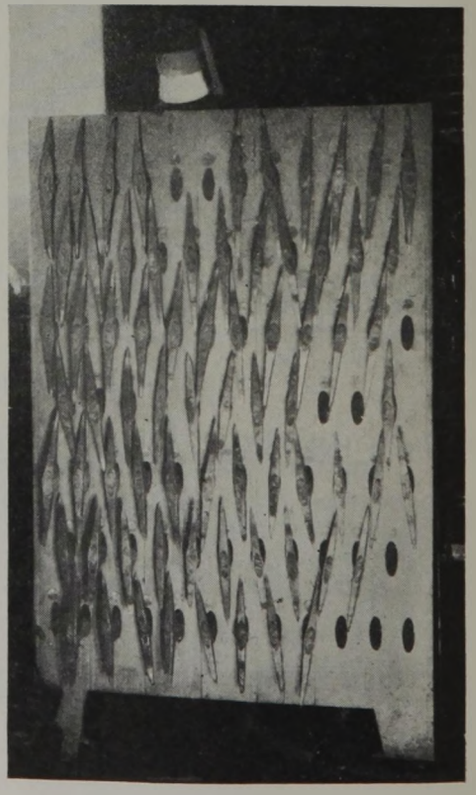
Pick Rack Prevents Loss

To prevent the loss of picks, the rack shown herewith has been installed at the American No. 2 mine of the Knox Consolidated Coal Corporation, Bicknell, Ind. Details are supplied by Thomas James, mine manager. This operation is now entirely on the mechanical-loading basis, all labor being paid by the day. One result of the changeover was a high loss rate for tools, particularly picks, which quite frequently meant that at starting time a number of men had no picks to work with. This was in spite of the fact that each man was supposed to take care of his own tools.

Now, each pick carries the miner's life check number, and corresponding numbers are placed on the rack, which has been installed in the shop on the surface. After sharpening, the picks are placed in the holes in the rack corresponding to their check numbers. Thus, it is easy to tell who is responsible for the missing picks. At No. 2, incidentally, all picks have always been on hand since the second day after installation of the rack.

The frame of the rack is built of 2x4-in. lumber, and the front and shelves on which the pick handles rest, of ship lap. If de-

Facilitates Check on Picks.



sired, doors can be added to lock across the front and prevent any picks being taken out except when the blacksmith or supply man is present.

Belts on Gathering Pumps Demonstrate Advantages

As spur-gear drive connections between motors and gathering pumps were found to be a source of constant irritation and expense at mines of the Gauley Mountain Coal Co., Ansted, W. Va., the V-belt drive with automatic tension equipment was adopted for all units by W. T. Dalton, chief electrician and master mechanic. These drives have been in use for over a year without any expense for maintenance, and the elimination of vibration and shock has been reflected in a material reduction in motor-winding and connection troubles.

The V-belts are kept under a practically uniform tension, regardless of any slight stretch that might occur, by the use of a tilting motor base so adjusted that the belt tension holds it slightly inclined, as indicated in the accompanying sketch. Arrangement of the base, which is built of four angles, is shown at the lower left side of the figure. The two outer angles are rigidly fastened to the pump base and the motor is bolted to the inner angles. By changing the pin to the various holes, the motor can be adjusted to secure the desired tilt.

Grooved pulleys for both motors and pumps were made in the mine shop. The former were turned from short sections sawed from scrap locomotive axles, while the pump pulleys were made by welding together three elements—hub, disk and rim—and finishing the job in a lathe. Plates from scrap boilers furnished the material for the disks; hubs are made from old axles; and rims from bar stock.

Experience with the arrangement indicates a question as to the necessity for the several adjustment holes in the base. After the initial stretch, the belts change but slightly in length with prolonged service. For the most part, the gathering pumps are driven by 5-hp., 550-volt d.c. motors.

Quietness and safety are the two additional advantages of the V-belt drive. An unguarded belt of the size used on the gathering pumps presents only a slight hazard, while only expensive and troublesome guards can reduce the hazard of gearing to a like degree. Elimination of gear noise is reflected in better maintenance and lubrication, because warning noises can be heard. Men working or walking on haulways close to the pumps have a better opportunity for hearing the noise made by approaching equipment, and if there happens to be a telephone station near an installation, the pump does not have to be shut down to make it possible to use the station.

Lengthening Conveyor Belt Life

"The belt is the most expensive part of a belt conveyor; therefore, it should be protected from unecessary wear and injury," W. W. Sayers, chief engineer, Link-Belt Co., points out in a recent issue of the *Link-Belt News*. "If a belt is allowed to run improperly trained, its life will be greatly shortened and even the highest grade belt will be a disappointment. Conveyor belts, whether empty or centrally loaded, usually run true for long periods after once being properly trained.

"When a belt runs out of line, the cause should be found and corrected at once. Belts should always run true and central on the carrying and return idlers, either loaded or empty. Otherwise, the belt edges will wear off against frames or other obstructions, and the bottom of the belt is liable to injury by riding on the edges of troughing idlers; furthermore, the material may spill.

"If one section of a conveyor belt runs true and central on the idlers, and another section runs out of line along all parts of its travel, it indicates that the belt is either crooked or not centrally loaded. If the part that runs out is at the splice, it is probable that the splice or joint is not square.

"On the other hand, if the belt runs out steadily at any one point in the conveyor—that is, if it keeps running out on the same idlers—it is the idlers that are out of line. Usually the idler or idlers causing the trouble is or are just behind the point where the belt starts out of line.

"Conveyor belts should be trained while empty, and if they run out of line when loaded, it probably is due to uncentral or side loading. Correction of the loading chute is the preferable remedy.

"Variations in wind pressure sidewise of conveyor, or in the volume, sizes, percentage of lumps, and/or moisture content of materials fed to belt at different times may, however, make it impossible to keep the loaded belt in alignment by means of either the supporting idlers or alterations to loading chute. When varying material causes the belt to be loaded more heavily on one side of its center line, the heavily loaded side seeks a lower level, thereby crowding the belt off center with the idlers. Pivoted self-aligning idlers should be used for correcting the effects of such varying conditions.

"Belts cannot be made to run true by adjustment of take-up screws, or of head pulley. Both head and tail pulleys should be set in alignment, and kept so. All other training should be done by the idlers or, if possible, by correction of the loading chute.

"The center roll of a troughing idler must be in contact with the belt, for it is the one that really steers or trains the belt, unless the belt is overplied or too stiff to assume the shape of the idlers when empty, and thus fails to make contact with the center roll.

"Idlers should be kept square with the belt, and when training a belt by lining up idlers, always work with direction of belt travel. Stuck or sluggish idler rolls always tend to deflect the belt and cause it to wear unnecessarily.

Foundations or conveyor supports may be responsible for bad alignment of belts, if not secure and rigid.

"Side-guide idlers or self-aligning idlers should never be used while training a belt. Guide idlers bearing against the edge of a belt are frequently the cause of excessive wear and premature failure of the belt. They destroy and loosen up the edges, permitting the entrance of moisture and dirt between the plies of the fabric.

"It is a mistake to try to train a belt by increasing the tension. This not only strains the driving mechanism but increases the horsepower requirements, puts an unnecessary stress on the belt, weakens the splice, reduces the troughing of the belt, and thus prevents the effective training action of the center idler roll.

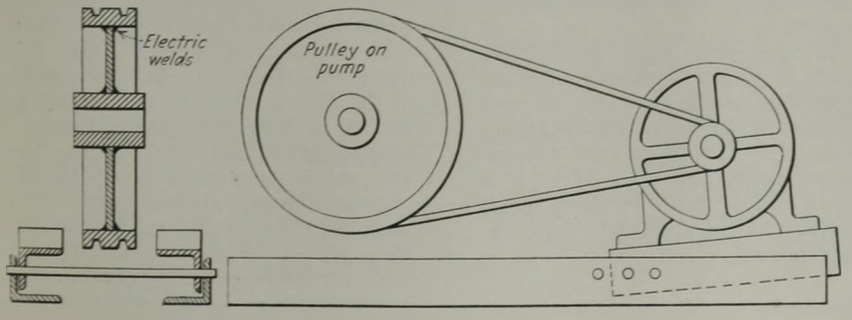
"Trippers should be inspected regularly to see that belts do not scrape against the frame, and that the belt runs true over the pulleys of the tripper.

"Skirt boards should be set so that they are close to the belt but not touching it. Short skirt boards at loading points should be set, or cut away, in such a manner that the space between the belt and the skirt board increases in the direction of the belt travel. Thus pieces of material which would otherwise wedge in between the belt and skirt board are permitted to work free instead of gouging the cover of the belt or pushing the belt to one side.

"Self-aligning idlers, above referred to, resemble stationary idlers, except that they are pivotally mounted and swivel automatically when the belt is misaligned, thereby leading the belt and maintaining it central with the supporting idlers.

"Self-aligning idlers actually correct misalignment without harming the belt, whereas fixed guide rolls at sides of belt do not overcome misalignment, but merely restrain forcibly any further sidewise movement of the belt. As long as misalignment occurs there is a continuous heavy pressure between the belt edge and the fixed guide roll. This action wears and destroys the belt edge rapidly."

Drive Arrangement and Construction of Pump Pulley and Motor Base.



WORD from the FIELD

Report of Planning Committee On Mineral Policy Out

The report of the planning committee for mineral policy of the National Resources Board, recommending control of mine capacity and continuance of regulation along the lines of the present NRA bituminous code, was released for publication Jan. 13. This report, which was summarized in the major report of the National Resources Board on national planning a few weeks earlier (*Coal Age*, January, 1935, p. 38), is a document of 60 printed pages of which less than five are specifically devoted to considering the case of bituminous coal. No discussion of anthracite problems is embodied in the report.

In reviewing the argument for production control, the National Resources Board emphasized that it should not be the intent of any limitations authorized to create monopoly profits or "to subsidize inefficiency." The objection that stabilization protects the inefficient producer, however, declares the committee report, "loses some of its force in this industry where several thousand marginal producers (commercial mines, not wagon mines) had already been forced out of business before the great depression began. Any mine able to survive 1930 to 1932 has demonstrated a considerable efficiency. With deflation of the less efficient mines so far accomplished, the present time offers a unique opportunity to inaugurate production control."

Although the committee admits that establishment of such control involves many problems, such control is necessary to "prevent serious future inflation of capacity and its train of evils. The committee, therefore, would commend the importance of capacity control alike to the industry, the mine workers and the government. We would urge the industry to remember that some limitations on the individual are necessary in any form of joint action. We would urge upon the public the great importance of the ends in view and feel that a friendly hearing should be accorded to any serious attempt by this industry to stabilize production and capacity on a national scale. Above all, we would counsel against a defeatist attitude. We cannot but believe that if the bituminous coal industry really desires to achieve econmic stability there will be found both economic devices and constitutional powers sufficient for the purpose."

Illinois Commission Named

Governor Horner of Illinois announced the appointment on Jan. 6 of three operators, three miners and three Illinois citizens not connected with the mining industry to compose the State Mining Investigation Commission. The group will study methods and conditions with special reference to the safety of lives and the conservation of Illinois coal deposits. Under the law the commission is to report to the Governor and General Assembly a proposed revision of the State's mining laws.

Operator appointees on the commission are George C. McFadden, assistant vice-president, Peabody Coal Co., Chicago; John E. Jones, safety director, Old Ben Coal Corporation, Benton, and James F. McElwee, Sr., president, Lake Erie Mining Co., Peoria. Miner representatives are Curtis Mundell, West Frankfort; Henry Vaughn, Harrisburg, and Thomas Gaffigan, Springfield. The public will be represented by J. E. Poling, Chicago; L. H. V. Bowman, Danville, and August A. Wile, Murphysboro. The commission held its first meeting Jan. 15 at Springfield and chose Mr. McFadden as chairman.

Scrip Provision Stay Extended

Provisions in various retail codes which prohibit acceptance of scrip in payment for goods have been stayed to and including Feb. 6 under an order issued Jan. 6 by the National Industrial Recovery Board. The codes affected are those for the retail trade, retail jewelry trade and retail food and grocery trade, together with "any other code or codes" in which similar prohibitions may exist. The stay was ordered to permit time for further study. Recommendations for limited acceptance of scrip were offered in the report of a special committee which investigated the scrip system, submitted Oct. 22 (*Coal Age*, November, 1934, p. 506).

1934 Bituminous Output Up; Hard Coal Also Gains

Bituminous coal production registered a substantial gain for the third successive year in 1934, when output totaled 357,500,000 net tons, according to preliminary figures by the U. S. Bureau of Mines. This compares with an output of 333,630,533 tons in 1933, or an increase of 7.2 per cent.

For the first year since 1926, anthracite production also showed an increase as compared with the preceding year, output in 1934 reaching a total of 57,385,000 net tons, according to preliminary data. This is a gain of 15.8 per cent over the preceding year, when 49,541,344 net tons was produced.

Labor Board Rules in Two Cases; Anthracite Strife Continues

Decisions by Division III Labor Board during the past month involved a complaint against the discharge of a miner in one case for drunkenness and disorderly conduct while off duty and another against code violation in the matter of overtime. The United Mine Workers was the complainant in both cases, the first against the Blocton Cahaba Coal Co., Coleanor, Ala. In affirming the discharge of the miner it was shown by the board that the right to discharge was unlimited until the enactment of the code and that even though that right was limited by the working agreement, the agreement contained the provision that "customs that are not in conflict with this agreement may be continued."

In a case against the Little Cahaba Coal Co., Piper, Ala., a miner alleged that he was required to work overtime from fifteen minutes to two hours each day as an engineer pulling coal that was loaded after quitting time, which he contended was not hauling coal in transit as contemplated in the code. He quit work, refusing to perform such overtime, but returned to work the next day and was assigned to another job at the same rate of pay. He then requested that he be restored to his former job. The board sustained the contention that such overtime was a violation of the code, but cited an express provision that "pending hearing and determination of disputes, employees shall not cease work because of any dispute." The miner therefore violated the code and broke the working agreement and can assert no right under either.

Hearings before Division I—South Labor Board at Pineville, Ky., beginning Jan. 12, were marked by charges of threats and intimidation of prospective witnesses against alleged strong-arm methods by Sheriff Middleton and his deputies, numbering 191. Van A. Bittner, labor member of the board, said that if Governor Laffoon fails to clean up Harlan County and remove Sheriff Middleton, the matter will be referred to President Roosevelt. Twelve coal companies in southeastern Kentucky and Tennessee were cited to appear for alleged violation of wage and hour agreements. The hearing closed Jan. 14, decision to be announced later at Cincinnati, Ohio. At a mass meeting of union miners held at Lexington, Dec. 29, union leaders reaffirmed their determination to make Harlan County fully unionized.

In Illinois, the United Mine Workers has started a drive to unionize small mines in the Herrin district; the seven-hour day and union wage rates are in force. President-elect William Keck, of the Progressive union, announced Jan. 15 that his organization will start discussion of a new scale at a convention to open at Gillespie Feb. 12. A 30-hour week will be asked, with no decrease in wages; in fact, increases will be sought in some instances.

Another dynamiting, this time a trestle on the Chicago & Illinois Midland R.R. north of Springfield, took place Jan. 6, causing the wreck of a 12-car coal train. Three days later, a train of sixteen empty coal cars on the Chicago, Burlington & Quincy R.R. was bombed two miles from Waltonville, the fourteenth incident of the kind since last August.

The labor situation in the anthracite region continues to shift between on again and off again without remaining long in either stage. Squabbles due to the dual union set-up still plague the Glen Alden Coal Co., a strike order by the United Anthracite Miners in the closing days of December being rescinded Jan. 1, only to be followed the next day by threat of a walkout by UMW members. Over 200 UMW adherents employed at No. 2 colliery of the Kingston Coal Co., Kingston, returned to work Jan. 17 after a three-day strike over alleged delay in payment of wages. Nearly 400 insurgents employed by the Peckville Coal Co. at Old Forge went back after two days' idleness over alleged changes in wage rates for work done on belt lines installed recently in low places in the colliery.

The insurgent union received another setback Jan. 8 when the Anthracite Conciliation Board issued a statement that under the terms of the agreement between the United Mine Workers and operators, "no employee or group of employees receiving the benefits of this agreement may set up any organization other than the United Mine Workers to represent them in their dealings with the anthracite operators." The statement was made in response to a claim by the UMW tri-district executive board that the Glen Alden Coal Co. violated the contract when it accepted settlement of a strike called by the insurgents, through intervention of a Chamber of Commerce committee and others.

Anthracite Stripping Discussed At Hazleton Meeting

Anthracite stripping has undergone radical changes in the last four or five years due to introduction of large dragline excavators, said H. R. Randall, president of the Rhoads Contracting Co., speaking at a meeting of the Hazleton Mining Institute, Jan. 16, at Hazleton, Pa. Earlier strippings were confined principally to basins and therefore were more extensive in the Southern and Middle fields, where many folds exist. The dragline presents a more economical method for deep working of crop coal, therefore opens huge possibilities in the Northern field.

Use of the dragline allows ready adjustment of working depth to meet the production cost allowable according to the seasonal demand. The cut can be reworked later and the deeper coal taken during winter months when demand is at its height. This first-and-second method of strip mining cannot be employed economically with shovel equipment which must operate down in the cut.

According to Mr. Randall, the proposed state legislation to limit or prohibit stripping with the object of increasing employment of underground miners would have the opposite effect. Many of the high-cost mines of the Southern field would have to close entirely if their low-cost strip tonnage was cut off.

NRA and Industry Battle Over Price Control; Labor Wins Fight for Code Membership

WHILE the National Industrial Recovery Board was holding public hearings at Washington, D. C., last month in an effort to build up a record to support its announced disapproval of price-fixing code provisions in general, NRA and the bituminous producers were quietly battling to determine whether price control should remain with the soft-coal industry or should be shifted to the administration. After the industry had twice rejected proposals advanced by NRA, announcement was made that the NIRB would accept in principle the alternative suggestions recommended by the National Bituminous Coal Industrial Board, which had been called into session—for the second time since its organization—on the demand of John L. Lewis, president, United Mine Workers, that prompt action be taken to prevent the breakdown in the price structure threatened by offers of contracts for delivery after June 16 at prices 30c. to $2 per ton under code minima.

Subject to a few minor modifications in phraseology which do not affect the intent of the provisions, the NBCIB recommendations were formally approved by NIRB on Jan. 25 to continue in effect until April 30. This new amendment sets up arbitration boards to pass upon individual price adjustments and interdistrict correlations. The administrative order of last fall (*Coal Age*, November, 1934, p. 440) setting up the Adams plan for price correlation has been canceled. Instructions also were issued warning all Presidential code authority members to withhold approval of prices which do not meet all the conditions of the new amendment. NIRB further ruled that Presidential members could take no action on prices fixed by joint agreement between divisions or appealed to the national arbitration board; in those two cases, it held, power of approval or disapproval was lodged only with NIRB.

First warning that an attack might be made upon the price-fixing control set up in the original code came late in December when NRA, in calling a public hearing for Jan. 4 to consider an amendment proposed by the operators to eliminate the situation complained of by Mr. Lewis, also scheduled an alternative proposed amendment which authorized NIRB, "through such agencies as it may designate," to investigate costs and thereafter "to determine and publish" minimum prices (*Coal Age*, January, 1935, p. 45). Although it was intimated that this proposal had been injected merely to galvanize the industry itself into taking more positive action, it was renewed in more expanded form within a few days after the public hearing. This proposal was rejected by a vote of 8 to 6. In the meantime, however, NRA had given its approval to a revision of Sec. 1 of Art. VI, which condemned contracting for future deliveries at less than code prices.

This amendment, which became effective Jan. 8, is identical in purpose with that suggested by the majority of the subdivisions of the industry (Northern Panhandle, eastern Pennsylvania, northern West Virginia, Southern Subdivisions Nos. 1 and 2, Ohio and Michigan subdivisions of Division I, Divisions II and III and the Arkansas-Oklahoma subdivision of Division IV). It also is in harmony with recommendations made by the NBCIB. To facilitate comparison with the revision originally proposed by these subdivisions, new matter in the text following is shown in italics and words deleted are set off in brackets.

> Sec. 1—The making of a contract to sell *or offer to sell coal*, whether for immediate or future delivery, *at a price below the fair market price at the date of such contract or offer*, (regardless of the dates specified for the making of deliveries), or [the] *any* sale or delivery of coal [under] *below* the fair market price thereof *at the time of delivery*, determined as hereinafter provided, is hereby declared to be an unfair competitive practice and in violation of this code. *Such fair market price shall be determined and established as hereinafter provided, and* it shall be proper in determining such fair market price to consider the purposes of the National Industrial Recovery Act, the minimum rates of pay herein established, the furnishing of employment for labor and [also] *the* competition with other coals, fuels and forms of energy [or] *for* heat production.

The proposals voted down by members of the NBCIB were revisions of Secs. 2, 3, 4 and 5 of Art. VI. As in the original proposals suggested by NRA for the Jan. 4 hearing, they began by reciting that an emergency adversely affecting small enterprises, wages and labor conditions existed which made the establishment of minimum prices by NIRB "during the pendency of such emergency" necessary. Minimum prices and rules were to be recommended to NIRB by the marketing agencies and code authorities within ten days after the effective date of the amendment and at least monthly thereafter ten days prior to their proposed effective date. Copies of such proposed changes were to be transmitted to every other divisional and subdivisional code authority at the time of submission to Washington and every such division and subdivision was given the right to protest such changes and to be heard prior to their proposed effective date. NIRB was to make its decisions on such protests within 30 days from the proposed effective date of the prices or regulations challenged. Prices and regulations would not become effective until "established and published by NIRB or such instrumentality as it may designate."

As a basis for establishing such prices, NIRB "or such instrumentality as it may designate" was required by the proposed amendment to give "due consideration" to the price recommendations of the code authorities and marketing agencies. In turn, these agencies were called upon to consider, among other factors: (1) the purposes of NIRA, (2) protection of investors in the industry, (3) competition with other coals and other forms of energy, (4) trade customs, (5) buying habits of consumers, (6) chemical and physical analysis. While competition was to be recognized, code authorities and marketing agencies were enjoined from recommending "dumping" prices for any consuming markets. The proposed revisions also contemplated the classification of all coals in each division and subdivision on a basis which would give consumers "reasonable opportunity to buy and producers reasonable opportunity to sell their coal in usual and normal markets."

When these proposals were put to a vote at the NBCIB meeting on Jan. 11, James D. Francis, A. A. Liggett, J. D. A. Morrow and Charles O'Neill, representing operators in Division I; George W. Reed and Jonas Waffle (Division II), Henry DeBardeleben (Division III) and W. C. Shank (Division IV) opposed acceptance. H. C. Marchant, representing producers in Division V, joined with Presidential Members Gilbert W. Gambrill (Division II), H. S. Salmon (Division III), Robert S. Lemon (Division IV), Arthur Vail (Division V) and F. E. Berquist, NRA member-at-large, in voting in favor of the proposals. Wayne P. Ellis, acting division administrator and newly elected chairman of NBCIB, and Mr. Lewis did not vote.

Following this rejection, the board then decided to appoint a committee to confer with NRA officials to see whether some other plan could be worked out to continue price stabilization along the line previously proposed by the National Coal Association while legislation to extend the principles of the code for another two years were going through the Congressional mill. Messrs. O'Neill, Marchant, Lewis, Reed and Francis were made members of this committee. Still later, NBCIB resumed consideration of its original recommendations covering revisions of Art. VI and additions to Art. VII. These recommendations were unanimously approved at a board meeting on Jan. 16.

The first section of this revision is aimed at the same practices outlawed by the amendment approved Jan. 8. In so far as provisions governing classification and the factors to be considered in establishing prices are concerned, Sec. 2 of the NBCIB proposal is practically identical with the rejected NRA revisions. The essential difference between the two lies in the fact that NBCIB contemplates the continuance of price control by the industry; NRA revisions reduced the code authorities and marketing agencies to the status of recommendatory groups. Paragraph (f) of NBCIB revision of Sec. 2, therefore, restates the essence of Sec. 4 of Art. VI of the original code with the qualification that the prices so named are "subject to appeal, suspension and modification as hereinafter provided."

Sec. 3 of NBCIB revision of Art. VI provides that where complaint is made against any prices so established, a hearing shall be held within five days after receipt of complaint and, in the event complainant is dissatisfied with the decision—to be made within five days after the hearing unless an extension of time is agreed to by complainant—an appeal may be made to an impartial board of arbitrators. Under Sec. 4, conferences between agencies and code authorities of different divisions or subdivisions are authorized for the purpose of establishing fair competitive price relationships and trade practices. Agreements reached at such conferences are subject to approval or disapproval by NRA within ten days after submission to the administration. Where no agreement is reached, the dissatisfied agency or code authority may appeal to a national board of arbitration.

Provisions for the establishment of divisional and national boards of arbitration are covered in the additions to Sec. 2 of Art VII. Divisional boards are to consist of not more than five members neither directly nor indirectly connected with the coal industry during their services on such boards. Subject to the approval of NRA, marketing agencies or code authorities may set up joint boards to function for more than one agency or subdivision. The national board of arbitration is to consist of five members, appointed by the operator members of NBCIB subject to the approval of NRA. Salaries of members of the national board are not to exceed $10,000 per year; appointments are to be made for two years and members are subject to removal by a vote of at least six of the nine operator members of NBCIB.

Except for a thinly veiled threat of a general suspension of bituminous mining on April 1 if producers attempted to use low realizations on contracts taken at prices under the code minima as an argument in the forthcoming wage negotiations with the United Mine Workers and a plea by Mr. Lewis for labor representation on the code authorities, the public hearing on the afternoon of Jan. 4 was a drab spectacle. Most of the drama had been played behind closed doors at a meeting of the directors of the National Coal Association two days earlier and at sessions of NBCIB the preceding day and on the morning of Jan. 4. As a result of these executive sessions, the public hearing opened with a formal presentation of the revisions recommended by NBCIB.

In offering these recommendations, Mr. O'Neill stated that approximately 80 per cent of the National Coal Association directors favored continuation of the compulsory price-fixing provisions of the code and compulsory coordination of prices between different divisions and subdivisions. With the exception of Sec. 1, upon which no action had been taken by the association directorate, said Mr. O'Neill, the recommendations of NBCIB were in harmony with the majority opinion of the National Coal Association directors. The proposed revision of Sec. 1, he added, had the approval of most of the divisions and subdivisions throughout the country. The amendment with respect to price-fixing methods and standards had been suggested because, in the opinion of producers and their attorneys, "the present code is not clear enough and definite enough to establish prices that can stand up in court."

John L. Steinbugler, president, William C. Atwater & Co., felt that the amendment to Sec. 1 was necessary from a technical standpoint so that there could be no question as to its application to contracts for future delivery. "In a strict legal sense," he explained, "the original code prohibition against the sale of coal at less than the prescribed prices would apply only to a transaction in which the title immediately passed from the producer to his customer." As a practical matter, clarification to remove any doubt as to intent is imperative because offers now are being made for contracts for delivery after June 16 at prices substantially under the code minima. To permit such practices and offers to continue "would be demoralizing to the stability of the code during the next five and one-half months."

Mr. Reed, supporting NBCIB proposals, declared that the code had been beneficial to Illinois and Indiana operators and that fully 90 per cent of the railroad shipping mines would like to see the code continued. It was also his opinion that 1,595 operators of small mines favored the code because it had made it possible for them to secure business they had "never dreamed of before the code came in. That runs, of course, more to the enforcement features." J. G. Skelton, operating a small mine at Danville, Ill., presented a sorry picture of compliance in his area. Most of the smaller operations in Vermillion County, he testified, pay no attention to code provisions on prices and labor. As a supplier of relief coal, he said, he must observe the code, but his mine scale has been locked for the past two months "because I cannot sell coal for a dollar a ton more than I can buy it from my neighbors and I cannot meet their price and hold the relief contract."

Formal protest against both the amendment proposed by the operators and the alternative suggestion of NRA, made by Ralph E. Jamison, chairman of the western Pennsylvania subdivisional code authority, provoked sharp questioning of the witness by B. T. Ansell, of the legal staff, and Leon Henderson, chief of the division of research

Push Legislative Program

A two-year extension of the bituminous code was again indorsed by the industry at a meeting of the directors of the National Coal Association at Washington, D. C., Jan. 16-17. A new special legislative committee was named to draft enabling legislation for that purpose and to further study the needs of the industry for permanent legislation. The new committee, made up of members from each subdivision of Divisions I and II and one member each from the other three divisions, is as follows:

Division I—Charles O'Neill (Eastern subdivision), R. E. Jamison (Western Pennsylvania subdivision), W. L. Robison (Ohio), Brooks Fleming, Jr. (Northern West Virginia subdivision), E. G. Mathiott (Northern Panhandle subdivision), H. R. Hawthorne (Southern No. 1), J. D. Francis (Southern No. 2), and C. F. Richardson (West Kentucky subdivision); Division II—George B. Harrington (Illinois), Fred S. McConnell (Indiana) and C. T. Carney (Iowa); Division III—D. A. Thomas; Division IV—W. C. Shank; Division V—H. C. Marchant.

Following transmittal of the National Resources Board report to Congress by the President on Jan. 24, Senator Guffey (Pennsylvania) introduced a bill to give legislative force to the regulations deemed necessary by the board to stabilize the soft-coal industry. Title I of this bill provides for a statutory code on production and price control; creates a commission of five to supervise code enforcement and a commission of three to settle all disputes involving labor relations. Title II covers the use of government credit for the acquisition of surplus capacity and the rehabilitation of mine workers displaced by such purchases. The government would be reimbursed through a tonnage tax. The Guffey bill is sponsored by the United Mine Workers.

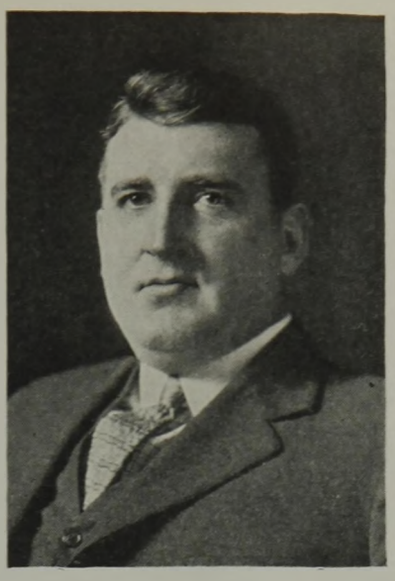
and planning of NRA. These questions revolved around the existence of the "emergency" cited in the NRA proposal, finely drawn distinctions between a crisis and an emergency and why the price-fixing machinery of the original code was considered proper and legal while the protest had characterized the NRA substitutes as "unlawful, arbitrary, confiscatory" and contrary to the spirit and provisions of NIRA. Pressed as to whether the "impossible task" of cost determination and price fixing could not be accomplished by NRA, "even with the advice of the industry," Mr. Jamison retorted that that depended upon "how much of the advice" NRA officials took.

M. G. Youngquist, speaking for the Iowa subdivision, advocated adoption of NBCIB recommendations. His subdivision, he said, was giving about 70 per cent compliance; the 30 per cent of non-compliers represent about 400 small mines. "We are unequivocally opposed to price fixing by governmental authority," asserted C. S. B. Ward, chairman, Wholesale Coal Code Authority, who saw no reason to believe prices so fixed would be any more enforceable than "prices fixed by the industry itself with the consent of the government." Mr. Ward, therefore, favored the original proposal of the operators. Subsequently he filed a letter of protest against NBCIB recommendations to the extent that these proposals might be interpreted to permit the operators to fix wholesale commissions "in contravention of the provisions of the wholesale code which expressly grant to the members of the wholesale coal industry the right to bargain freely and without restriction with producers in respect of their discount or commission."

Higher prices on coal when sold for byproduct gas making than for general industrial use were attacked by Russell G. Hunt, spokesman for the American Gas Association, and C. W. Cook, vice-president, Hudson Valley Fuel Corporation. Mr. Hunt voiced the opinion that large contract consumers should enjoy more favorable prices than spot buyers because, he claimed, the former group could be served more cheaply by the producer. Mr. Cook felt that existing code price relationships discriminated against the byproduct plant in favor of beehive coke. The limitations on contracting proposed, he said, probably would result in no contracts being made by the byproduct industry.

Reiterating opposition to government price fixing, Mr. O'Neill said that the special legislative committee of the National Coal Association had "explored the cost of production theory for many weeks and at all times reached the conclusion that it was utterly impracticable and impossible of application." Personally, he did not favor a premium on byproduct coal, but that question is still a subject of controversy between the subdivisions. A use classification was necessary because the mines could not hold railroad business at regular industrial coal prices. Mr. O'Neill stated that about 95 per cent of the railroad shipping mines "in our subdivisions are complying with code prices and fair practices. Truck operators, of course, are uncontrolled and uncontrollable so far as we can do anything about it up to date."

R. L. Ireland, Jr., speaking for the Ohio subdivision, supported NBCIB recommendations, but wanted the code amended to outlaw contracts already made at less than code prices since the code became effective.



Charles O'Neill

Appointed president of the Eastern Bituminous Coal Association and chairman of the Eastern Subdivisional Code Authority, Mr. O'Neill has been granted leave of absence from the office of vice-president of Peale, Peacock & Kerr, Inc., in order that he may devote his time exclusively to his new responsibilities.

Pointing out that Ohio rail mine prices have been correlated with prices in other divisions, while neither ex-river nor truck mine prices are correlated on a delivered basis, he insisted that the correlation basis should be uniform for all classes of mines; whether the basis be mine or delivered prices he did not care. He also complained that Ohio had been unable to get any assistance from NRA in pushing compliance cases.

Disapproval of NRA proposals for code amendment also was voiced by Irvin Davis, chairman of Southern subdivision No. 2 of Division I, who indorsed the recommendations of NBCIB. The experience of this subdivision in the matter of enforcement, he added, differed from that of Ohio. "We have received excellent cooperation, particularly in recent weeks, from the legal department of NRA, the Federal Trade Commission and the Department of Justice." Mr. Davis' testimony also developed that the representative of NRA to whom the Ohio enforcement cases had been referred and who had been reported "missing" by Mr. Ireland was busy on compliance and enforcement work in Southern subdivision No. 2. W. G. Crichton, chairman of Southern subdivision No. 1 code authority, and David C. Reay, secretary, Northern West Virginia subdivision, also spoke in favor of NBCIB recommendations.

While the mine workers, said Mr. Lewis, neither opposed nor indorsed the recommendations, the union was "perfectly willing to have those amendments approved in the hope that they will prove to be more effective in restraining some of the present tendencies and practices which are unsound and detrimental to" the stability of the industry. Personally, he was inclined to agree with those operators who felt that the proposed amendments did not go far enough. There must be, he declared, not only greater compliance but a greater demonstration of capacity for self government by the industry.

The union, continued Mr. Lewis, has a vital stake in the preservation of the price structure of the industry because the stability of wage rates rests upon that structure. "The United Mine Workers do not intend that through the practices of the industry in violation of the code provisions the industry shall again be thrust into a species of guerilla economic warfare and that the United Mine Workers become responsible, and solely responsible in large mining areas, for the maintenance of the wage structure and the maintenance of the price structure through engaging in industrial conflict with operating groups here and there throughout the country. Rather in all sincerity we would prefer to have the industry as a whole suspend its operations, if that should become necessary, while engaged in a discussion of why it had reached its present state and what was going to be done about it. In that way the integrity of the industry may be preserved and the operators as well as the mine workers be saved from the alternative proposition of having to break up into countless indiscriminate confused fighting units."

Data submitted at the meeting of NBCIB, he said, showed that as much as 70 per cent of the coal in some areas was moving on contracts at pre-code prices. Statements had been freely made that the volume of business being booked for delivery after June 16 at less than code prices was increasing. If, as a result of these developments, operators come into the wage conferences next month claiming that the margin between costs and realizations "is too small to justify any further decrease in the hours of labor, any increase in the wage structure, any improvement in the condition of the mines or even to justify a continuance of existing wage structures," Mr. Lewis desired to serve notice now that the miners would not be swayed by any such presentation "or any such artificial state of facts brought about through the inability of industry and NRA to regulate the situation."

In cooperation with the National Coal Association, continued Mr. Lewis, the miners have been attempting to work out a legislative program for the industry. Unfortunately, he said, this effort has bogged down because the operators have been unable to agree among themselves. "But," he added, "the United Mine Workers have worked out a legislative program and, with or without the coal operators, are going to bring it to the attention of the administration and Congress in this session. It is a program designed to help the operators just as much as the mine workers."

Mr. Lewis renewed his demand for labor representation on the code authorities, which had been voted down 8 to 7 at the morning session of NBCIB. Stressing the community of interest between mine workers and management in the industry, Mr. Lewis declared that he urged this demand with no claim of super-intelligence on the part of the labor leaders. "But I do modestly admit," he confessed, "that the representatives of the United Mine Workers are just as intelligent and just as capable of filling a seat inefficiently as any operator in the sound of my voice."

When, on Jan. 11, Mr. Lewis again offered his motion for representation, it was adopted by NBCIB by a 10 to 4 vote. The motion calls for an amendment to Sec. 2, Art. VII of the code by adding that "all code authorities, divisional or subdivisional,

shall have as a member thereon a representative of the accredited and recognized organization of employees." On Jan. 17, Mr. Ellis indicated that NRA would ratify the recommendation, possibly without formal amendment to the code. Labor representatives will be district presidents of the United Mine Workers, it was forecast.

At the general hearing on price provisions in codes of fair competition, beginning Jan. 9 before the NIRB, C. Claflin Young, chairman, National Code Authority for the Retail Solid Fuel Industry, urged that Art. V of the retail fuel code, covering cost determinations, be retained in its present form. Open price filing, he said, had adequately served its purpose in those divisions in which it has been resorted to, and it should rest with each divisional code authority, conversant with local conditions, after adequate and full public hearings have been held, to determine whether an emergency exists in fact, and whether the provisions of Art. V should apply. Such emergencies, however, should not be declared to exist for more than 90 days and should be subject to "change, modification, revision or extension by NRA upon a showing that the conditions of the emergency have changed." Retail cost determinations, according to Mr. Claflin's statement, "should be based exclusively upon lowest reasonable cost, with absolutely no provision for a profit or return on invested capital." To delete or modify in any particular the provisions of Art. V would nullify the labor and wage provisions of the code. The declaration of emergencies and the determination of lowest reasonable costs is a sure method of preventing oppression toward small enterprises and the creation of monopolies."

Clarence Donnelly, chairman of the cost committee of the New York retail coal code authority, corroborated the testimony of Mr. Claflin and added that retention of the marketing practice provisions and the establishment of determined costs are "absolutely necessary if the industry is to remain solvent."

Appearing for the wholesale coal code authority, C. W. Hendley, of Baltimore, Md., asserted that any action against the wholesale branch of the industry would afford a monopoly to large operators having their own selling agents. "In our judgment," he said, "government price fixing is unnecessary and undesirable. Our position is that whether the price be fixed by the industry, the administration or by the ordinary operation of the law of supply and demand, consideration must be given to the cost of wholesale distribution."

A protest against Administrative Order X-131, dated Jan. 7, 1935, which establishes the principle of a single assessment upon the total retail trade of each retail establishment, was filed Jan. 9 with W. A. Harriman, NRA Administrative Officer, by the National Retail Coal Code Authority. The protest pointed out that, "unlike most of the general retail industries which might be made the subject of multiple and inequitable assessments under overlapping codes, the Retail Solid Fuel Code has made its assessments apply on a tonnage basis, with the result that, irrespective of the amount of tonnage handled, there has always been a fair and equitable assessment."

The National Code Authority for the retail coal industry adopted by unanimous vote a resolution that a coordination committee of the retail solid fuel code and the bituminous coal code should consider amendments to both codes making it a violation for members of the retail solid fuel industry to purchase coal of operators not complying with the bituminous code, and also for operators to sell to members of the retail solid fuel industry not complying with the retail coal code. A proposal to transfer the Retail Solid Fuel Code and the Wholesale Coal Code from NRA Division 4 to NRA Division 1 has been rescinded, and both codes will remain under the supervision of Deputy Administrator Frank A. Hecht.

A. W. DeBirny, assistant counsel, litigation division, NRA, attached to Subdivisional Code Authority No. 2, has been assigned to the task of pushing the prosecution of code violators directly with district attorneys, without recourse to Washington. He has taken up his duties in Cincinnati, assisted by an additional attorney-examiner assigned by the Federal Trade Commission to collect evidence on alleged code violators and to determine whether they shall be prosecuted.

Applications for approval of budgets have been made by three subdivisions of the Bituminous Coal Code, as follows: Eastern Subdivision of Division I, $295,400 for 1935, on a basis of not exceeding 1c. per ton on monthly production; Southern Subdivision No. 2, Division I, $64,610.25 for Oct. 2 to Dec. 31, 1933, on the basis of 1.4c. per ton on the production during the three months covered; Iowa Subdivision, Division II, $21,500 for year ending Sept. 26, 1935, on the basis of 10 mills per ton on production for the year 1933, until figures are available on 1934 output, when the later figures shall be used.

An important development among enforcement activities in January was the issuance of a permanent injunction Jan. 8 by the U. S. Court for the Southern District of West Virginia restraining the Vera Pocahontas Coal Co., of Iager, W. Va., from misrepresenting the sizes of coal. The company was charged with selling a larger coal for the price of a cheaper coal. The Gillie Coal Co., Bokoshe, Okla., lost its NRA insignia for violation of the wage and hour provisions of the bituminous code.

Michael J. Hartneady

Named as Secretary of the Department of Mines of Pennsylvania by the newly elected Democratic Governor, George H. Earle. Mr. Hartneady assumed his new office on Jan. 15. Before taking up his new duties Mr. Hartneady resigned the presidency of District 7, U.M.W., to which he had recently been elected for the third successive two-year term.

Personal Notes

HUGH J. BROWN, vice-president of District 7, U.M.W., since 1929, with headquarters at Hazleton, Pa., has been advanced to the presidency of that district. He succeeds Michael J. Hartneady, appointed Secretary of the Department of Mines of Pennsylvania.

LEWIS R. CLOSE, of New York, was elected president of the Lehigh Valley Coal Co. Jan. 21 to serve until the annual meeting of directors, in April. He succeeds John M. Humphrey, recently deceased. Mr. Close also is president of the Lehigh Valley Coal Corporation, holding company, and of the Lehigh Valley Coal Sales Co.

C. D. CRADDOCK, connected for many years in various capacities with the Utah Fuel Co., Salt Lake City, Utah, has been chosen president of the National Coal Co., with headquarters in the same city and operations in Carbon County. He succeeds F. A. Sweet, who has resigned because of ill health.

JAMES D. FRANCIS, president, Island Creek Coal Co., Huntington, W. Va., has been appointed to the business advisory council of the U. S. Department of Commerce.

ROBERT GREGG, president, Tennessee Coal, Iron & Railroad Co., since 1933, has been made vice-president in charge of sales of the United States Steel Corporation, vice Charles L. Wood, who has retired on account of ill health. The change becomes effective Feb. 1.

D. D. HULL, JR., president, Virginia Iron, Coal & Coke Co., Roanoke, Va., has been appointed by Governor Peery to the Virginia Conservation and Development Commission. He succeeds Lee Long, vice-president, Clinchfield Coal Corporation, whose term has expired.

BERTRAM P. MANLEY, executive secretary, Utah Coal Operators' Association, has been chosen a member of a committee to draft a law to take the place of the Utah recovery act (the State NRA) when that law expires, July 1. It was decided to seek continuance of the benefits of the code movement at a meeting of industrial leaders held in Salt Lake City, Jan. 16.

MALCOLM MUIR, president, McGraw-Hill Publishing Co., has been named to membership on the NRA industrial advisory board.

M. L. NEWHALL, president, Berwind Fuel Co., Chicago, has been elected vice-president of the Berwind-White Coal Mining Co. and will retain both offices, with headquarters at New York.

JOHN L. PERRY, vice-president, American Steel & Wire Co., has been recommended by the finance committee of the United States Steel Corporation for election as

president of the Tennessee Coal, Iron & Railroad Co., to succeed Robert Gregg, who has been chosen vice-president in charge of sales of the Steel Corporation.

E. W. Seckendorff has joined the technical staff of the Battelle Memorial Institute, Columbus, Ohio, where he will assist in the study of fuel problems. He was born in Austria, where his engineering studies began, being continued in Switzerland. Since coming to this country he has had extensive experience in production and research problems at various Stone & Webster plants, Philadelphia & Reading Coal & Iron Co., Jeffrey Mfg. Co. and the Great Lakes Coal & Coke Co. His investigations have included problems pertaining to power plants, boiler-plant operation, mechanization and electrification of mining properties, and the utilization of pulverized coal.

Carl Stripe, recently assistant to the vice-president of the Davis Coal & Coke Co., has joined the Combustion Engineering Co., Inc., to take charge of sales of small industrial stokers.

Mine Equipment Builders' Codes Approved by NIRB

Approval of codes for the coal-cutting-machine industry and the coal-mine-loading-machine industry was announced by NIRB on Jan. 6. Both codes are supplemental to the machinery and allied products industry code, and contain the general labor provisions of the master code: the basic 40-hour maximum work week and minimum wage rate of 40c. an hour. The basic code contains both population and geographical wage differentials.

The codes were approved on the condition that provisions prohibiting "wilfully" destructive price cutting be stayed, and that the Coal Cutting Machine Manufacturers' Association and the Coal Mine Loading Machine Manufacturers' Association delete from their bylaws the words "and further assents to the code or codes of the industry." The usual standard trade practices appear in the supplemental codes.

Annual sales in 1933 of the coal-cutting-machine industry, according to its association, which purports to represent 95 per cent of the dollar volume business of the industry, declined to less than one-third of the 1929 level, totaling $2,005,700 in the latter year. Employment declined from a total of 1,482 in 1929 to 847 in 1933, a drop of 42.8 per cent.

Annual 1933 sales for the coal-mine-loading-machine industry declined in approximately the same ratio as the above industry, and amounted to $575,000 in 1933, according to the association, claiming 90 per cent of the industry. Employment declined from 160 in 1929 to 101 in 1933, or 36.8 per cent.

Mine Explosion Kills Eleven

An explosion Jan. 21 in the Gilberton colliery of the Philadelphia & Reading Coal & Iron Co., Gilberton, Pa., caused the death of eleven men, with two reported missing. Seventy-one others were overcome with blackdamp. A gas ignition was reported to be the cause of the blast.

Congress to Act on Administration Program For Social Security Insurance

PRESIDENT ROOSEVELT'S social insurance program, foreshadowed in his message on the subject in the closing days of the last session of Congress, took definite form Jan. 17 when identical bills to carry out the proposals embodied in the report of the President's Committee on Economic Security were introduced by Senator Wagner (New York) and Representative Lewis (Maryland). The report, accompanied by a brief covering message from the President, covers unemployment compensation benefits, old-age pensions and annuities and government aid to needy and dependent mothers and children. Prompt consideration was urged by the President because "federal action is necessary to and conditioned upon the actions of States" and 44 State legislatures are meeting or will meet soon.

The Wagner-Lewis bill provides for:

1. Protection of the needy above the age of 65 through free State pensions not to exceed $30 per month financed equally by the States and the federal government.

2. A national system of contributory old-age annuities financed by joint contributions on a 50-50 basis from employers and employees and without governmental financial participation.

3. Voluntary old-age annuities, bought directly from the government, for those in higher income groups not subject to the compulsory contributory plan.

4. Unemployment compensation financed by a 3 per cent federal tax on payrolls subject to a credit up to 90 per cent to employers contributing to similar State plans.

5. Government grants to States for assisting dependent mothers and children and for the promotion of public health—not health insurance.

6. Supervision of old-age and unemployment insurance systems by a Social Insurance Board of three members appointed by the President and part of the Department of Labor; supervision of direct benefits to the aged and other dependents by the Federal Relief Administration; supervision of health benefits by the Public Health Service.

The duties of the Social Insurance Board shall include:

(a) Studying and making recommendations as to the most effective methods of providing economic security through social insurance, and as to legislation and matters of administrative policy concerning old-age insurance, unemployment compensation, accident compensation, health insurance and related subjects.

(b) Examining and making recommendations to the Secretary of Labor as to the allowance of credit under Title IV of the act (social insurance).

(c) Supervising and directing . . . the payment of old-age annuities under a national contributory old-age insurance system.

(d) Issuing old-age annuities, as provided in Title V.

(e) Assisting the States . . . in the administration of unemployment compensation laws.

The purpose of the "old-age assistance" is to secure "a reasonable subsistence compatible with decency and health." Applicants for pensions must be residents of the United States and must have lived in the State from which application is made five years or more within the decade immediately preceding such application. Until Jan. 1, 1940, however, assistance may be denied otherwise eligible persons under 70 years of age. The bill appropriates $50,000,000 for the year ending June 30, 1936, and $125,000,000 annually thereafter to cover the federal government contribution to the old-age pensions. The bill also carries annual appropriations of $25,000,000 beginning next July for aid to dependent children; residence requirements for such aid in any State shall not exceed one year.

To finance compulsory old-age insurance or anuities, employers and employees must each contribute a sum equal to 0.5 per cent of the employee's earnings annually during the five years commencing Jan. 1, 1937, 1.0 per cent the next five years, 1.5 per cent the following five years, 2.0 per cent beginning with 1952 and 2.5 per cent beginning with 1957. Employers' contributions would be collected as an excise tax. Under Title VI, the Social Insurance Board is authorized to borrow, on government credit, amounts sufficient to provide for citizens under 65 annuity certificates which, with interest accretions, will not exceed $9,000 when the beneficiary attains the age of 65.

Unemployment compensation is to be financed by a 3 per cent tax on payrolls beginning next year. The bill provides for lower rates in 1936 and 1937, however, if the Federal Reserve Board's adjusted index of total industrial production falls below 95 per cent of the average for 1923-25. If the index figure does not exceed 84, the rate for the first year will be 1.0 per cent; if higher than 84 but less than 95, the rate shall be 2 per cent, subject to the provision that in no event shall the 1937 rate be less than that for 1936. The index for November, 1934, was 70 per cent.

The bill further authorizes annual appropriations of $4,000,000 beginning next July to aid State agencies in extending and strengthening services for the health of mothers and children, particularly in rural and depression-hit areas. An additional $3,000,000 is authorized in order "to cooperate with the State agencies concerned with the provision of medical care and other services for crippled children, especially in rural areas." Eighty per cent of an annual appropriation of $10,000,000 to the Public Health Service is to be alloted to the States to develop State health service and to assist States and political subdivisions thereof "in maintaining public-health programs." The remaining $2,000,000, the bill provides, is to be available to the Public Health Service for further investigation of disease, problems of sanitation and related matters.

In his message to Congress, the President expressed gratification with the work of the Committee on Economic Security which he appointed to study the question. "It has not attempted the impossible," he said, "nor has it failed to exercise sound caution and consideration of all the factors concerned—the national credit, the rights and responsibilities of States, the capacity of industry to assume financial responsibilities and the fundamental necessity of proceeding in a manner that will merit the enthusiastic support of citizens of all sorts. It is overwhelmingly important to avoid any danger of permanently discrediting the sound and necessary policy of federal legislation for

economic security by attempting to apply it on too ambitious a scale before actual experience has provided guidance for the permanently safe direction of such efforts."

Hearings on the bill opened in the Ways and Means Committee of the House and the Finance Committee of the Senate the week of Jan. 21.

A.M.C. Convention Set for May

The twelfth annual convention of Practical Coal Operating Men and National Exposition of Coal Mining Equipment, under the auspices of the Manufacturers' Section of the American Mining Congress, will be held in Cincinnati, Ohio, May 13-17. Preliminary arrangements for the convention were made at the December meeting of the directors, held in Washington. As in past years, meetings will be held and exhibits shown in the Music Hall.

Research Committees Named

Committees on standards of performance, to determine laboratory facilities and to outline a technical research program for Bituminous Coal Research, Inc., have been announced by John C. Cosgrove, president. The committee on standards of performance includes B. R. Gebhart, assistant to the president, Appalachian Coals, Inc., Cincinnati, Ohio (chairman), and these five members of the Committee of Ten—Coal and Heating Industries: Thomas A. Marsh, representing the stoker industry; Homer R. Linn, boiler and radiator industry; Harvey Manney, warm-air heating industry; H. M. Hart, heating and plumbing industry, and J. H. Walker, American Society of Heating and Ventilating Engineers.

Committee to recommend laboratory facilities to the board of directors: George K. Smith, president, Sunday Creek Coal Co., Columbus, Ohio (chairman); L. W. Householder, vice-president, Rochester & Pittsburgh Coal Co., Indiana, Pa.; R. H. Sherwood, president, Central Indiana Coal Co., Indianapolis, Ind.; Col. W. D. Ord, president, Empire Coal & Coke Co., Landgraff, W. Va., and W. A. Marshall, president, Lincoln Coal Co., New York.

Research program committee: Howard N. Eavenson, president, Clover Splint Coal Co., and president A.I.M.E., Pittsburgh, Pa. (chairman); R. L. Rowan, Stonega Coke & Coal Co., Philadelphia, Pa.; L. H. Dayhoff, president, Little Betty Coal Mining Corporation, Chicago; B. R. Gebhart, assistant to the president, Appalachian Coals, Inc., Cincinnati, and James Walter Carter, president, Carter Coal Co., Washington, D. C.

Committees for coordination of coal research and probably on market promotion and ways and means are to be set up later by President Cosgrove.

Heavier Coal Shipments Forecast

Shipments of coal and coke for the first quarter of this year are estimated by Regional Shippers' Advisory Boards at 1,976,764 cars, as compared with 1,967,533 cars actually shipped in the first quarter of 1934. The prospective gain is 0.6 per cent.

30-Hour Week Would Boost Nation's Coal Bill

Establishment of a compulsory 30-hour week for the bituminous coal industry would mean reduced labor productivity per man and increased labor cost per ton, and for society a big increase in its fuel bill to be avoided only by reducing its coal consumption, the National Coal Association asserts in a brochure entitled "The 30-Hour Week and the Bituminous Mining Industry," just issued. "If consumers continued to use only as much coal as they used in 1933," it is pointed out, "this would add well over $100,000,000 to their annual coal bill.

"For reasons entirely beyond the control of mine operators," it is stated, "the demand for bituminous coal is very unevenly distributed throughout the year. In a normal year, the demand for coal in the country as a whole, and hence its production, is 50 per cent greater in some months than in others, while in individual States the variation is even greater. This irregularity of demand, with its resulting irregularity of employment, is a basic fact which must be given careful consideration in any attempt to arrive at reasonable provisions as to working hours per week. .

"In many industries a 30-hour week may mean a 30-hour week; in the bituminous coal industry, because of its seasonal character, a nominal 30-hour week means an actual average, for the hundreds of thousands of men in the industry, of about 24 hours throughout the year, an average for the country as a whole in the months of minimum production of less than 20 hours per week, and in individual States of less than ten hours per week. This extremely short working-week would be enjoyed not only by the 400,000 men needed in the industry while operating under a 40-hour week but by an additional 100,000 men needed to get out the production of maximum months under a 30-hour week. Consumers of bituminous coal would be expected to foot the bill, and nine-tenths of the additional cost would come not out of the much-maligned employers but out of the great body of laborer-consumers.

"This is on the assumption that the consumption of bituminous coal would not fall off as a result of the substantial increase in costs and prices that the introduction of the 30-hour week would entail. As a matter of fact, the demand for bituminous coal would be seriously curtailed through increased economies in consumption and through the resort to rival sources of heat and power, with resulting decline in production and in volume of employment.

"In an industry with as high a degree of irregularity of employment as exists in the bituminous mining industry, and with as insecure a hold on its market as bituminous coal possesses, to attempt to regularize employment conditions by reducing the allowable maximum hours of work per week is to enter upon a vicious circle leading to ever greater and greater demoralization."

Permissible Plates Issued

Three approvals of permissible equipment were issued by the U. S. Bureau of Mines in November and December, as follows:

Jeffrey Mfg. Co.; Type 41-A shortwall mining machine; 35-hp. motor, 250 volts, d.c.; Approval 273; Nov. 30.

La-Del Conveyor & Mfg. Co.; Type SLS-18 shaker conveyor; 10-hp. motor, 500 volts, d.c.; Approval 274A.

Sullivan Machinery Co.; Type CA-12 mining machine; 50-hp. motor, 440 volts, a.c.; Approval 275A.

"Gene" Leslie Dies

E. H. Leslie, district manager of *Coal Age* and *Engineering & Mining Journal*, Chicago, and affectionately known as "Gene" to hundreds of mining men and manufacturers of mining equipment in the Middle West and Rocky Mountain States, died suddenly at his home in Winnetka, Ill., Jan. 14, from an attack of pneumonia.

Born in Ohio in 1884, Mr. Leslie received his early education in the grade schools of Columbus and the Steel High School, Dayton, Ohio. He was graduated from Princeton, where he had specialized in science, with an A.B. degree in 1906. The next three years were spent at Columbia University studying mining and metallurgy. Following his graduation from Columbia with an E.M. degree in 1909, Mr. Leslie went to Mexico City, D. F., to engage in consulting work and to act as editor of the *Mexican Mining Journal*. In 1912, he moved eastward to Chicago to take the position of Mid-Western manager for the *Mining & Scientific Press*, and in 1915 journeyed westward to San Francisco, Cal., to become associate editor. When that publication was absorbed by *Engineering & Mining Journal*, in 1922, Mr. Leslie was transferred to the business department and several years later also was made district manager of *Coal Age*.

Mr. Leslie was a member of the A.I.M.E., the University Club (Chicago) and the Columbia and Princeton Alumni associations. He is survived by a widow and three children.

Coal Bill Provides $4 Duty

All imports of coal would be subjected to a tariff of $4 per ton by the provisions of a bill introduced in Congress early in January by Representative C. Murray Turpin, of Pennsylvania. The measure was framed to reduce unemployment among miners, particularly in the anthracite field. It provides for collection of the duty "notwithstanding any treaty provisions," the sponsor of the bill explaining that recent decisions by the Customs Court of Appeals had invalidated a previous impost of $2 a ton on coal imports where "most favored nations" clauses were involved.

Bootleg Mining a Menace

Elimination of "bootleg" coal operations in the anthracite region near Shamokin, Pa., is sought by the Stevens Coal Co. and Susquehanna Collieries Co. The Stevens company, which has leased the Cameron

colliery from the Susquehanna, has appealed to the State Department of Mines to prohibit bootleg operations on its property, asserting that they are a menace to the safety of workers below engaged in legitimate mining operations.

The Susquehanna company is making a test case in an action before the State Superior Court to make permanent an injunction against nineteen bootleggers restraining them from trespassing on company-owned property. County courts refused to act "without full hearing on all phases of the issue," pointing out that the condition had existed for two years without previous recourse to injunction.

TVA Plan Has Ups and Downs; Cement Plant to Use Coal

Developments in the power plans of TVA during the last month were featured by the City of Knoxville, Tenn., taking definite steps to build its own power distribution system, which would use electricity bought from TVA and compete directly with the Tennessee Public Service Co., a local utility. The City Council awarded a contract Jan. 2 for the first unit of the new municipal system. The city's action followed litigation which blocked the efforts of TVA to purchase plants of the Tennessee Public Service Co. in and near Knoxville for $6,088,000.

Judge W. I. Grubb, in federal district court at Birmingham, Ala., issued an order Jan. 9 temporarily restraining fourteen northern Alabama towns involved in the TVA program from borrowing money from PWA for construction of power distribution plants. This order came soon after the mayors of three of the towns—Sheffield, Florence and Tuscumbia—had announced receipt of contracts for loans totaling nearly $800,000.

The restraining order was the outcome of a suit by preferred stockholders of the Alabama Power Co. to enjoin the municipalities from "aiding, furthering or participating in the illegal use or diversion of federal funds," by accepting a loan from the PWA or TVA for construction or acquisition of an electric utility system in competition with the plaintiff company.

Judge Grubb refused, however, to accept a supplemental bill filed by counsel for the power company, the court holding that this would tend to encumber the proceedings. The attorneys said that the power company had no objection to competition from the municipalities, but asserted that it did object to "competition by illegal means." The PWA loan, he contended, would constitute such competition.

The PWA announced on Jan. 9 that it would associate itself in an appeal from Judge Grubb's order, as it has done in a number of other instances when municipal power projects have been opposed. TVA on Jan. 19 moved for a continuance of the Alabama Power Co. action to halt the government power project, and Judge Grubb set Jan. 25 for the motion for a hearing, the trial to begin Jan. 28.

What is believed to be a challenge to the TVA project in neighboring States is seen in an announcement Dec. 31 by the Arkansas Power & Light Co. of an expansion program to deliver electricity to 15,000 isolated farm homes in 53 Arkansas counties at a cost of "about $6,000,000." Harvey C. Couch, president of the Arkansas Power & Light Co. and head of utilities in Louisiana and Mississippi, who recently resigned as a director of RFC, said he would seek financing through "some government agency." About 3,500 miles of transmission lines would be necessary.

Thomas Kennedy

Inaugurated on Jan. 15 as Lieutenant Governor of Pennsylvania, Mr. Kennedy will continue to hold the office of secretary-treasurer of the United Mine Workers. The constitution of the miners' union, it is said, permits officers to hold elective political offices; if there had been provisions to the contrary, said Mr. Kennedy, he would not have consented to be a candidate on the Democratic ticket.

By a vote of 3,888 to 3,098, the city of Jackson, Miss., rejected a proposal for municipal ownership of an electric power plant and a possible hook-up with TVA at an election held Jan. 19. The vote was taken on a proposed bond issue of $1,500,000 to finance the project. Mayor Walter A. Scott supported the proposal, which was opposed by the Mississippi Power & Light Co. after negotiations for lower rates had fallen through.

Reviewing the TVA program in the course of an address at the University of Pennsylvania, Jan. 10, John E. Zimmermann, president, United Gas Improvement Co., Philadelphia, said: "I find it difficult to believe that our people are going to be better off by government ownership and operation of utilities than under private ownership and operation. No matter where you may look, you will find that actual experience with government operation has proved the contrary and has frequently been followed by disastrous effects upon the people. The determination of the constitutionality of the TVA and the legality of some of the things being done under the act are of vital interest to those whose savings are invested in light and power companies." If it is adjudged to be constitutional, Mr. Zimmermann asserted, "private capital will seek safety from this paralyzing competition of the federal government by investment in other lines of business."

Speaking before a council of engineers at Salt Lake City, Utah, Dec. 31, C. B. Huntress, president, Appalachian Coals, Inc., Cincinnati Ohio, said that the TVA program threatens to annihilate an investment of $780,000,000 in private utilities and destroy the market for 6,000,000 tons of coal a year. If carried to its logical conclusion it will result in greater unemployment and the uneconomic production of power at the expense of the taxpayers.

Direct loss of a market for 5,000,000 tons of coal from the production of water power by the St. Lawrence seaway project is predicted by Howard N. Eavenson, Pittsburgh, Pa., president of the Clover Splint Coal Co. as well as the A.I.M.E., in a booklet entitled "Recent and Possible Future Developments in Competition Between Coal and Water Power." Installation of boilers using electricity generated by surplus water power, says Mr. Eavenson, has already displaced consumption of 1,250,000 tons of coal annually. He believes that a similar situation will develop in the Tennessee Valley if and when the TVA program is carried out. In addition to the direct losses in coal consumption caused by the St. Lawrence project, the report sees a threat to 15,000,000 tons of coal exports from the United States to Canada yearly.

The National Coal Association also is giving wide distribution to a reprint of an address before the Coal Mining Institute of America, Dec. 6, at Pittsburgh, Pa., by Dean Holbrook, of the University of Pittsburgh, on the issue of coal versus hydro power (*Coal Age*, January, p. 40). Under the title "The Coal Industry and the Government's Hydro-Electric Plants," the address stresses the proposition that the first and best source of power is coal, with particular reference to the TVA, the Loup River project and the St. Lawrence seaway scheme.

A $2,000,000 natural-gas line from the Long Lake gas field, in Anderson County, Texas, to Dallas, a distance of 100 miles, is to be constructed by the Lone Star Gas Co., it was announced early in January.

On the other side of the ledger, the Alpha Portland Cement Co., St. Louis, Mo., announced on Jan. 8 that it will abandon the use of natural gas at its St. Louis plant and return to coal as soon as storage and drying facilities can be reconstructed. The plant formerly consumed 100,000 tons of screenings annually.

Independent Anthracite Agency Elects Temporary Officers

Independent anthracite producers who marketed 11,300,000 tons of hard coal in 1934 held an organization meeting at Wilkes-Barre, Pa., Jan. 15 and launched a temporary set-up of their new selling agency, Independent Coals, Inc. Patterned after Appalachian Coals, Inc., the new organization is designed to effect an orderly distribution of anthracite and eleminate a plethora of coal that sometimes floods the markets and causes price cutting. When producers representing 12,500,000 tons output are enrolled the organization will become permanent.

These temporary officers were elected: president, Donald Markle, president, Jeddo-Highland Coal Co., Jeddo; treasurer, George F. Lee, general manager, George F. Lee Coal Co., Wilkes-Barre; secretary, A. B. Jessup, vice-president, Jeddo-Highland Coal Co. James H. Pierce, representing the Kingston, Price-Pancoast and West End and the East Bear Ridge interests, presided at the organization meeting.

Creosoted Ties Show Profit At Consolidation Mines

Creosoted ties in the two-mile main-line track at the Owings (W. Va.) mine of the Consolidation Coal Co. are in perfect condition after eight years of service, and should last twenty years easily, declared F. F. Jorgenson, manager of production at the meeting of the American Wood Preservers' Association, New York City, Jan. 22-25. Owings was one of the first of the Consolidation mines to install the company's Class A main-line track, which is based on the use of 33-ft. lengths of A.S.C.E. standard-section 60-lb. rail and sound oak, pine, chestnut, locust, tamarack or spruce ties 5 in. thick, 7 in. across the face and 6 ft. long treated by the Reuping, or empty-cell, process with the final retention of 8 lb. of creosoted oil per cubic foot of timber. Specifications call for a creosoted oil equal to or better than coal-tar solution oil, of which at least 80 per cent shall be a distillant of coal-gas or coke-oven tar and the remainder a refined and filtered coal-gas or coke-oven tar in compliance with A.R.A. standards.

Equipment operating over the Owings track consists of one 20- and several 13-ton locomotives pulling cars weighing 2 tons and holding 4 tons of coal. Standard trip size is 40 cars. In eight years, 4,229,300 tons of coal has passed over all the track and 6,041,471 tons over part. Maintenance, except for cleaning up spillage, has been almost nothing, never exceeding $25 per year. At present, the cost of a treated tie is approximately 80 per cent more than an untreated tie, and should have seven times the life. Labor cost of replacing an untreated tie is nearly 50 per cent more than the cost of the tie, and the total cost of replacing an untreated tie is about 35 per cent greater than the cost of the treated tie alone.

Approximately 100,000 creosoted ties have been purchased in the West Virginia division in the past years for the construction of nearly 30 miles of Class A track, with results similar to those achieved at Owings. Creosoted timber also has been used in shaft lining, mine buildings and car bottoms, said Mr. Jorgenson. Not a car bottom has succumbed to rot or mechanical wear in five years of service, and all new cars are equipped with creosoted bottoms, in addition to the use of creosoted timber in replacements.

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Industrial Notes

Ohio Power Shovel Co., a subsidiary of Lima Locomotive Works, Inc., Lima, Ohio, has been consolidated with the parent company, and will hereafter be operated as Lima's shovel and crane division.

Cincinnati Mine Machinery Co., Cincinnati, Ohio, announces that all its sales and service work in Pennsylvania, Ohio, West Virginia, eastern Kentucky and Virginia will be handled hereafter by direct factory representation. C. W. Crady, with headquarters in Pittsburgh, Pa., will represent the company in the northern fields, while Ben Jordan will cover the southern territory.

Ralph H. Clore, formerly general sales manager of the United States Electrical Tool Co., has been appointed general sales manager of the Medart Co., manufacturer of power transmission machinery, St. Louis, Mo. He succeeds F. P. Kohlbry, who resigned to assume active charge of the Machinery & Welder Corporation, Chicago.

New Jersey Zinc Sales Co., New York, has purchased the business and good will of David Randall & Co., Boston, Mass., which it will continue to operate in the latter city. George W Harragan will remain as New England representative.

Borg-Warner Corporation, Chicago, has acquired an interest in Marbro Products Corporation, Chicago, holding patents covering a new process for the manufacture of rubber hydrochloride and derivative products. William P. Hemphill has been elected president of the Marbro company. Borg-Warner has consolidated its major subsidiaries and will operate them as departments of the parent corporation. The units affected are: Rockford Drilling Machine Co. and Mechanics Universal Joint Co., both of Rockford, Ill.; Bork & Beck Co., New Castle, Ind.; Warner Gear Co., Muncie, Ind.; Detroit Vapor Stove Co., Detroit Gear & Machine Co., Norge Corporation and Long Manufacturing Co., all of Detroit.

Griswold A. Price has been appointed manager of sales in the St. Louis district for the Illinois Steel Co., Carnegie Steel Co. and Tennessee Coal, Iron & Railroad Co.

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John M. Humphrey Dies

John M. Humphrey, 68, president of the Lehigh Valley Coal Co., anthracite and bituminous producer, Wilkes-Barre, Pa., died Dec. 28 of a heart attack at his home in Kingston, Pa., after a week's illness. Born in Philadelphia, he was educated at Germantown Academy and Lehigh University, where he was graduated as a mining engineer. After a brief period with the Norfolk & Western Ry., he entered the employ of the Lehigh Valley Coal Co. in 1890 and was successively division engineer, mining engineer, superintendent in charge of the Mahanoy and Shamokin division and chief engineer. He became president of the company in 1921.

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More Anthracite for Italy

A 7,000-ton cargo of anthracite cleared from Philadelphia for northern Italy on Jan. 8. The shipment was made by the Philadelphia & Reading Coal & Iron Co. aboard the steamer "Vallarsa." This is the third cargo of anthracite shipped by the Reading company in recent months to Italy.

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Bernice Mine to Be Sold?

Sale of the operations of the Connell Anthracite Mining Co. at Bernice, Sullivan County, Pa., to the Bernice Coal Co., is in prospect as the result of a ruling by Judge Lewis, of Lackawanna County Court. The court granted permission to the receivers, who are operating the colliery, to sell the property for $150,000, after declining to allow the company owning the land to cancel the lease to the Connell company. Robert Westlake is president of the Bernice company.

New Bonus System Adopted at Union Pacific Mines

A new bonus payment system whereby underground employees may receive from $20 to $25 when the mine in which they are employed shows the lowest ratio of cost for labor, material and power in any year has been put into effect by the Union Pacific Coal Co. All underground employees on a day wage or tonnage basis are eligible, provided they have been regularly employed during the last three months of the year and are still on the mine payroll at the end of the year. Employees who are unable to work on account of sickness or accident or who have been given leave of absence for good cause will be considered as being in service. The new plan is effective from the beginning of this year.

As soon as possible after the close of the calendar year a statement of the cost for labor, material and power for each mine will be prepared and compared with the cost for those items in the preceding year. Employees of the mine showing the lowest ratio will receive $25 each and workers in the mine showing the next lowest figures will be awarded $20 each.

Under the system adopted at Union Pacific mines in 1930, men employed on shaker conveyors, scrapers and Joy loaders who exceeded a nominal day's output were paid an amount equal to one-half the labor cost per ton developed on each class of machine. In 1931, pit-car loaders were included in the arrangement. As certain variables which could not be controlled entered into the daily output per man-shift worked on the large scraper loaders and pit-car loaders, the arrangement was discontinued on these types of equipment. The same situation similarly affected operators of Joy loaders. As a result of this situation only workers on shaker conveyors were able to earn substantial bonuses during recent years. Bonus payments to Nov. 1, 1934, totaled $114,946.63.

Under the old arrangement much of the bonus was earned by reason of certain crews enjoying favorable locations, placing those with unfavorable locations at a disadvantage. There also was complaint from some employees, such as motormen, tripriders, drivers, timbermen, repairmen and the like, that they were unable to participate in such payments.

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Coming Meetings

Eastern Ohio Coal Operators' Association; annual meeting, Feb. 11, Cleveland, Ohio.

American Institute of Mining and Metallurgical Engineers; annual meeting, Engineering Societies Building, 29 West 39th St., New York City, Feb. 18-21.

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

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

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

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