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District Selling Agencies

IN DISCUSSING consolidations as one phase in the stabilization of the bituminous industry, the program published in the September issue of *Coal Age* said: "District selling agencies probably would be an easier first step than physical mergers of producing companies." The same conclusion, apparently, has been reached by the special committee of the National Coal Association appointed several weeks ago to consider ways and means of rehabilitating the industry.

THIS COMMITTEE, at a meeting in New York City on December 3, adopted a report which proposed: (1) That producing fields be divided into specific districts, the output from each district to be handled by a district selling agency, and, (2) that "proper steps should be taken in each of the producing districts looking toward the eventual consummation" of physical mergers "along natural and economic lines."

ALTHOUGH many producers strongly oppose the district agency plan, there are possibilities in the idea which should not be denied earnest consideration. A producer who has built up a reputation for quality and performance might well hesitate to sink these advantages into anonymity. But, could he retain these advantages and at the same time embrace those inherent to the district plan, his hesitation might vanish.

SUCH AN OPPORTUNITY is presented, if, as has been suggested by one close student of the plan, the proposed district agency be limited to the handling of spot coal. Under this modification, individual, long-term customer relations would be preserved. While this limitation is not embodied directly in the committee plan, the committee plan does seek to protect trade names and good will and makes all sales for future deliveries exceeding sixty days subject to specific approval by the producing company.

THE GREATEST DANGER the district selling agency scheme faces, however, is not the opposition of its enemies but the enthusiasm of some of its friends. If the scheme is to be an instrument of stabilization, its limitations as well as its advantages must be recognized. Its unquestionable benefic possibilities in lessening cutthroat intradistrict competition are no greater than its malefic possibilities in intensifying interdistrict sales warfare.

EXAGGERATING the importance of the district selling agency may possibly hasten its acceptance by the doubting, but such a course means only eventual disappointment and disillusionment. The district selling agency is in no sense a panacea for the basic ills of the bituminous coal industry. Neither can this plan function to its full effectiveness until and unless the other still more fundamental problems are attacked and solved.

THEREFORE, while this particular proposal, should it be adopted, will mark a forward step in the direction of ultimate consolidation into larger producing units, the drive toward the other major objectives also must be undertaken if true stabilization is to be attained.

ECONOMIC PROBLEMS + And Technological Progress Dominate Pittsburgh Conference

PROGRESS in the study of fuels was manifested in many directions at the Third International Conference on Bituminous Coal, held under the auspices of the Carnegie Institute of Technology, Pittsburgh, Pa., Nov. 16-19. Primary among the discussions were those on the economics of coal mining. Cleaning also had its innings with a review in brief of European practices. The effect of mine waters on rivers and streams, and the means by which the acidity of mine water may be decreased, or the water may be made even alkaline, where hitherto acid, were considered at a session on stream purification. Low-temperature carbonization, pipe-line transmission of pulverized coal in Germany, classification, gasification and hydrogenation, and the utilization of coal were among the other subjects treated in the four-day gathering.

In opening the conference, Dr. Thomas S. Baker, president, Carnegie Institute of Technology, reiterated that the scientist is seeking to develop more and more substances from coal which will be of service to mankind, to conserve a great inheritance for future generations, and "to secure a greater reward for the miner and mine owner for their labor and hazards. Let us not be impatient. The thought that coal is something more than fuel is comparatively new, and time must pass before the hopes of the research worker can be realized."

Myron C. Taylor, chairman, finance committee, United States Steel Corporation, said that in the 50 years from 1878 to 1928 the growth in the population of the United States was 140 per cent; in coal mined was 736 per cent; in water power, 1,018 per cent; in natural gas, 2,033 per cent; and in oil used, 3,346 per cent. Mr. Taylor denied that the introduction of machinery had laid men idle. In 1920, census reports showed 39.3 per cent of the population was gainfully employed, and in 1930, the same reports recorded 39.8 per cent thus employed. In 1890 only 36.1 per cent of the population had paying jobs.

Albert C. Ritchie, Governor of Maryland, decried "running to government, especially by business, big or little, for help to administer its affairs." He declared himself as having "more faith in economic than in political statesmanship—not because business men are smarter but because these are questions germane to their individual and collective interests and they are also largely problems of their own making.

"The excessive injection of government into the stream of business is bad, and governmental handling of industrial matters is sure to be insufficient, autocratic and costly—as Adam Smith long ago pointed out." "In your industry," he added, "where ownership and operation are entirely intrastate, and only the transportation of your product comes within the purview of federal power, I cannot see why federal regulation should be called for."

Deploring unremunerative prices of coal, C. E. Bockus, president, National Coal Association, said that, without any definite figures, he believed that over a period of years the amounts received from the resale of coal lands and from royalty on coal produced have at least equaled the profits from the operation of coal mines. Mr. Bockus declared that "both the mining and transportation industries have extended their services to meet a demand that no longer exists."

Competition, he said might eliminate mines and raise prices, but any rehabilitation of price would cause the rehabilitation of closed mines. Mr. Bockus advocated "reasonable cooperation for a sensible reduction of output," but refused to comment on the legal difficulties to be confronted. He said that the coal companies maintained their tonnage (1) to afford sufficient running time to keep their organization intact; (2) to lessen the cost of overhead per ton of production; (3) to justify the expense incurred in establishing a market for certain coals; (4) to furnish freight to a friendly railroad.

Dr. L. E. Young, vice-president, Pittsburgh Coal Co., Pittsburgh Pa., said that stabilization proposals could in general be grouped under: (1) consolidation, (2) production control, (3) price control, (4) sales programs, (5) freight-rate revisions, (6) improvements in labor relations, (7) taxation relief, (8) conservation, (9) federal fact finding, (10) federal

Coal Conference Developments

In addition to this general summary of the deliberations of the Third International Bituminous Coal Conference, the present issue of *Coal Age* also includes special stories on the Conference sessions on coal cleaning problems and on stream purification. The former begins on page 623 and the latter on page 629.

ownership, and (11) treatment of coal mining as a public utility. He charted 55 programs or suggestions for the satisfactory reconditioning of the coal industry, the result of an extensive research into the literature of coal mining.

W. T. Thom, Jr., Princeton, N. J., declared in a paper that the oil reserves of this country fully proved were 10,000,000,000 bbl., with semi-proved and perspective reserves of greater size and possible reserves of, at least, several times that amount. Natural-gas reserves he put at not less than 100,000,000,000,000 cu.ft. and perhaps twice that volume. In 1930, the production and consumption of natural gas passed 2,000,000,000,000 cu.ft. per annum. "Undoubtedly the great development of natural-gas pipe-line systems has only just begun."

Prof. Thom advocated that taxes which force overproduction of coal and oil be removed, and that orgies of overcompetition in oil-field development be eliminated. He questioned whether the coal industry could regulate itself. Government regulation appeared impracticable and too late to mend the present emergency. If neither plan could be applied almost immediately, he added, must we not then look to our state governors?

It was easier, said H. N. Eavenson, consulting engineer, Pittsburgh, Pa., for foreign nations to find a solution of their coal troubles, because of the state ownership of coal in those countries. Abroad, the Sherman law had no analogies. Certainly chaos will not be allowed to reign until the far-off day when our oil and natural-gas reserves have been spent. He called for a law instructing the Interstate Commerce Commission to forbid the extension of railroads to new mines for five years, with an extension of this time if conditions after its expiration appeared to warrant it.

R. V. Wheeler, Sheffield University, Sheffield, England, said the gas companies and power companies were the principal sufferers in the regulation of the industry under the Coal Mines Act of 1930. It was they who had to pay an increased price for coal.

W. L. Affelder, assistant to the president, Hillman Coal & Coke Co., recommended that Dr. Baker be asked to name a committee to form a plan for the economic coordination of the coal industry. Dr. Baker later appointed C. E. Lawall, director, School of Mines, West Virginia University, Morgantown; Walter H. Glasgow, Secretary of Mines, Harrisburg, Pa.; J. J. Rutledge, chief engineer, Maryland Bureau of Mines, Baltimore, Md.; F. R. Stearns, Stearns Coal & Lumber Co., Stearns, Ky., and James Berry, chief, division of mining, State of Ohio, Columbus, Ohio.

This committee, in a report presented on the closing day of the conference, acknowledged the receipt of six plans and codified them but did

Dr. Thomas S. Baker

not feel under obligation to report in favor of any of them. The high points in each plan were as follows:

No. 1 calls on the governors of the eight principal coal-mining states east of the Mississippi to appoint a body representing mine interests and public or legislative bodies.

No. 2 suggests combinations of operators of low-cost mines having a total annual coal production of 500,000 tons, each group to be regulated by a district organization supervised by state commissioners, and all in turn under the "sponsorship" of a national board or commission.

No. 3 would establish an advisory board of representatives named by the governors of states, who, on receiving a plan, would enter into a compact to put it into effect.

No. 4 asks the governors to call operators together to determine quotas and to use civil and military means to enforce quotas and prevent coal being sold below cost; coal to be declared a public utility and mines to be licensed.

No. 5 provides for a coal dictator from outside the industry.

No. 6 calls for modification of anti-trust laws and an enabling act by Congress.

Alfred G. White, research division, National Industrial Conference Board, New York City, read a paper on the competitive position of world coal, in which he declared that the formula of relationship between coal, oil, and natural gas was taken as: One short ton of coal equals 3.5 bbl. of oil and equals 23,000 cu.ft. of natural gas. In reducing German brown coal to its equivalent in tons of bituminous coal, 9 tons of brown coal was equated to 2 tons of bituminous coal. For the higher-grade lignites the ratio of 2 to 1 was used. He gave the accompanying table of coal consumption, wherein lignite and brown coal are reduced to their bituminous equivalents.

World Coal Consumption by Zones in Millions of Short Tons

Zone	1913	1929	Percentage of World 1929	Change 1913-1929
Northern America.....	580	625	41	+45
Southern America.....	16	12	1	—4
Northern Europe......	630	681	44	+51
Mediterranean-Russia..	67	84	5	+17
Southern Africa—Southern Asia—Oceania....	48	64	4	+16
Northern Asia.........	43	73	5	+30
	1,384	1,539	100	155

Thus Northern Europe, the Mediterranean, and Russia consumed 765,000,000 short tons and Northern America 625,000,000 tons in 1929.

R. B. Harper, vice-president, Peoples Gas Light & Coke Co., Chicago, declared that the energy supply represented by the production of natural gas was greater than that afforded by 80,000,000 tons of coal, that represented by water power approximated 85,000,000 tons of coal, and that represented by petroleum was greater than would be afforded by 220,000,000 tons. But, as he pointed out, 13.6 per cent of the natural gas was utilized in the manufacture of carbon black and 36.8 per cent was used in the oil-and-gas fields for drilling and pumping and for the operation of recovery plants; 40 per cent of the petroleum products in 1929 was consumed by automobiles, motor boats, tractors, aeroplanes, and other mechanical means of transportation.

Mr. Harper saw good reason to expect competition between all these basic sources of heat energy for many decades in the future, as the smallest known reserve of the three, natural gas, may be conservatively estimated at 20,000,000,000,000 cu.ft., equivalent to about 1,000,000,000 tons of coal. Research, however, is being made to ascertain if gas in conjunction with air, aided by electric power, will make it possible to eliminate smoke and aid in the ignition of a lower grade of coal than could be burned without such assistance. Thus the use of the several fuels eventually may be cooperative instead of competitive.

"Pipe lines," said George I. Rhodes, vice-president, Ford, Bacon & Davis, Inc., New York City, "now under construction or placed in operation since 1929, the year that showed the maximum consumption of natural gas, have an aggregate daily capacity of about 1,000,000,000 cu.ft. When these new lines are loaded to capacity there will be a further consumption of about 250,000,000,000 cu.ft., or an increase of more than 25 per cent above the recent maximum consumption."

Increasing efficiency in the utilization of coal and greater use of coal equivalents in the steel industry were set forth in a paper on "Future Possibilities of Bituminous Coal," by W. A. Forbes, assistant to the president, United States Steel Corporation. In 1920, the consumption of coal by the Corporation interests was 37,710,875 gross tons; in 1929 it was only 33,077,847 gross tons. During the same period, however, the use of coal equivalents had mounted from 9,197,358 to 11,638,531 gross tons. Thus, the actual coal consumption per ton of ingots and steel castings had declined 22.7 per cent. These changing conditions are reflected in Tables I and II.

George A. Orrok, of Orrok, Myers & Shoudy, consulting engineers, New York City, protested against the current belief that water power is a free gift of Nature. Today, he said, the average cost of development of all water-power sites remaining undeveloped has been variously estimated as running from $300 to $600 per kilowatt with transformers, rights of way, and transmission line; and substations cost another $100 per kilowatt. On the other hand, records from more than 100 steam stations built in this country show them to average about $100 per kilowatt. Some steam stations have been built for $50, and some have been reported to have cost over $200 per kilowatt.

Rudolph Pawlikowski, president, Kosmos Engine Works, Goerlitz, Germany, sent a paper describing a new type of Rupa internal combustion engine that has been developed to use pulverized materials, including coal and vegetable wastes. The seventh Rupa engine, Herr Pawlikowski says, has run in daily and continuous operation nearly 1,000 hr. on the hydraulic brake with an average load of about 130 hp. It has consumed approximately 59 short tons of brown-coal powder. For months it ran 10 to 14 hr. daily and frequently made runs of 80 to 90 hr. It delivers as much power with coal as with fuel oil. It uses only as much water as a diesel engine and costs little more. Its operation, he declared, is 26 per cent less expensive than a steam turbine and 50 per cent less than a diesel engine.

Table I—Fuel Types Used by United States Steel Corporation

	Year 1920 Per Cent	Year 1929 Per Cent
Coal used in coking		
Beehive ovens	17.8	3.0
Byproduct ovens	28.2	48.1
	46.0	51.1
Coal used for other purposes	34.4	22.9
Total coal used	80.4	74.0
Coal equivalent of other fuels used		
Tar	1.4	2.4
Fuel oil	0.8	0.8
Coke breeze	1.0	2.1
Blast-furnace gas	9.6	10.5
Coke-oven gas	3.7	6.7
Natural gas	1.8	1.2
Waste heat reclaimed	1.3	2.3
Total coal equivalent	19.6	26.0
Total coal and coke equivalent	100.0	100.0

Table II—Pounds of Coal or Equivalent Per Ton of Ingots*—United States Steel Corporation

	1920	1929
Coal	4,382	3,388
Coal equivalent	1,068	1,192
	5,450	4,580

*Includes steel castings.

C. E. Lawall

E. G. Bailey and R. M. Hardgrove, Fuller Lehigh Co., Fullerton, Pa., described the slag-tap furnace and showed how it adapts itself well to coals with ash-fusion points below 2,500 deg. F. The furnace floor is cooled so as to protect it from extreme heat, but not to a degree that will destroy the fluidity of the slag. The slag near the floor contains an excess of iron, and thus remains liquid. The burners are placed vertically, facing downward so as to cause the flame to sweep the top of the slag. Coarse coal falling into the slag is burned on its surface, and for this reason only 1 per cent of the ash in the pit is carbon. Thus only about 0.04 per cent of the heat of a coal containing 13 per cent ash is lost. About half the ash goes up the stack, and this ash contains no unburned coal. About 40 or 50 per cent of the ash is tapped, whereas with the ordinary furnace only 10 or 15 per cent falls into the pit. This ash is suited to all the purposes to which the slag from a blast furnace may be put.

At the session on the economies of low-temperature carbonization Dr. R. P. Soule, Tri-Continental Corp., declared he had "come to bury Caesar not to praise him." He declared that the United States had spent far more than $50,000,000 to make low-temperature carbonization a success and had failed. The domestic coke made by the processes was at best fragile and too often there would be none. When transported the coke developed large quantities of fines. The loss in gas was more costly to the plant operators than the gain in tars.

Philip C. Pope, secretary, Institute of Fuel, London, England, expressed his personal preference for the static low-temperature carbonizers, because they give a large percentage of lump coke—more than the semi-static and far more than the continuous equipment. He had hopes that something might yet be done with the low-temperature carbonization of pulverized coal. Mr. Pope said he recognized that conditions in Great Britain for carbonization were more favorable than in America, especially as the development of benzol was a national necessity for defense in case of war.

Walter Runge, consulting engineer, New York City, said that he did not despair of making a success of low-temperature carbonization in the United States. The lump coke from the K.S.G. process had sold for $7 a ton, and the fines for $1.50. Unfortunately, in that process the retorts would one day produce good balls of coke, and then suddenly run to dust, without any recognized change in the conditions. He thought that coal having 8 to 10 per cent of ash would be more desirable than coal with a low-ash content. Low-temperature tars could be used for varnishes and perhaps for plastics. It had been found that the cresylic acid plastics needed expensive curing, but this difficulty might be overcome.

In reply to Dr. Runge's statement that the creosote from low-temperature carbonization was many times as good as high-temperature creosote, but could not be sold because it did not meet the arbitrary standards set up by creosoting firms and could not be tested to their satisfaction except by a 10-year experience, Mr. Pope said that bus companies in England were using creosote in their engines, which were started with gasoline and

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AUTOMATIC EQUIPMENT

+ Economizes Pumping Cost At Illinois Mines*

By J. M. JOHNSON

Chief Engineer
Bell & Zoller Coal & Mining Co.
Zeigler, Ill.

AUTOMATIC pumping equipment can be made beneficial to mine costs during periods of part-time operation. Its chief merit during such times is that it obviates the presence of attendants to keep the sumps properly drained. The plan, if it is to be most effective, should include suction control valves, thereby enabling one pump to gather automatically from a number of points, and even perhaps to do the work of several pumps. Besides reducing the cost of attendance, such a plan lowers maintenance and investment, and generally simplifies the pumping system.

It is not always a prerequisite to the practicability of the plan that the pumping load be heavy or fairly constant. The water producing areas may be widely scattered and at none of these need there be any great or regular accumulation of water. Such are the conditions in the southern Illinois field, typified by the Zeigler mines of the Bell & Zoller Coal & Mining Co., at which automatic pumping equipment has been advantageously applied.

In the No. 1 mine, water discharged to the surface is handled by two pumps. One is at the materials-shaft bottom and the other discharges through a borehole at a location 1.2 miles northeast from this shaft. This last pump is a three-stage Cameron centrifugal pump of 220 g.p.m. designed to operate against a 500-ft. head, and is driven by a 50-hp. motor. It operates about six hours a day and handles all the water from the northeast section, which comprises about 200 acres of mined-out area. Ditches and a siphon 650 ft. long carry this water to the pump station.

The installation at the materials-shaft bottom consists of a 4x6 Deming single-acting triplex plunger pump, designed for a working pressure of 230 lb., driven through an Allis-Chalmers Texrope drive by a 10-hp., 220-440 volt, 3-phase, 60-cycle, ball-bearing motor. This pump handles water from two sumps, one 20 ft. from the pump at the materials-shaft bottom and the other at the air-shaft bottom, 700 ft. away. Most of

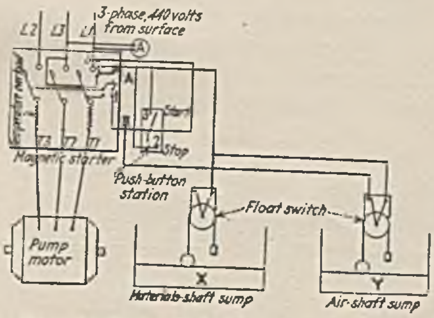


Fig. 1—Float Switches in the Sumps Start and Stop the Pump Automatically. Starting and Stopping Also Can Be Controlled Manually by Pushbuttons at the Pump

the water handled in the materials-shaft sump is relayed by a Gould horizontal triplex pump from an area about 0.8 mile northeast from the sump at the hoisting shaft. The pump at the hoisting shaft is a deep-well pump which will be described later. General Electric type CR 2931 float switches installed at each sump start or stop the pump motor when the water rises or falls to predetermined levels in the sumps. Fig. 1 indicates the operation of the system.

Suction control valves open or close as the water in the sumps rises or falls. These valves are float-controlled but do not govern the operation of the pump, their function being merely to close the suction line to either sump when the water in the sump has been drawn below the end of the suction inlet. The float switches are set to make contact when the water rises to a certain level above the suction valves. To illustrate: when the water flows into the sump marked *X*, the float in the suction valve is lifted and releases the roller on the stem of the valve. Then as the water rises sufficiently to operate the float switch, the pump suction opens the valve and draws water from the sump until it becomes low enough to permit air to enter the suction line. As soon as air enters the suction line, the valve drops and is locked in closed position by the float.

If sump *Y* has been filled to the elevation at which the float switch at this point operates, while sump *X* is being drained, the pump will continue to operate after the suction valve in sump *X* has closed, but will then be drawing water from sump *Y*. Thus, the pump operates whenever either sump has sufficient water to operate either float switch and will continue to operate until the water in both sumps becomes low enough for both float switches to break contact. Thereby the water level in both sumps is always kept at the required elevation.

The discharge line rises directly from the pump for 6 ft., then horizontally 50 ft., and again vertically up the shaft 400 ft. The line up the

*Abstract of paper delivered at 39th annual meeting of Illinois Mining Institute, at Springfield, Ill., Nov. 6.

shaft is 4 in. in diameter and the line from the shaft to the pump is 2 in. in diameter. A gate valve at the base of the 4-in. line provides means for draining the column when the pump is out of service or during the winter months. A 2-in. check valve is installed in the horizontal line to protect the pump against the high water column when the pump stops, and a Boyts-Porter air relief valve tapped into the top of the horizontal line between the check valve and the pump relieves pockets of air that might tend to build up excessive pressure in the line. This valve is especially effective when the pump begins to pull water through the 700 ft. of suction line from the airshaft sump.

Since the installation was designed to minimize attention, it was necessary to provide a positive oiling system. A Joy hydraulic pump was mounted on the pump base, and a reservoir 6 in. deep built around the base and with a capacity of five gallons of oil is connected to all bearings requiring oil by a system of ½-in. pipe lines. The oil pump is chain-driven from the pinion shaft of the triplex pump. Oil is carried continuously from the reservoir to the bearings; petcocks above each oil cup can be closed or opened to regulate the supply to each point.

During continuous operation, the oil overflows the oil cups and drips back into the reservoir, from which it is recirculated. Any water that may leak from the pump into the oil supply is drained off through a pipe in the bottom of a 12-in. square tank built into and extending 18 in. below the bottom of the reservoir. Turbine oil has been satisfactorily used for lubrication. It does not emulsify and the water settles readily to the bottom of the tank, and can be drained off.

An ammeter installed in the power house and connected into the pumping circuit indicates the operating time of the pump. This ammeter is connected also in the circuit leading to the pump in the hoisting shaft. From ampere readings, the powerhouse attendant determines when either or both pumps are in operation. Without this instrument, during idle time there would be no assurance that both pumps were operating.

The deep-well pump installed at the hoisting shaft is a Deming "Oil-Rite" which consists of a pumping head with a 10-in. stroke, driven through a Texrope drive by a 3-hp. motor mounted on top of the pumping head. The pumping head is mounted on shaft timbers at the dumping level and from it a 4-in. drop pipe extends down 44 ft. into the sump. On the end of the drop pipe is a brass-lined artesian well cylinder; in this cylinder two flat disk-type valves connected to the drive head by wood sucker rods operate in the drop pipe with each stroke of the pump head and force the water upward. The discharge line is made up of 707 ft. of 1½-in. pipe and delivers the water to the materials-shaft sump.

The operation of this deep-well unit is controlled by a float switch similar to those installed at the two already mentioned sumps.

Oiling of this unit is automatic. Oil is stored in the crankcase and carried to the main bearings through a splash system. A force feed through a tube to the top of the pump provides oil for the connecting-rod bearings and crosshead. In this way all bearings are assured a positive oiling. Change of oil ordinarily is required every five or six months. The pumps have given satisfaction in eight months of service.

At No. 2 mine, water areas are not so widely scattered as in No. 1. Two 4x6 Gould horizontal triplex pumps serve as relays to a 4x6 Deming single-acting triplex unit which discharges to the surface. One of the relay pumps is installed at the bottom of the airshaft and draws water from a number of sumps along two southwest entries, as indicated in Fig. 2. The total length of suction line on this pump is 5,000 ft. Suction control valves are of the automatic type; these are in service in the line at five sumps that require pumping daily; and four smaller sumps on the same line are controlled by gate valves. The pump discharges into a reservoir at the hoist-shaft bottom, whence the water is lifted to the surface by the "lift" pump which is automatically controlled by a float switch similar to those mentioned on the preceding page.

Equipment used to make these units self-operative is all standard material assembled to provide installations that will give continuous service with a minimum of attention and maintenance.

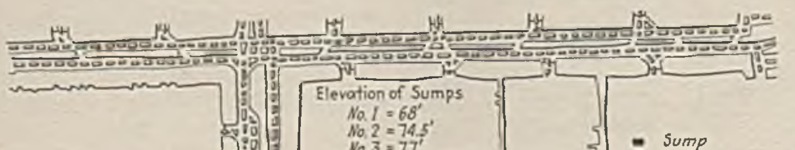


Fig. 2—In This Installation, Water Is Picked Up Automatically at Five Separated Points by a Single Pump on a 5,000-Ft. Suction Line in Zeigler No. 2 Mine. Four Smaller Sumps Are Controlled by Gate Valves in the Line

ECONOMY AND SAFETY

To Relieve Industry Burden

Sought by West Virginia Institute

ECONOMICAL and safe operation under present-day conditions occupied the attention of delegates to the 24th annual meeting of the West Virginia Coal Mining Institute, held at the Fort Henry Club, Wheeling, W. Va., Nov. 27-28. In addition, plans for stabilization were dealt with in one paper and in a general discussion at the open meetings, at which Thomas G. Fear, general manager of operations, Consolidation Coal Co., Fairmont, W. Va., presided.

Ditches are by far the cheapest means of drainage where they can be installed, said S. Austin Caperton, general superintendent, Slab Fork (W. Va.) Coal Co. While the initial cost sometimes may be prohibitive or outlets may not be available, there are few mines where ditches of some description will not lower drainage cost. At the Slab Fork mine, ditch construction has been under way for years, Mr. Caperton declared. The mine is now fully developed and has a total of only five gathering pumps, aggregating 40 hp. Only two of the pumps run eight hours, and only one man on part-time duty is required to take care of them. The cost of drainage, including labor, power, and supplies, is 2½c. per ton.

One example of the use of ditches cited by the speaker was in the development of a 206-acre tract in the Slab Fork mine. This tract contained two swags, one of which could be reached by a ditch. An estimate showed that it would be 12 or 15 years before the 106 acres in the first swag would drain to the drift mouth unless a ditch were dug. This ditch (2,080 ft. long) was completed in 1927 at a cost of $6,000, and it is expected that it will handle the water for the next ten years.

Installation of a pump and pipe line for the second swag cost $3,000, the line discharging into the ditch from the first swag. The pump will be operated five years at a total cost for power, labor, and supplies of $8,000, making the grand total $11,300. If the second swag could have been ditched, the apparent saving would have been $5,000 as compared with the cost of pumping for five years. Construction of the ditch to the first swag eliminated pumping all the water from the 206 acres against a lift of 35 to 40 ft. through a pipe line that would have been 1,500 ft. long.

At the Rush Run mine of the Caperton interests, the workings dip away from the headhouse, which made it necessary in the past to pump the water to the surface through boreholes 100 ft. deep. Until a year ago, the water was handled by two centrifugal pumps, each with a 75-hp. motor, located midway between the drift mouth and the face. The pumps ran nine hours per day and required the full-time services of one man. After the mine had been fully developed and only the pillars were left, it was found that some changes in the pumping system would have to be made. Part of the pillars were in a section which had been allowed to flood and, in addition, the low point of the mine was in a section where pillar working would start. Location of a pump at this point was out of the question. A survey showed that the cover was 260 ft. thick over the low point, and that the surface was suitable for draining away the discharge. Location of a pump at this point, which was adjacent to the substation and shops of the Brooklyn mine of the company, would allow practically all the water to be removed from the mine by the construction of one short ditch.

A Pomona pump was bought for $10,000 and the pump motor was placed over the borehole and connected to a 2⅛-in. shaft running down the inside of a 10-in. casing. The shaft and casing were made in 10-ft. lengths, and the former rotates in rubber bushings which are attached to the casing by bronze spiders at 10-ft. intervals. At the bottom of the casing, five bowls, in which the turbine wheels operate, extend down into the water. The motor is rated at 150-hp., 2,200 volts, 1,760 r.p.m., and the pump will lift 1,400 gal. of water per minute out of the 240-ft. borehole. The installation has been in operation for only a year, so definite figures on savings are not available. One pumper was released, however, as the substation attendant starts the pump, and it is automatically stopped by sump switches. The pump, said Mr. Caperton, delivers as much water in four hours as the two centrifugal pumps did in nine hours, with approximately the same horsepower.

Savings of 6c. per ton in labor and 2c. per ton in supplies were shown to be possible by F. S. Follansbee, chief engineer, Koppers Coal Co., Pittsburgh, Pa., through the use of a larger mine car. Discussing this paper (abstracted elsewhere in this issue of *Coal Age*), Mr. Fear told of the installation of 450 new cars at a Kentucky mine of the Consolidation Coal Co. These cars were of the same capacity, but the height was 6 in. less. In three weeks after installation, the output per loader per day showed an increase of 2 tons, he declared, primarily because of the decrease in effort required.

Development of the large mines common today has been made possible largely by progress in the use of electric locomotives for haulage, asserted Thomas A. King, assistant chief engineer, New England Fuel & Transportation Co., Grant Town, W. Va., in discussing the modernization of underground haulage. One of the major advances of the past decade is the improvement in haulage roads for economical mine operation. Larger mine cars have brought steel construction into the picture as a means of reducing maintenance. Haulage cost is a comparatively small part of the total cost of mining, declared Mr. King, but it is one susceptible of material reductions by the use of proper equipment and methods.

Ventilation is the least understood of the various operations entering into the mining of coal, in the opinion of Homer G. Bell, ventilation engineer, Consolidation Coal Co., Fairmont, W. Va. Fans are the chief stumbling block, he contended, largely because many erroneous ideas are held about their operation. As a result, the fan ordinarily is speeded up when more air is needed. But the increased volume is accompanied by an increase in power cost, whereas, in many cases, the resistance could have been lowered to obtain the same result more cheaply.

The volume of air or the percentage of methane in a split is not an accurate indicator of safety or efficiency, Mr. Bell declared, for the reason that improper distribution or control may result in a hazardous condition or may make maintenance expensive. More overcasts, elimination of doors where possible, a greater number of splits, or shortening the length of the open split will go far toward remedying bad ventilation. The open split also should be the starting place in any investigation for reducing resistance, as it governs the water gage.

As all the factors covering energy losses are reflected in the operation of the fan, this is the logical place to begin investigations, Mr. Bell said. Checking the power consumption may reveal a low operating efficiency, but before condemning the fan the files should be consulted to see if it is working under the conditions for which it was designed. Three steps may be taken in correcting power losses due to low efficiency: the fan may be replaced by a new one if it is working above normal capacity; cleaning old airways or driving new ones, or the construction of a new opening to the surface may be tried if the fan is working below capacity; and in certain cases, the fan may be moved closer to the working sections.

Rationalization, declared Ralph N. Harris, industrial engineer, Morgantown, W. Va., "is the coordinated and trade-wide application by an industry of the principles and methods of scientific management, together with the correlation of production and consumption on a national scale." This necessarily means associated effort which shall protect the interests of both the producer and the consumer groups. Such a movement is entitled to government encouragement and support; "in addition to this, perhaps, and dependent entirely upon the manifest honesty and sincerity of the movement, special legislation may be found necessary."

Bituminous management, Mr. Harris charged, has erred in its failure (1) to interpret market trends correctly; (2) to recognize the law of diminishing returns in additional capital and labor investments after the line of maximum productivity has been reached, and, (3) to recognize the inadvisability of increasing capital investment until the full efficiency of the existing investment has been completely developed.

"Neither investment, profits, wages, nor prices can be pegged successfully at artificially determined points, but all must be brought into the closest possible balance with the requirements of the market and with each other." Uncontrolled and needlessly wasteful deflation must give way to orderly, but inevitable, deflation which will leave the field to that group of producers whose average unit costs on the required volume are the lowest. Mr. Harris suggested that the average sales volume for the five-year period 1925-29 be used as "market demand" and the key figure upon which all planning for profit must be based. From this figure must be determined daily full-time capacity requirements, adjusted for seasonal variations. Individual managements must then rebuild their entire organizations to that required for the most efficient operation at this revised capacity (see *Coal Age*, Vol. 36, pp. 239-241, 313-314, 359-363).

Such a study, he said, spotlights the importance of the financial structure of the producing organizations. The present value of each class of capital liability will depend upon the earnings available for its needs after prior claims have been met. In this way, "a revised capital value based upon actual conditions is set up. The proportion this total bears to the total of preferred capital liabilities outstanding and also to the total of all outstanding capital liabilities provides overcapitalization ratios which are valuable in comparing unit costs" and in defining the middle ground upon which district stabilization should be based. Operations able to show a ratio against preferred liabilities of 100 per cent or better will be the most closely adjusted to conditions—the natural survivors.

"The adjustment of the financial structures of all operations in a district so that fairly uniform and high ratios may be had is a fundamental procedure and should be fully developed before any effort is made to adjust sales prices." To fix prices which would yield profits ample for the needs of the low-ratio companies would only perpetuate unhealthy conditions by encouraging further development of dormant production. "The creation of par ratios for all operations in a district indicates the ability and the willingness of all operations to so adjust their affairs that they are in line with the conditions established by the law of supply and demand and under free competition." Consolidations, collective selling, cooperative buying, and other methods then may be invoked "to effect those additional savings which may be used to bring common stock issues to a parity and in increasing wages."

To apply these methods of rationalization over wider areas, Mr. Harris proposed:

1. Grouping unit operations into districts determined by natural operating conditions rather than by geographical lines to work out local district problems, educate the group in sound rationalization, increase operating efficiency, adjust and maintain wage scales, and sponsor cooperative marketing and buying.

2. State commissions (composed of representatives from each district wholly or partly within the state, the head of the state mining department, state commissioner of labor, and dean of the state school of mines, any one of whom may be designated State Coal Commissioner and chairman by the Governor) to set up and adjust district quotas, act as boards of arbitration between intrastate districts and between employers and employees, review work of district organizations, and suggest needed changes, legislative or otherwise; with industrial relations promoted through the state labor department.

3. A national commission (composed of the state chairmen, one representative from each district, and an advisory or control group of federal government officials) to review work of state and district organizations, iron out or arbitrate interstate differences, and eliminate unfair trade practices.

Heading the Institute

Ellsworth H. Shriver, Koppers Coal Co., Charleston, W. Va., was elected president of the West Virginia Coal Mining Institute at the annual meeting in Wheeling. Other officers were chosen as follows:

Vice-Presidents: M. L. Garvey, Charleston; E. S. Wade, Windsor Power House Coal Co., Windsor Heights; D. L. Brown, New England Fuel & Transportation Co., Grant Town; James Sisler, West Virginia Geological Survey, Morgantown; and George Caldwell, West Virginia-Pittsburgh Coal Co., Wellsburg.

Secretary-Treasurer: Charles E. Lawall, head of the School of Mines, Morgantown.

Executive Board: S. Austin Caperton, Slab Fork Coal Co., Slab Fork; R. E. Salvati, Pond Creek Pocahontas Co., Bartley; Robert Lilly, mine inspector, Mt. Hope; and Thomas G. Fear, Consolidation Coal Co., Fairmont.

BAD ROOF
+ Is Made Safe
By Hitch Drilling

A Contrast in Timbering Methods—Above, the New, Safe Way; Below, the Old, Dangerous Way

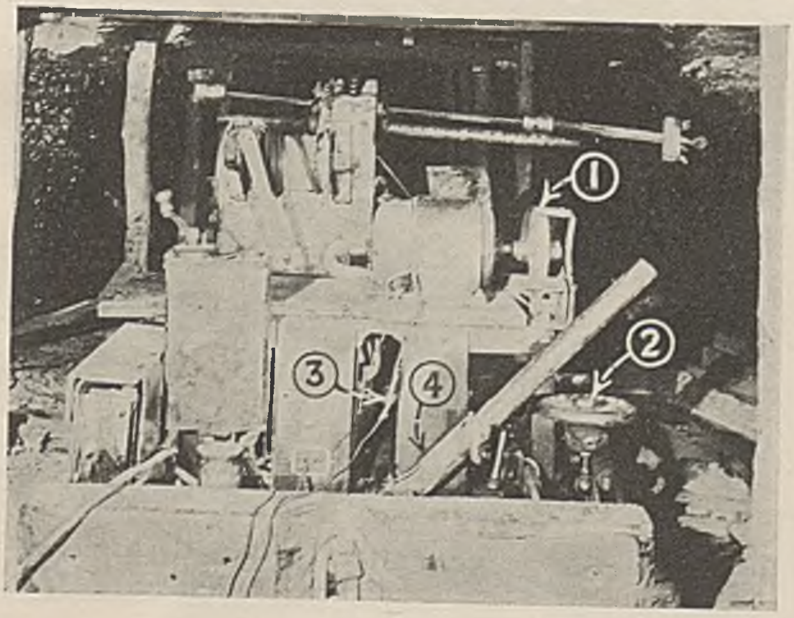
FOR want of a better method customary practice has been to support roof beams on legs—and therein lay the source of much danger and worry. What will happen if rolling stock is derailed? The legs can be hidden away in hitches, of course, or carried in or on a wall. But that method is not frequently followed, because its cost is high.

Study of this problem at the No. 8 mine of the Binkley Mining Co., Clinton, Ind., gave rise to the development of a hitch drill which obviates the need for legs under the crossbars. The mine is working the No. 3 seam under a treacherous roof of which at least 1 ft. checks and falls shortly after the coal is taken. Yet the ribs stand well. The initial fall by no means ends the trouble, which continues indefinitely unless the rock is held by beams and lagging. Prior to the development of the hitch drill, the roof was held by rail beams on wood legs.

The present method is to drill two 8-in. holes at opposite points in the ribs of a heading for reception of the beam. These holes are drilled to provide a clearance above the rail of 6 ft. on main haulways and 4 ft. 8 in. on panel headings. As the coal is about 5 ft. thick, on the main headings holes invariably must be drilled in slate.

One hole is drilled 2½ ft. deep and the opposite hole 3 ft., which means that the support given by each rib is 18 in. Rails of 90-lb. weight are employed as beams. These, on 4-ft. centers, are locked with pieces of split props, and intervening zones are stoutly lagged.

Fig. 1—Rear View of Drill Truck Showing (1) Emery Wheel; (2) Wheel Brake; (3) Clutch on Propelling Motor Shaft; (4) Ratchet Lever on Windlass Shaft, by Which Baseplate of Drill Rig Is Moved



Crossbars at breakthroughs are supported on a longitudinal beam running across the mouth of these openings. Each end of this beam rests on pegs which are 90-lb. rail, sunk and cemented in a hole 5 ft. deep so as to project 1 ft. from the rib.

Two machines are in service. The first was installed two years ago, the second during the current year. Thus far they have been used in placing two miles of crossbars. Both were built in the mine shop under the direction of B. H. Schull, manager, and Thomas Schull, superintendent of the plant, in accordance with a design which has been patented. In their construction, parts from discarded equipment were largely used.

The truck rides on mine-car wheels mounted fixed to their axles. It is propelled from job to job by a 7-hp. motor through sprockets and chains. For long moves, however, the machine is hauled by a locomotive, in which case the propelling mechanism is idled through a clutch (see Fig. 1). Only one wheel is equipped with a brake, and this is applied through a handwheel and screw.

The drill itself is anchored to a turntable which revolves on a roller bearing about a kingpin. This pin holds the table centered on a heavy baseplate which can be slid crosswise of the truck, adding to the reach of the drill. Front and rear edges of

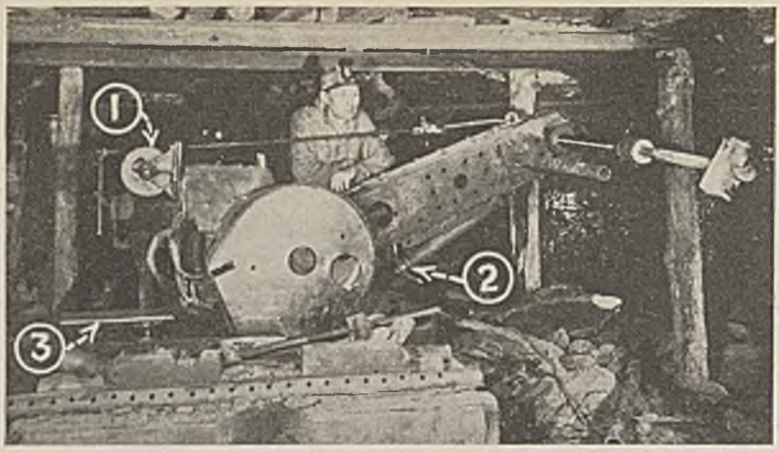


Fig. 2—Front View of Truck With Drill Rig Swung 90 Deg. Showing (1) Worm Pulley for Elevating Drill Boom; (2) Screw Jack for Supporting Boom in Elevated Position; (3) Channel Guide of Baseplate. At the Machine Is Thomas Schull, One of the Designers

the plate are held by guide channels, and movement is accomplished by two ropes on a windlass shaft under the truck.

A 25-hp. motor from a breast machine, regulated by a controller from a locomotive, drives the drill through a sprocket chain. Speed reduction is through pinion and gear. The drill is on the end of a boom which is raised and lowered by a steel cable and a hand-operated worm-driven reel, as indicated in Fig. 2. Once elevated to the desired horizon, the boom is supported by a screw jack beneath it.

There is no differential between rotation and feed; both motions are simultaneously effected by a positive drive. A 2-in. splined threadbar is rotated by a key in the bore of the chain sprocket. Two heavy nuts, one on each side of the sprocket, guide the feed. As the average feed is 20 in. per min. and the threadbar has six teeth to the inch, the average r.p.m. of the drill is 120.

Drill steel, 1¼ in. square, is held on the threadbar by a heavy socket sleeve. One or more intermediate sections can be similarly mounted to extend the reach of the drill. Two parts comprise the business end of the drill. One is a pilot or auger point forged at the end of the drill steel; the other is a 7-in. long rectangular drill block that is held on the drill steel by a seated setscrew. In this block are inserted four common cutting-machine bits. Thrust is taken by a horizontal telescopic jack, shown in Fig. 3.

Both holes are drilled without changing the position of the truck or boom. The first hole having been put in, a drill steel is placed on the free end of the threadbar, rotation is reversed, and the second hole started. In this way no time is lost in feeding out, nor in swinging the drill through 180-deg., which is necessary when drilling is done on one end of the threadbar.

Only for moving from job to job is the turntable revolved, and then through an angle of 90 deg. to the position shown in Fig. 2. This allows the drill bar to travel within the clearance left by the temporary posts in the heading. It also saves the time which otherwise would be consumed in centering the threadbar.

Two workers man the drill. One handles the controller and the second removes the cutting from the hole with a curved surface shovel to avoid packing. Perhaps the hardest part of the job is that undertaken by the man at the drill end, who must square-face the slate and start the pilot hole, using a pick. This takes 1 to 1½ min.

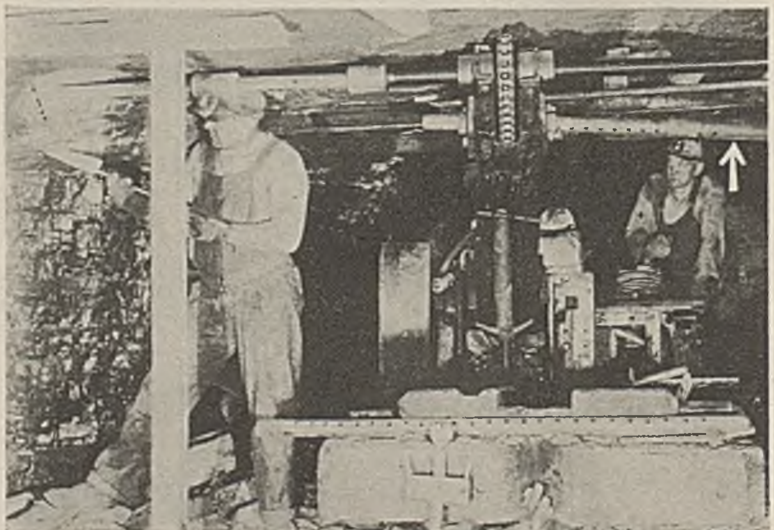
Though the roof is a hard gray shale, the machine will drill an 8-in. hole in it to a depth of 2½ ft. in 1½ min. Moving the machine 4 ft. and making ready for drilling the next set of holes, including bit changes, takes less than five minutes. A ½-gal. bucket of cutter bits lasts the shift out when the drilling is in rock. The average number of rock holes drilled in 8 hr. is 46.

It should be mentioned that not all of this time is required for actual drilling. The pilot auger must be sharpened at intervals, for which an emery wheel is mounted on the machine. Most of the time lost to drilling is used in making the roof safe for work. Loose rock must be ripped down and in many instances safety props set.

Thomas Schull states that the reach of the drill is at least 24 ft. This fact was determined in drilling a 24-in. hole through coal in a 20-ft. pillar. The outcome of this experiment has raised in the minds of the designers the question of the feasibility of punching holes through the pillar, at rather short intervals, as an auxiliary means of ventilation which might safely allow the driving of standard breakthroughs at wider intervals than is now specified by the laws.

Holes have been put through a 6-ft. packwall and 3 ft. into the flanking rib, the drill being extended about 12 ft. from the track rail. Many such holes were drilled along one side of a parting which had been narrowed by packwall for through haulage only. The drillholes were extended into the solid rib for fear that the support of crossbars by the packwall would not be stable.

Fig. 3—Drill in Operating Position. The Man at the Left Removes the Cutting With a Small Shovel. Arrow Points to the Thrust Jack



CLEANING PRACTICES
+ In America and Europe Reviewed At Bituminous Conference

THAT coal washing is difficult at one plant and easy at another, and that this difficulty is susceptible of an accurate measurement, is not as generally realized as it should be, was the burden of the article of B. M. Bird, chief concentration engineer, Battelle Memorial Institute, Columbus, Ohio, at the coal-cleaning session of the Third International Bituminous Coal Conference held at Carnegie Institute of Technology, Pittsburgh, Pa., Nov. 16-19. One operator preparing a 4-per cent ash washed coal, said Mr. Bird, may have an easy problem, whereas another, cleaning perhaps a 10-per cent ash coal, has an exceedingly difficult one.

The difficulty can be ascertained by taking the percentage of coal of a specific gravity 0.10 below the specific gravity sought from the percentage of coal of a specific gravity 0.10 above the specific gravity sought, which is, of course, the percentage of coal between 0.10 above and 0.10 below that specific gravity. This figure he adjusts by multiplying it in every case by a factor for the coal, which is 100 divided by the percentage of coal of a specific gravity above 2.0. The figure thus obtained, he terms the adjusted difference at the mean specific gravity. He plots this on the washability curve. Mr. Bird presented the foregoing table.

Difficulty in Cleaning Coal Related to the Percentage of Coal Between 0.10 Above and 0.10 Below the Specific Gravity of Separation

Percentage of Coal	Degree of Difficulty	Available for
0– 7	Simple	Almost any process; high tonnages
7–10	Moderately difficult	Efficient processes; high tonnages
10–15	Difficult	Efficient processes; medium tonnages; good operation
15–20	Very difficult	Efficient processes; low tonnages; expert operation
20–25	Exceedingly difficult	Very efficient processes; low tonnages; expert operation
Above 25	Formidable	Limited to a few exceptionally difficult processes; expert operation.

Mr. Bird showed how curves can be made to illustrate these efficiencies. "In checking the performance of plants," he said, "I have found large differences in the results obtained with the same equipment. The man doing poor work usually makes the alibi that his washing problem is more difficult than the other fellow's. The 0.10 curve shows whether this is really a fact and affords a means of putting washery performances on a comparable basis." However, as he stated, the tonnage treated per hour; the lighting, natural and artificial; the type of feeders; the design of water system—in fact, everything about the two plants—must be equally good. The adjustment described, while purely empirical, is essential, for impurities easily removed in washing must not obscure the real washing problem.

J. B. Morrow, preparation engineer, Pittsburgh Coal Co., said the coal-cleaning industry used altogether too many curves. He was getting better results than the figures of efficiency curves showed, because in actual cleaning operations fragments are broken off and good coal is separated from bad coal.

K. Lehman, Rheinische Stahlwerke, Essen, Germany, supplied a paper in which he said that fusain was undesirable in low-temperature distillation, gasification and hydrogenation, or at least had no economic advantage. Fusain had by far the lowest fusion point and, for the most part, an abnormally high phosphorus content, especially objectionable in the manufacture of low-phosphorus iron. It usually has more pyrite than other coals. As it has great calorific value, it is well suited to use in pulverized form. Bright coal contributes the coking qualities. To separate it is the chief purpose of the Lehman-Hoffmann petrographic-separation process. Cokes from dull coals are strongly fissured, especially at high temperatures, though with a sufficiently rapid heat transfer good low-temperature coke results, well suited to domestic fuel. It usually has the highest fusion point. Dull coals of low rank are excellent materials for hydrogenation.

Reinhardt Thiessen, U. S. Bureau of Mines, Pittsburgh, Pa., advocated the use of petrographic separation. The differences in the characteristics of the various parts of the United States coal beds, he felt, would justify it. Studies he had made of nine or ten beds confirmed him in this conclusion. Though the Pittsburgh had no mattkohle, or durain, it had no less than seven separate layers which greatly need separation into varieties for use.

Dr. Lehman, said Mr. Morrow and J. A. Younkins, preparation-plant chemist, Pittsburgh Coal Co., Pittsburgh, Pa., had declared in his paper that fusain had uniform characteristics. They found, on the other hand, that there were "hard" and "soft" fusains and two kinds of soft fusain. Hard fusain has a high ash content—about 26 per cent—and is high in volatile content—about 37 per cent. Analysis of the ash shows an extraordinarily high lime content—up to 64.9 per cent. One soft fusain shows high lime—about 60 per cent—but low volatile content—12.3 per cent and ash about 9 per cent. The other variety is lower in ash—7.3 per cent—and is comparatively very low in lime—3.9 per cent.

Their fusain does not always have lower fusion point than the coal substance. Hard fusain has an ash fusion point of 2,540 deg. F. and soft fusain, 2,135 deg. F., whereas a seam sample of coal shows 2,500 deg. F. Also their fusain often contained less pyrite than other coal. Hard fusain runs 0.95 per cent, and soft fusain, 0.35 per cent, whereas the coal in the same locality will run 1.40 per cent. However, one of the high fusains has 2.20 per cent.

Nor does the Pittsburgh Coal Co.'s fusain have a comparatively high calorific value. On a moisture-and-ash-free basis its calorific value is lower than that of other coal. Hard fusain gives 11,490 B.t.u. and soft fusain, 14,600 B.t.u. per pound. whereas the coal shows 15,250 B.t.u. It must be noted, however, that in calculating these calorific values on a moisture-and-ash-free basis the ash is not equated to a non-combustible basis, but used "as run." The lime content of 64.9 per cent in hard fusain would have a lower ash percentage if calculated on a "non-combustible" basis. Fusain up to 30 per cent increases the strength of the coke.

The accompanying table shows the values for bright and dull coal:

Bright and Dull Coal in Pittsburgh Bed

	Bright Coal	Dull Coal
Percentage of ash............	2.8	6.8
Volatile (moisture-and-ash free)	38.3	41.9
B.t.u. (moisture-and-ash free)..	15,090	15,280
SiO_2 in ash..................	40.9	54.2
Fe_2O_3 in ash.................	11.5	9.8

E. B. Ricketts, research engineer, New York Edison Co., New York City, gave equations with constants for three large boiler plants. These were to be used for figuring the value of impure coals as compared with cleaner coals. With a capacity factor of 50 per cent and investment costs figured in, a 5-per cent ash coal costing $4 per ton in the bunker is equivalent to an 18-per cent ash coal at $2.22. This assumes ash-handling costs of 20c. per ton. The low price is so low that the operator could not venture to meet it.

Ralph H. Sweetzer declared that one company's coal cost $1,000 a day more for freight before cleaning than it did after cleaning, yet the same B.t.u. value was being shipped.

C. Berthelot, consulting engineer, Paris, France, said that in Continental Europe at least one per cent of all the coal cleaned was treated on pneumatic tables. Froth flotation is increasing in favor. For example, the Welsh mines, especially the Powell Duffryn, produced about 134,400 short tons of coal by flotation in 1930. Two large plants, the Randolph and the Dumbreck, use flotation coal for making super coke containing only 1.5 per cent ash. It is used for the manufacture of electrodes.

At the Randolph Colliery, gas-oil or kerosene is added to the flotation coal to deflocculate the coal particles. This mixture passes over a belt of coconut fiber. The coal drains, and its water content is reduced to 18 per cent. No coal is lost in the water removed from the particles of flocculated coal. At Powell Duffryn the flotation coal was allowed to drain for 36 hr. and its water content dropped to 25 per cent. It was then reduced to 5 per cent in a Meguin heat dryer. This flotation coal makes a coke with 5.5 per cent ash. On the Continent, about a million tons of coal is prepared annually by flotation, primarily with the use of the Kleinbentink flotation machine, in operation at the Mines Fiscales Neerlandaises. In Europe, drainage towers are used for drying in general washing practice.

W. R. Chapman, consulting engineer, London, England, said that 30 per cent of all the coal mined in Great Britain was cleaned. Most of the new works have been built for the cleaning of nut sizes. Those erected prior to 1921 were for the cleaning of slack. At a colliery in the north of England coal is being cleaned by froth flotation, the cleaning being so effective that the coke is sold under a guarantee that the ash shall not exceed one per cent. At Ynyscedwyn Colliery, anthracite duff is cleaned by the Clean Coal process and regularly sold with an ash content of 2 per cent. The Elmore vacuum flotation process is done under vacuum and without agitation in a single vessel. The froth is unstable at atmospheric pressure, collapsing as soon as it leaves the vacuum. For this reason the water drains away rapidly. Coal below ⅛ in. will dry naturally to 12 per cent in about 2 hr. This is about half the moisture percentage usually retained by such coal, but the efficient drainage is due to the complete removal of shale and clay and the repulsion of the water from the oily surfaces.

Thomas Fraser, consulting engineer, Hydrotator Co., Pittsburgh, Pa., described the air-sand process of coal cleaning. At the Cadogan plant, 1-in. to 2-in. coal with raw coal running 83 per cent float at 1.45 sp. gr., 3 per cent between 1.45 and 1.60 sp. gr., and 14 per cent sink in 1.60 sp. gr. gave the following respective figures: 97.6, 1.8 and 0.6.

▼ ▼

Economics and Technology Dominate Pittsburgh Conference

(*Continued from page 616*)

then shifted to straight creosote. They used 25 per cent gasoline and 75 per cent creosote.

Dr. R. V. Wheeler described the Salerni process, developed by Chevalier Commander Piero Salerni, of London, and tested apparently only in 50-lb. samples at Sheffield University. It is much like the K.S.G. process, having an externally heated revolving retort. The feed is pulverized coal mixed with pulverized coke and oil, the whole being well mixed. The coke and the oil that are used are made from the products of the retorts. Cracked oil and oils from the coal are recovered. The coke is dense and the entire product is in lumps. Though the tests were not on a commercial scale, great hopes are laid on this process.

Capt. R. D. Gatewood, manager, United States Salvage Association, New York City, and C. J. Jefferson, consulting engineer, Kennedy Van Saun Manufacturing & Engineering Corporation, New York City, declared that coal was being ruled out of the mercantile marine by reason of a lack of experimentation. In ten years the percentage of bituminous-coal heat to total heat used has decreased from 60.8 to 21.1 per cent in the United States sea services. Even if the present price of oil makes competition impossible, coal men should prepare themselves to meet oil on an equal or superior basis as soon as the price of oil rises. The Shipping Board has $1,000,000 for experimentation purposes and should make the necessary studies of the possibilities of coal.

H. F. Johnstone, special research assistant professor in chemical engineering, University of Illinois, Urbana, reported that sulphur dioxide could be oxidized by the catalytic action of manganese oxide solutions without regeneration. Solutions of iron oxide were far less effective, though both are far superior to solutions of copper, zinc, tin, chromium, cerium, molybdenum and many other metals, he said. Mr. Johnstone is seeking means of preventing air pollution in the combustion of coal.

FACE PREPARATION + For Mechanical Loading

K. E. CAINE
Mining Engineer
Joy Manufacturing Co.

ANY decision on methods of face preparation for mechanical loading must be guided by the effects on three factors: net sales realization, marketability, and machine productivity. No methods have yet been devised which will serve these end points equally. What promotes best interests in the direction of one may work to the disadvantage of the others. Because of this incompatibility, wisdom prompts the choice of methods which produce results on middle ground.

For example, face preparation methods might be adopted which materially increase the productivity of the loading machine. As a result of this, however, the percentage output of lump sizes may be diminished. Sales realization would fall accordingly and perhaps wipe out the saving effected in machine operation. Again, the quantity of impurities in the coal and the percentage of different sizes may be so altered that the cleaning process in use is incapable of bringing the product up to established standards. It is here that marketability interests enter protest.

Though the coal should be loose, so that it can be removed with a minimum of digging either by hand or by machine, this does not imply that the face must be shot to pieces. The ideal method to use is one in which the resistance to the explosive is at a maximum in the direction of the open face and in which the impurities are removed entirely before the coal is loaded.

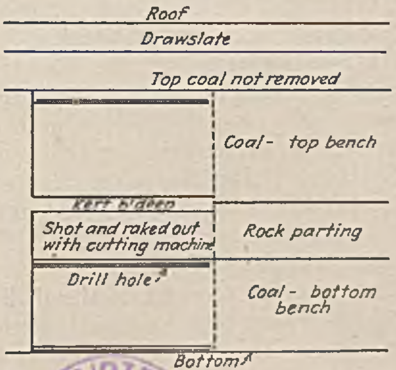
Experimentation and observation of results alone can be relied upon to determine the proper depth of the horizontal cut. If the explosive manifests a tendency at the back to shoot through vertically, leaving the front standing or in a semi-solid condition, then the cut is too deep. Similarly, if the explosive spreads forward horizontally, leaving the back solid, the cut is too shallow.

In many coal seams, it is impracticable to cut to what appears to be the ideal depth. Physical conditions may limit the allowable depth. Machines available may not have the reach. Yet there may be a desire to improve the loading operation and increase the production without changing the standard width of the room. In such cases, shearing and snubbing often come to the rescue.

Three open sides to a block of coal can be produced by making a shear cut in addition to the horizontal cut. This practice is particularly advantageous where the coal is strong horizontally or where the explosive will not tend to spread effectively across the face.

In the Pittsburgh No. 8 field of Ohio, standard practice has been to cut to a depth of 5½ to 6 ft., with entries 8 ft. wide and rooms 24 ft. An entry cut will produce from 8 to 10 tons, and room cuts, approximately 25 tons. Experiment showed that by bottom-cutting room faces to a depth of 9 ft. and a width of 22 ft., using a center shear, it was possible to produce more coal per place (35 tons), maintain hand-loading lump percentage standards with mechanical loading, prepare the coal for efficient mechanical handling, and more easily keep up the 12-in. drawslate until after the coal was loaded. Likewise, conditions were improved in the narrow 8-ft. entries by cutting and shearing to a depth of 9 ft.

Fig. 1—Cutting and Raking Out a Middle Parting, Leaving Top Coal to Hold Drawslate



By snubbing, it is possible to weaken the vertical resistance to the explosive. In hand loading, where snubbing has been extensively used for some time, the practice has been to round off the front of the cut by hand, seldom more than about 18 in. high and 18 in. deep. With mechanical loading it has been found more effective to snub to the full depth of the cut.

The mine of the Marion County Coal Co., located at Centralia, Ill., adopted full depth snubbing in 1927. At this plant, which operates in the No. 6 seam, the practice consisted of shooting four shots placed about 24 in. from the bottom and just over the characteristic blue band of this seam. These shots were placed in level holes drilled to the back of the cut. The coal broken down by these was removed by hand from under the top coal on the night shift. At the finish of this shift, the top coal was broken down by light charges and made ready for loading the next day. This practice was largely responsible for this mine being the first in the state to maintain an average output in excess of 300 tons per loading machine shift from a 100-per cent mechanized operation.

These results stimulated thought and experimentation toward reduction in the cost of effective snubbing. Growing out of this study came the development of the practice of using snubbing pans, first adopted extensively at the Royalton mine of the Taylor Coal Co., at Royalton, Ill. For details of this method refer to *Coal Age*, Vol. 34, p. 210.

The cost of snubbing by the pan methods varies from 4 to 7c. per ton. Snubbing pans can be constructed at a cost of from $4 to $5 each, including labor and material. Seven pans are required for a 24-ft. room. The general practice is to use a set for each working place or room. This procedure is necessary, of course, in those states where blasting is done by shotfirers when the other men are out of the mine.

There is a disadvantage to this practice in states where blasting must be done off-shift. In this case, it is necessary either to organize a night shift crew to do the snubbing or to double the size of the territory allotted to each loading-machine crew. As each place can be shot only once per day in the latter instance, each room can be prepared only every other day.

Loading-machine output must be increased approximately 50 tons per shift to justify the increase in the cost of operation resulting from the use of snubbing pans if the other factors, such as increase in lump, are disregarded. If the tonnage output is not increased by their use, but the 6-in. lump percentage is raised 7 per cent on a machine producing 300 tons per shift, then pan snubbing is justified. It also is likely that the cost of surface cleaning will be reduced sufficiently or the salability of the raw coal increased to such an extent by the removal of partings in the coal at the face as to justify the use of the snubbing pans.

Development of mounted cutting machines has made possible the removal of considerable impurity at the face either by cutting directly in the stratum of impurities or by so cutting as to make its removal subsequently possible. At one plant in the Thick Freeport seam of Pennsylvania, the bony parting is removed by cutting directly in it. Two cuts are made in this seam to remove this one parting. At another operation in this bed, a third cut is made at the top to remove dirty coal at the roof.

At these plants the coal is also sheared. The coal benches above and below the kerf, after the bony has been removed, are from 3 to 4 ft. thick, and as the cuts are made 9 ft. deep, it is necessary to shear them. Otherwise the explosive would blow through the back of the cut and not spread effectively.

At an operation in the Kanawha district of West Virginia a parting 26 to 36 in. thick occurs approximately 3 ft. from the bottom which is removed at the face. The kerf is cut at the top of the parting and in the coal. Holes are drilled in the coal under the parting; the rock is then shot and raked out by the cutter bar of the machine. The depth of cut made is 6 ft. and shearing is not required. After removal of the rock the top and bottom benches are then shot, and produce clean coal. This method is shown in Fig. 1.

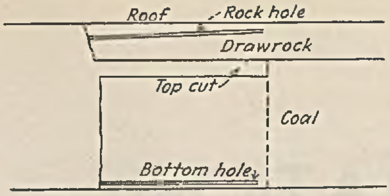


Fig. 2—Method of Removing Drawslate for Better Face Preparation. The Operation Cycle Is This: (1) Top Cut in Coal; (2) Drill Rock and Coal; (3) Shoot Rock; (4) Rake Out Rock; (5) Load or Gob Rock; (6) Shoot and Load Coal

It is sometimes advisable to top-cut in order to remove top impurities, or to leave coal for the support of drawslate, or to protect the roof from the action of explosives. This method is not practicable, however, if the coal is frozen to the bottom and does not shoot free. Top cutting has been proved quite efficacious for removing the top bony of the Eagle seam in West Virginia. The method also is used with marked success in the thick Pittsburgh seam of Pennsylvania, particularly in the coke fields. In the latter case, top coal is left up to hold the drawslate. This scheme of cutting has been quite widely adopted and has made mechanical loading possible at several operations.

Due to the success of cutting and raking as practiced at the operation in West Virginia referred to in the preceding paragraph, it has been suggested that the drawslate found in the thin Pittsburgh seam of Pennsylvania might be entirely removed by cutting in the coal at the top, followed by shooting and raking out of the rock. The general method is illustrated in Fig. 2. Actual experiments no doubt will prove the practicability of this method. Experiments are being made in cutting directly in the drawslate, but have not yet been carried to a successful conclusion.

At the operation of the Fayette Realty & Development Co., near Terre Haute, Ind., cutting is done in the clayey shale directly under the coal bed. By so doing, the percentage of screenings is materially reduced and additional headroom is provided.

The practice of requiring the cutting machine men to do the drilling has been an aid at some operations. This is the method employed at the Republic Coal Co operation in Montana, where shortwall machines are used entirely. One man is employed to charge and tamp the holes after the machines. The machine men cut and drill five to seven rooms per shift, producing from 190 to 225 tons total.

At a number of operations, drills mounted on track-mounted cutting machines are in use. Their use is not advised, however, where high tonnage is required per unit, because of the time required for the drilling phase of the operation.

Time studies will determine the effect of any experimental change in the method of preparation upon the "loadability" of the coal. In this connection, screen tests should be made. By making these screen tests, time studies of production rate, and estimates of change in production cost, definite conclusions on the economy of any contemplated change can be crystallized.

Assume, for example, that a change in method of preparation is contemplated, and that the following results were obtained. The 6-in. lump was increased from 25 to 30 per cent, the screenings decreased 5 per cent. Simultaneously, the production rate of the loader was so increased that the car-loading cycle was decreased from 5 minutes to 4.25 minutes, and the preparation cost increased 3c. per ton.

If the differential in sales realization between lump and screenings is $1 per ton, then the net gain per ton of mine-run resulting from the increase in 6-in. lump will be approximately 5c. per ton. If the operating cost of the unit crew amounts to 15c. per minute and the car capacity is 3 tons, then the reduction of the car-loading cycle from 5 minutes to 4.25 minutes will reduce the production cost approximately 4c. per ton. Thus the deduction can be made that a gross return of 9c. per ton will result from increasing cost of preparation 3c. per ton. The change, therefore, can be said to be advisable, since the net realization can be increased 6c. per ton by putting it into effect.

A thorough study of the operation, the nature of the seam, the market price of coal produced, and the requirements of that market, followed by intelligently supervised experiments based on practical operating ideas, will show the most economical methods of face preparation to use in connection with any type of loading machine.

[The last article in this series will appear in an early issue.]

employment, taxes should be increased and that money should be borrowed to meet the situation.

Mining Congress Deliberates On More Complete Mechanization

MECHANIZATION in the coal industry is weakest in its financial aspects was the burden of the address of A. T. Shurick, consulting engineer, New York City, at the three-day session of the American Mining Congress, held in Washington, D. C., Dec. 3, 4, and 5. Mr. Shurick declared that the railroad equipment trusts might be duplicated in the coal industry, with benefit to the coal operator, the manufacturer, and the consumer. In this he thought the manufacturer could and should take the initiative. He proposed that the financing should be done by a central bank, in which men experienced in coal mining should be interspersed with bankers, the former to pass on the character of the plans proposed from a technical viewpoint, and the bankers to provide the experience needed to raise the money and to guard the investor.

Maturities in coal mining had been set by manufacturers at such a short period that the would-be purchaser of mining equipment was afraid to face the monthly payments. Railroad equipment trusts have maturities ranging from 10 to 15 years. Only one of those of which Mr. Shurick had learned had a period as low as five years. Contrast that with the financing of mining machines. There months replaced years. Coal-mining financing should provide for a shorter period of maturity than railroad financing, because of obsolescence and greater wear and tear, but he thought that it would be safe to arrange for maturities of five years. Col. Warren R. Roberts, Roberts & Schaefer Co., Chicago, declared that the suggestions made were worthy of approval.

J. D. Rogers, vice-president, Stonega Coke & Coal Co., Big Stone Gap, Va., discussed the necessity for modern productive methods. He said that in general he believed that the mines were already 50 per cent mechanized when consideration was given to all forms of mechanization.

Brice P. Disque, director, Anthracite Institute, said that the anthracite region might study the possibility of using in larger degree the mechanization that has increased the daily production per man in the bituminous region from 4.11 to 5.42 tons. He added that the desire not to reduce the number of men employed might result in the anthracite region losing its market, and thus defeat the consummation which the maintenance of hand-operation methods attempted to establish. It amazed him, he said, to find that many operating companies in the anthracite region are paying taxes greatly in excess of their profits, and some are paying royalties ten times as great as their earnings.

W. C. Hull, assistant vice-president in charge of traffic, Chesapeake & Ohio Ry. Co., discussed the railroads' interest in coal. He detailed the work being done by the C. & O. and the Norfolk & Western R.R. in the study of the small stoker, and said that last year $7,500,000 was spent in the installation of car retarders and in the lowering of the loading equipment of piers, as a means of reducing the degradation of coal. He said the railroads have a heavy interest in coal, for they have $12 per ton carried annually invested in equipment for handling coal, of which only $8 per ton is actually in use.

At the mechanization luncheon, it was decided, subject to the decision of the board of directors, to broaden the scope of the inquiry into mechanization so as to cover all forms of mechanization and not mechanical loading only.

W. J. Jenkins, president and general manager, Consolidated Coal Co. of St. Louis, St. Louis, Mo., described his experiences in the sharing of work as a means of meeting the difficulties caused by technological unemployment and reduced coal demand.

At the afternoon session, Dec. 3, James W. Collier, of the House Committee on Ways and Means, and prospective chairman, said that a deficit of nearly two billion dollars confronted the nation. He did not believe, speaking entirely for himself, that corporations should be required to pay any more than 12 per cent. He thought that in view of the fact that expenditures could not be brought down without increasing unemployment, taxes should be increased and that money should be borrowed to meet the situation.

James A. Emery, general counsel, National Association of Manufacturers, Washington, D. C., said that the debts of the states, counties, and towns had increased twice as fast as the national income—in fact, at the rate of $1\frac{1}{2}$ billions of dollars annually. The total debt has reached 32 billions. He thought it highly important that further social experiments should not be tried.

At the mining session of Dec. 4, David Burnet, U. S. Bureau of Internal Revenue, and Scott Turner, director, U. S. Bureau of Mines, spoke on their departments, and S. Livingston Mather, vice-president. Cleveland Cliffs Iron Co., Cleveland, Ohio, recited the results of the questionnaire as to eleven points the Congress might study, viz.: Stabilization of mineral industries, wasting industries and taxes, mineral tariffs, modern mining methods, finding new markets, industrial relations, educational research, relation of government to business, world affairs and silver, cooperation between government and industry, coordination of association activities. All had received favorable votes, ranging from 70 to 91 per cent of those cast.

Directors were elected as follows: For three years, Mr. Mather; R. E. Tally, vice-president, United Verde Copper Co., New York City; L. J. Ramsburg, vice-president, Koppers Co., Pittsburgh, Pa.; and Frank R. Crockard, president, Woodward Iron Co., Woodward, Ala., the first three to suceed themselves and the fourth to succeed J. T. Skelly, vice-president, Hercules Powder Co., Wilmington, Del. For two years, Charles G. Berwind, Berwind-White Coal Mining Co., New York City, to succeed Erskine Ramsay, chairman of the board, Alabama By-Products Corporation, Birmingham, Ala.

At the board of directors' meeting Mr. Mather was elected president; A. E. Bendelari, president, Eagle-Picher Lead Co., Chicago; J. B. Warriner, president, Lehigh Navigation Coal Co., Lansford, Pa.; D. D. Moffat, general manager, Utah Copper Co., Salt Lake City, Utah, vice-presidents; and J. F. Callbreath, secretary. The executive committee will consist of Mr. Mather, Mr. Tally, and L. S. Cates, president, Phelps Dodge Corporation, New York City. The Manufacturers' Division left the location and date of the annual show to its board of governors.

BIGGER MINE CARS

Cut Labor and Supply Costs*

By F. S. FOLLANSBEE
Chief Engineer, Koppers Coal Co.
Pittsburgh, Pa.

Savings of 6c. per ton in labor and 2c. per ton in supplies by the use of a car holding 24.6 per cent more coal can be shown to be possible in analyzing the costs at a mine with a monthly production of 33,183 tons. The mine in question has better than average conditions, as follows: clean seam, 44 in. thick; good roof; fairly hard bottom; and uniform grades in favor of the loads and drainage. Hand loading prevails, and the all-steel, solid-end mine cars, dumped by a rotary dump, have a capacity of 2.5 tons.

IN A study of the relation of mine cars to costs, let us take an individual mine and make an analysis of its costs. In this analysis, it is found that producers (cutters and loaders) aggregate 56.5 per cent of the total men on the payroll, while non-producers inside and outside, respectively, total 32.8 and 10.7 per cent. Fixed charges comprise 21.3 per cent of the total production cost; mining cost is 78.7 per cent. Of the mining cost, labor constitutes 82.7 per cent (65.1 per cent of the total cost of production) and material amounts to 17.3 per cent (13.6 per cent of the total production cost). Compensation insurance and purchased power make up 33.5 per cent of the material cost, leaving 66.5 per cent, or 9.1 per cent of the total production cost, for supplies proper. Labor includes piecework, day men, and salaried men. The piecework is largely made up of loading, cutting, and yardage. These three comprise 68.4 per cent of the payments for labor, leaving 31.6 per cent, or 20.6 per cent of the total cost of producing coal, to the day and salaried men.

Of the fixed charges, royalty, leasehold, development, and depreciation are charged at a fixed amount per ton, leaving taxes, insurance, and general office expense as the only variables affected by the monthly tonnage. The variables amount to 27.0 per cent of the fixed charges, or 5.7 per cent of the total production cost. If the monthly tonnage is a fixed amount, the local management has no control over the variable items. Of the items that make up the material cost, compensation may be affected by the accident record or by reducing the unit cost of day labor. Power may be affected by reducing peaks, concentrating working places, locating substations close to the going sections, improved feeder design, and good bonding.

Among the items entering into the labor cost, 68.4 per cent is piecework, which may be affected by a change in the wage scale. This leaves 31.6 per cent of the labor, or 20.6 per cent of the total production cost, in which economies may be made by the local management. Thus, for a mine with a fixed monthly tonnage, there are only a limited number of items under the control of the local operating officials; in this case, in percentages of the total production cost: labor, 20.6 per cent; material, 9.1 per cent; total, 29.7 per cent. With a mine where production is pushed to the maximum, the 5.7 per cent of variables included in the fixed charges list may be added, making 35.4 per cent of the total cost of mining coal that is under local control.

There are three ways in which the labor cost (20.6 per cent of the total production cost) might be reduced, as follows: reduction in wages, less day men for a given tonnage, or increased tonnage for a given number of day men. Wage reductions are unsatisfactory and usually are passed on to the customer, while reducing the number of day men adds to unemployment. Increasing the tonnage for a given number of men is the most satisfactory. This reduces the number of days the mine will have to work to produce a given tonnage.

Concentration of working places is a large factor in securing a greater tonnage for the same number of day men, and one of the largest items in concentration is the capacity of the mine car. The mine in question worked eighteen days per month, loading 1,843.5 tons per day, or a total of 33,183 tons. Cars dumped per day totaled 765.6. Average loading per car was 2.41 tons. The gathering locomotives, which averaged 12.1 in number, each hauled 63.5 cars per day.

If these cars had averaged 3.00 tons each—an increase of 0.59 ton, or 24.5 per cent—and the gathering locomotive performance had been the same, the daily production would have been 2,295.2 tons, and only 14.4 days would have been required to secure the monthly production of 33,183 tons. Excluding eleven salaried men leaves the labor of 123.3 inside and outside day men for 3.6 days to be saved. At an average rate of $4.50 per day, the total saving for 3.6 days would be $1,997.46, or 6c. per ton on the monthly output.

The mine has 465 cars. If the larger car had been purchased at $35 more per car, the added cost of $16,275 would have been returned to the mine in eight months through the saving in labor cost alone. In addition, the increased concentration would have resulted in a further saving of 2c. per ton on material, whereas if the operation had been working at maximum capacity the savings would have been still greater. The larger car, with increased concentration of workings, would add to the productivity of the loaders and cutters, which should allow lower cutting and loading rates to be put in force. If, however, the mine went along with the field in the scale of wages paid, it should be able to attract men by offering more attractive work.

The average cost of maintenance and lubrication of mine cars in a widely scattered group of thirteen mines is 0.7 per cent of the total cost of the coal. The high is 1.27 per cent and the low is 0.31 per cent, and the cars are all types from old wooden varieties to modern, all-steel types, ranging in age from 1 to 13 years. If we can pay $30 to $40 more per car to secure modern facilities for reducing maintenance and lubrication costs 0.5 per cent, we are justified in adding a like amount for a saving several times greater.

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*Abstract of an article on "The Relation of Mining Cost to Mine Cars," read before the 24th annual meeting of the West Virginia Coal Mining Institute, Wheeling, W. Va., Nov. 27.

CAN MINE WATER

Be Processed Without Expense?

REAL progress is being made in the de-acidification of mine water, according to an address by W. L. Stevenson, chief engineer, Pennsylvania Department of Health, Harrisburg, Pa., at the Stream Purification Session of the Third International Conference on Bituminous Coal, Nov. 18. However, H. Bach, chief chemist, Emscher River Drainage Board, Essen, Germany, regards de-acidification as merely one of the desired ends. The exclusion of ferric hydrate from the water is also desirable and more necessary in alkaline organic water than in acid sterile water. So it appears that the halfway house has yet to be passed.

Mr. Stevenson's paper on "Coal Mine Drainage Disposal" declared that, as the result of joint action of his department, coal operators and waterworks officials, preliminary studies have been made which indicate, and which operating experience has since demonstrated, that tributary streams can be protected and in some cases mine-operation costs reduced by collecting main drainage within the mine to one or more large pumping stations. This method is preferable to the maintenance of a relatively large number of small pumps, each discharging small quantities of mine drainage through boreholes to points above the mine. Sometimes, all the water entering the mine can be brought to a single point, from which it can be discharged to the surface. In certain cases, in order to find a suitable point of discharge, it may be necessary to drive a heading in advance of active mining. This will prevent the acidification of tributary seams and limit the discharge to streams which are already acidified by other mine drainage. The tributary streams thus become available for public water supplies or for steam raising, sometimes at the very mines which institute this improvement.

As a result of this campaign mine waters have been diverted also to extensive sumps where the water can be kept in storage and neutralized by the alkaline waters coming into the area thus flooded. By taking the effluent from the surface of the water the impurities are decanted. Thus any water removed by pumping is cleaned of rock and coal detritus, basic ferric hydrate and other impurities. The area being kept under water at all times, the pyrite within the area is not subject to oxidization and thus does not add to the acidity of the water.

As far as possible, abandoned mines are sealed, thus shielding the pyrite from air by direct flooding. In those parts of the mines which the water cannot reach, the atmosphere thus sealed becomes of a character inert to pyrite. As the waters flowing into such flooded and sealed areas are almost always alkaline, the standing water soon becomes less acid, if not entirely of alkaline reaction. The Berwind White Coal Mining Co., at the Maryland shaft, St. Michaels, Pa., by expending over $100,000, has concentrated the drainage of all its mines, thus making it possible to abandon 80 pumps discharging through boreholes. Even with moderate impounding it has reduced acidity 14.3 per cent, and better results are expected with further impounding.

By abandonment of Derry No. 1 shaft of the Latrobe-Connellsville Coal Co., near Latrobe, and making breaches through mine pillars in other mines, both active and inactive, a drainage area underground of 25,000 acres has been created. The water rises to a level 40 ft. above the shaft bottom, at which level it discharges through an old slope opening. Thus 35,000 acres has been, and 50,000 acres in all will be, relieved of mine drainage. At a Quemahoning Coal Co. mine, a mile of main stream was protected from mine drainage by pumping from a new shaft 5,000 ft. lower down the stream, thus relieving the Quemahoning Reservoir from mine drainage. In nineteen other less important instances, drainage has been concentrated with advantage to tributaries. Three other large drainage operations are now under development.

On Oct. 15, 1930, the Brothers Valley Coal Co.'s shaft mine at McDonaldton, Pa., which had been abandoned April 1 of that year, had filled with water so as to seal off the shaft. By Feb. 23 of this year the water had risen 55 ft. in the shaft and backed up the pitch of the seam to a point 350 ft. from the shaft bottom. Two samples taken at that point showed 600 and 1,200 parts per million acid, respectively, and a sample at the top of the shaft, 59 parts alkaline. At the shaft bottom, the water was 245 parts acid. On June 9, the water in the shaft was 164 ft. deep, and 10 ft. below the water surface the water was 82 parts alkaline, and at the bottom of the shaft 11 parts alkaline.

In four other cases impounding made acid water alkaline. "In addition," says H. M. Van Zandt, as quoted by Mr. Stevenson, "one hundred or more cases are reported where the acidity was reduced in greater or less degree and where the water became alkaline, with values running up to 150 parts per million, all as the result of a more or less perfect impounding of the drainage water within the mines."

Later, Dr. Bach read a paper on "The Disposal of Coal-Mine Liquid Wastes," in which he discussed, among other matters, the presence of clay and other undissolved substances in mine water which the Germans are in certain cases removing by the use of sedimentation tanks.

Water from the open pits for mining brown coal contains lignite, much of which is in the colloidal state. The raw water as pumped from the mine is acid and of a chocolate color. By the addition of alum and afterward lime, a precipitate of brownish color is formed which settles to the bottom of the clarification tanks.

Dr. Bach said that the ferrous sulphate formed in the mines by the oxidation of pyrite is an incompletely oxidized compound and quickly exhausts the dissolved oxygen in the water in its own oxidation to ferric sulphate. As fish cannot exist without at least 2 to 3 parts per million of dissolved oxygen, the water being thus deprived of this gas, the fish may die of suffocation. The chief food of fish is in the natural mud on the bottom of the river which shelters various small organisms. The fertile river mud is the natural spawning place for fish and the home of their offspring. If the hydroxides of iron, from the ferrous sulphate in the water, are precipitated on the river bottom, coating it with a sort of skin, the fertility of the river bottom may be destroyed. The fish are then forced to migrate up the river or into the tributaries.

Water contaminated with iron salts

(Turn to page 632)

REFUSE DISPOSAL SYSTEM

+ Controlled by Topography And Maximum Capacity Demands*

REFUSE disposal at a new coal preparation plant should be designed to handle the maximum quantity of waste material which may be produced at any future time. Considerable danger of underestimating this quantity exists. Local conditions may make the loss of salable material in the refuse much higher than was expected, or the adoption of mechanical loading may make it more economical for the operating company to load out material that formerly was thrown aside in the mine. Additional capacity is necessary if the roof, bottom, or caved material must be removed to secure the coal, as in the anthracite field and in certain bituminous regions where the seams are thin.

Topography, it is generally conceded, is the most important factor in the selection of refuse-disposal equipment. In flat country or in a broad valley where plenty of storage space is available, a wider choice of equipment is possible. Hilly country reduces the number of suitable types somewhat, and may necessitate the installation of machinery for transporting the waste material over mountain tops into adjacent valleys. In certain cases, also, operators find that it is cheaper to dispose of refuse by shipping it out in railroad cars, or by trucking it away from the plant. The possibility of ignition, with ensuing discomfort to the community, is a further factor in the choice of a site for a refuse dump.

Waste material may consist of anything from very fine refuse from the washery or air-cleaning plant to large chunks of shale or rock from the mine. The general practice is to handle mine rock and preparation-plant refuse together as far as possible, though in some cases, particularly where the output of mine rock is large, separate facilities are provided for its disposal. Combining the two classes of waste material is advantageous in that it eliminates duplication of disposal equipment, centralizes the activity in one place, and consequently reduces the labor required.

Side-dump cars, electric larries, motor trucks, aerial trams, conveyors, tracked inclines, portable mine car dumps, and scrapers all find favor as refuse-disposal equipment, according to a survey of preparation practice at plants built in the past three years made by *Coal Age*. In some cases, the system used is a combination of more than one type of equipment, such as a rope haulage incline with a larry at the top for wasting the material. Combination systems are sometimes open to the objection that extra labor must be employed, but certain topographical conditions may require that more than one type of equipment be installed.

Whatever the type of equipment employed, it should be chosen not only for its suitability to the conditions at the plant but also with an eye to the operating labor involved. The average mine rarely employs more than one man in the routine disposal of refuse, finding that systems where several men are employed to overturn larries or dump cars by hand or to move material on the dump are unduly wasteful of labor. Automatic or semi-automatic bin gates, disposal equipment that can be operated by one man, and a system of dumping that eliminates any hand shoveling or trimming reduce the labor cost to a minimum.

Side-dump cars pulled by a steam, electric, or internal-combustion locomotive are used by many companies. Refuse-disposal systems involving this type of equipment have been found to be simple and flexible. Additional output can be handled easily by adding more cars to the trip, provided the locomotive is able to pull them. Loading is quickly accomplished in trips by bringing the cars successively under the bin gates, and discharge, in the modern types, requires only the tripping of a latch or manipulation of the control lever of an air valve or motor starting switch.

With side-dump cars, the waste material ordinarily is discharged parallel with the track, whether the dump be on a hillside or of the low, slightly rising type commonly found in level country. The width of the fill usually will not exceed 6 ft., but with a dumping distance of up to 2,500 ft., which the *Coal Age* survey shows is not excessive, several weeks would elapse under average conditions before it would be necessary to move the track to the brink of the fill for a new start. The use of sheet-iron slide plates would allow a still greater quantity of material to be dumped before moving the track.

Self-propelling larries play a prominent part in refuse disposal at many modern coal preparation plants.

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*Sixth of a series of articles on the fundamentals of modern coal preparation. The articles published in preceding issues were: "Suiting the Plant to the Preparation Job," by J. B. Morrow, preparation manager, Pittsburgh Coal Co., February, 1931, p. 57; "Coal Preparation Plant—The Structure That Houses It," by Andrews Allen, Allen & Garcia, March, p. 125; "Electrification Problems of Dry Cleaning Plants," by W. D. Turnbull, general engineer, Westinghouse Electric & Manufacturing Co., May, p. 247; "Electrification Problems in Washing Plants," by E. J. Gealy, electrical engineer, Pittsburgh Coal Co., Part I, July, p. 346; Part II, September, p. 477. Subsequent articles in the series will appear in 1932.

Several types of this equipment are available. By means of a rotating bin or the inclusion of three bin gates, the gravity-dumping type can discharge material at the end of the track or on either side. With one gravity type, which carries the refuse fairly high above the track, fills approaching 20 ft. in width can be made without hand labor.

Still greater fill widths are possible with larries using belts for discharging the material. One type, known as the throwing larry, employs a short belt or conveyor operating at high speed to throw the material away from the track. The conveyor belt ordinarily is of steel or is metal-clad. Still another model, the conveyor-stacker type, uses a comparatively long conveyor belt, operating at a lower speed. Larries can operate over practically any terrain that can be negotiated by cars. Capacities are variable over a wide range. At one mine, an 11-ton throwing larry transports 450 tons per day to a dump 3,500 ft. from the tipple. One large bituminous company has standardized on throwing larries where dumping space is available within three-quarters of a mile and can be reached over grades of not more than 6 to 8 per cent.

Electric drives receiving current from trolleys hold first place in the propulsion of larries. In a few cases, a trailing cable instead of a trolley is used for the last few hundred feet where the track is temporary. One company, at least, uses a battery to supply current for propelling a gravity dumping larry.

Motor trucks are used for disposing refuse at quite a number of the plants built in the last three years. Refuse output at most of these operations ranges from 3 to 10 tons per hour. One Illinois operator pays a contractor $10 per day for disposing of 100 tons of refuse, the contractor supplying the truck and driver. Perhaps one of the principal advantages in the use of motor trucks lies in the increased flexibility. Opportunity is provided for disposing the refuse elsewhere than on the dump, if desired, or disposal on different parts of the dump is possible. The latter advantage assumes added importance as a means of checking ignition. Experience at one Indiana operation where trucks are used shows that dumping the material in layers and compacting it under the truck wheels has eliminated much of the fire hazard.

Truck operation may be hampered by wet or freezing weather, experience has shown, and at plants where more than one machine must be used to handle the output of refuse, the labor cost is increased. Caterpillar tractors pulling crawler wagon trailers of 10 to 15 tons capacity offer possibilities in the disposal of preparation plant refuse. Flexibility equaling that of the motor truck is provided, the capacity is much greater, steeper grades can be negotiated, and the influence of weather is minimized. At a new mine in Tennessee the tractor wagon plan of disposal has been in successful use for several months.

The aerial tram has been found to be adaptable to practically all physi-

cal conditions, and operators using this equipment report a low operating cost. Trams can be used for stacking the material close to the plant, but find their greatest application, experience has shown, in carrying refuse several thousand feet across the top of a hill or mountain to an adjacent valley. Several late installations are over 3,000 ft. long, and one operates on a grade of 32 deg. Dumping spans of 1,500 ft. or more are not unusual.

Operation has demonstrated that the aerial tram, for practical purposes, has no distance or grade limitations, and that it has been the means by which a number of plants have been able to dispose of the refuse far enough away to escape discomfort when the dumps were accidentally ignited. Also, piling the material away from the plant, railroad, and town eliminates the possibility of slides, which may cause considerable property damage, bodily injury, or loss of life.

American aerial trams usually have a stationary track cable on which a trolley rides. The trolley, from which the bucket is suspended, is pulled by a separate rope. Installations in this country generally fall into two classes: oscillating and continuous. With the oscillating type, the bucket travels out and back on the same track cable. The so-called single-carrier system, consisting of one bucket and one cable, represents the simplest type of installation, and finds favor where capacities are small and hauls are short. For larger capacities or longer distances, the double-carrier system (two buckets and two cables) may be employed. Both buckets are driven by the same hoist and are arranged so that one is going out as the other is returning. Oscillating trams, experience has shown, usually are limited to distances not exceeding 1,800 to 2,000 ft. Longer distances lengthen the time of bucket travel, and thus reduce the capacity to below a practical value.

The continuous aerial tram has been developed for use over distances greater than 2,000 ft. With this type, a number of buckets are used. These travel in a continuous circuit. Single- or double-track cables may be used, and the carrier trolleys may be permanently attached to the traction rope (necessitating loading in motion) or grips may be provided for bringing the bucket to a stop for loading. Latest installations have automatic dispatching systems for attaching the loaded carriers to the traction cable at the proper intervals.

Continuous trams have been found to be well adapted to handling changes in volume of refuse produced if the cables and supporting towers are strong enough to carry the added load. Additional buckets may be purchased and the spacing decreased, or the rope speed may be increased for additional capacity. Recent installations of aerial trams have capacities ranging from 50 to 100 tons per hour.

Dumping of buckets may be accomplished by means of a movable tripping frame anchored at a certain point on the track cable; by an adjustable, automatic travel-limit device geared to the track wheels of the carrier; or by reversal of the direction of travel in the case of an oscillating tram. Convenience in changing the point at which the buckets dump dictates the choice of the dumping mechanism.

Belt or chain-and-flight conveyors are employed at a number of operations where the plant is built on a hillside near a deep ravine or where the refuse is stacked in piles on level ground near the plant. Conveyors also are used occasionally to discharge refuse into streams where the current is strong enough to carry the material away. Stacking by conveyors near the plant is especially prevalent in the anthracite region, but the advent of larger cleaning plants, which require a bigger dumping space, and a tendency to keep refuse piles as far away from the plant as possible have checked the installation of this type of equipment. As far as life in handling wet or dry refuse is concerned, the rubber belt has proved to be quite satisfactory, but it is not generally used in handling large chunks of refuse, because of the fact that an excessive width would be required.

Rope haulage on tracked inclines finds considerable favor in the anthracite region, and is used at a number of bituminous plants. The skips or cars usually are of the type which dump automatically at the top. The Saxon dump, which has been used for some years in the anthracite field, consists of a complete dumping-frame and head-sheave arrangement mounted on trucks. Extensions require only that the dump be moved a little farther up the rails which have been added to the track. A chute is provided to facilitate dumping several feet ahead of the track.

Many portable mine-car dumps have been put into use in the past few years for dumping refuse directly from the mine car. Experience has shown that this equipment is adapted to hillside use where the refuse is dumped parallel to the track or for widening fills in enlarging track yards. The car containing the refuse is pushed into a cradle which rocks or pivots so as to turn the car almost to the inverted position, dumping the material several feet away from the track.

Most portable dumps are of the "gooseneck" type. There also is another type built without the gooseneck, where the cradle is rocked by a drive mounted beneath the track; being comparatively low, this type of machine can work beneath trolley wires. As a regular method of disposal from mine cars, portable dumps have been found to be quite satisfactory where the hillside below the track is sufficiently long and steep to allow dumping for a week or more without moving the equipment.

Power drag scrapers are used at several plants for stacking refuse, picking it up after it is discharged from a chute or conveyor, or after it is dumped from cars. The usual scraper capacity is 1½ cu.yd., though one anthracite company uses a 3-cu.yd. scraper for stacking culm. Scrapers have demonstrated that they are not lacking in flexibility, though their operation is hampered if large chunks of material must be handled. With special "dog-leg" equipment for turning a corner, this equipment, in several instances, takes refuse from a dumping space under a track or chute and piles it parallel to the roadway. One middle western mine reports that more than 20,000 cu.yd. of washer refuse has been piled without changing the scraper head mast.

Disposal of refuse underground is not practiced except at a few anthracite operations. Even in the hard-coal field, aside from one operation within the limits of an anthracite city, which crushes the washery refuse and flushes it into the mine through a borehole, fine material usually is the only class of refuse sent underground, where it serves two purposes: The surface is supported where it is necessary to avoid damage to overlying strata and yet insure complete recovery, or the overlying strata in pillar sections are maintained until the seam above can be worked out or an opportunity is afforded for mining the pillars themselves.

Crushing as a primary stage in refuse disposal is not practiced at any bituminous operation, as far as *Coal Age* was able to determine in its survey, and only intermittently at certain anthracite operations, with the exception noted above. Present methods and equipment used in surface disposal usually are easily able to handle the largest pieces produced, operators have found.

In the design of a disposal system that must handle mine rock as well as cleaner refuse, it is important that chutes, gates, aerial-tram buckets, and other equipment be large enough to handle the biggest pieces without stoppage. Operations at several otherwise efficient plants have been hampered by poor design in this respect. If the mine rock is not already loaded mechanically, the possibility that it will be so handled in the future should be considered in determining the size of the largest pieces to be handled.

Local physical conditions and wide variations in the quantity of refuse produced cause handling costs to fluctuate considerably. A reasonable goal for which to strive, however, is 5c. per ton of waste material handled. This will include power, labor, and maintenance, as well as carrying charges on the equipment.

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Can Mine Water Be Processed Without Expense?

(Continued from page 629)

is unfit for agricultural purposes, especially in the case of irrigation of meadows, for films of hydroxide are formed on the grass blades which hinder access of air. The precipitate also clogs the soil and renders it infertile.

Ocher deposits promote the growth of iron bacteria, such as *Chrenothrix polyspora, Gallionella ferruginea, Leptothrix ochracea*, etc., which develop rapidly if the water contains organic matter as well as iron salts. "I have had," said Dr. Bach, "opportunities to see vapor condensers become totally clogged after a comparatively short time with iron bacteria from ferrous sulphate-contaminated river water. In such cases, slight chlorination of the water before entering the condensers prevented the bacterial growths and proved to be an effective remedy."

Ferrous-sulphate contamination may prove harmful in textile, especially rayon, factories, in paper mills and in several other industrial plants. When water is contaminated with ferrous sulphate not only is it necessary to remove the iron but also to decrease the hardness of the water, where there is need for soft water.

A. B. Crichton, consulting engineer, Johnstown, Pa., declared that only in some cases had sealing reduced acidity. J. K. Hoskins, U. S. Public Health Service, Cincinnati, Ohio, said that 87½ per cent of the acid in the water of the Ohio was due to mine drainage. The alkalinity of the Ohio River at Cincinnati has been decreasing.

It should be recognized, he said, that acid has its value as a coagulant and as bactericide. It is helpful as well as harmful. He added that Dr. Stevenson also had noted the germicidal effect.

R. Dawson Hall, *Coal Age*, remarked that in some mines the quantity of acid crystals was astounding and that the water if allowed to ebb and flow in areas thus covered would become intensely acid. A pound of sulphur would make almost 9 lb. of $Fe\ SO_4 + 7\ H_2O$. Consequently if the coal had 6 per cent of pyritic sulphur, the quantity of crystals of ferrous sulphur would be 52 per cent. Thus 100 lb. of raw coal would become 94 lb. of clean coal and 52 lb. of crystals. The protection of the ribs, roof, and floor of protecting areas in which water rose and fell was of the utmost importance in the control of acidity.

Illinois Institute Seeks Relief From Hard-Times Blues

OLD and new problems were thrashed out in the light of present conditions at the thirty-ninth annual meeting of the Illinois Mining Institute, held in Springfield, Ill., Nov. 6. In the technical field, interest was centered on the cleaning of Illinois coals and expected effects on combustion, savings in ventilation, with particular emphasis on fan equipment, and automatic control of pumping. But the gathering did not concentrate all of its attention on operating problems to the exclusion of economics. The threat of coal displacement by gas was touched upon, and research on coal received more than passing notice.

T. J. Thomas, president, Valier Coal Co., reported the accomplishments of the institute's committee appointed to promote vocational training at the coal mines of Illinois. The committee conferred with labor leaders, then obtained the cooperation of the state department of vocational training, and finally launched its program actively by a tour of the state. As a result, a number of classes have been started at important coal centers; these will be added to, financial support coming from the state and federal governments.

M. M. Leighton, chief, Division of Geological Survey, Illinois, told of the research program covering Illinois mineral industries which was launched during the year at the State University at Urbana, under the Geological Survey. A large sum has been appropriated for the study which will deal with raw materials in the ground, new utilization, and marketing. A building on the campus has been renovated and enlarged to house the various divisions of this research. A trained and experienced staff of seven will make investigations along such lines as the economics, microscopy, physics, and chemistry of entities in the mineral group. In addition to the attention it will receive in the breakdown of this general activity group, coal will be favored by studies of combustion.

In a paper on "Combustion and the Cleaning of Coal," E. D. Snow, University of Illinois, outlined the factors in combustion which emphasized the importance of mechanical cleaning at the mines for partial elimination of ash and sulphur. The paper is based on information gained from a survey on the feasibility of mechanically cleaning Illinois coals, being conducted as a cooperative project between the university and the Utilities Research Commission of Chicago.

The impurities give trouble all along the line. Mechanical cleaning at the mine is thought to be the simplest way out, and the required first step in coal beneficiation. Mr. Snow attributed the decline of mechanical cleaning at Illinois mines to extensive improvements in the design of modern stokers and other combustion equipment, which left acceptance of high ash and sulphur coal as a necessary evil. He voiced the opinion that a number of the Illinois coals could be cleaned satisfactorily by equipment which is winning use in eastern coal fields.

In a written discussion, A. E. Grunert, Commonwealth Edison Co., Chicago, stated that it is difficult to understand why the operators have not exerted more effort for the improvement of their product. By so doing they would be in better position to compete with other fuels, with mutual profit to themselves and to consumers. In his twenty years of experience with central Illinois coals he has seen no improvement in the contents of the product. He believes that is one reason the industry is "in the dumps." For this reason, too, he is not surprised that the consumer is looking elsewhere for fuel.

There are processes, he declared, which will remove about 37 per cent of the ash and 26 per cent of the sulphur from central Illinois coal, with a weight rejection of 11 per cent. Yet the heat rejection would hardly exceed 3 per cent. Including the saving in freight and figuring prices on the basis of heat units, so as to give a premium of 17c. per ton for mechanically cleaned coal, a fuel saving of about 4 per cent to the consumer at the plant would be realized.

J. G. Crawford, general manager, Valier Coal Co., speaking for the railroads, said the roads consider mine-run coal acceptable when it contains not more than 1½ per cent of impurities removable by hand picking. The percentage below this minimum would seem to be worth removal mechanically. He cited the case of a southern Illinois mine, now down, which shipped 3x6-in. egg with an analysis over 5 per cent in ash removable by hand picking. Closing the discussion, Paul Weir said the mechanical cleaning of coal doubtless will come to Illinois as a practice in the next five years, but hardly under the conditions of the immediate present.

In a paper on fan equipment and its relation to power cost, L. R. Robinson, sales manager, Robinson Ventilating Co., Zelienople, Pa., stated that operators are overlooking a big opportunity to save money through modernizing their fan equipment and ventilation methods below ground. Perhaps the reason for this indifference is the fact that the fan is not suspected of being a money waster because it gives so little trouble, less than 1 per cent of the fan business being repair parts. Even a small saving in power through operation of a modern fan would give a relatively large money saving, because the unit must operate continuously throughout the year.

In checking a fan, he advised that

Who's Who in 1932

The Illinois Mining Institute elected the following officers and board members to serve in 1932 at its recent annual meeting in Springfield:

President: George C. McFadden, assistant vice-president, Peabody Coal Co.

Vice-President: G. F. Hamilton, vice-president, Pyramid Coal Co.

Secretary-Treasurer: B. E. Schonthal, B. E. Schonthal Co.

Executive Board: Joseph D. Zook, president, Illinois Coal Operators' Association; T. J. Thomas, president, Valier Coal Co.; H. H. Taylor, Jr., vice-president, Franklin County Coal Co.; G. S. Jenkins, superintendent, Consolidated Coal Co. of St. Louis; G. F. Campbell, vice-president, Old Ben Coal Corporation; C. J. Sandoe, vice-president, West Virginia Coal Co. of Missouri; E. H. Johnson, vice-president, Safety Mining Co.; J. G. Millhouse, director, Illinois Department of Mines and Minerals; Harry Moses, general superintendent, U. S. Fuel Co.; F. S. Pfahler, president, Superior Coal Co.; Paul Weir, vice-president, Bell & Zoller Coal & Mining Co.

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opening in the main aircourse be sectionalized according to the width and height, so as to guarantee true volume measurement with a calibrated anemometer. For example, a 4x9-ft. opening should be divided nine ways horizontally and four ways vertically, setting off 36 squares, in each of which a reading should be taken. The division can be made with fine wire or heavy cord. Air-pressure readings, whether the fan is blowing or exhausting, should be taken at the shaft or air-drift mouth. When such readings are not taken outside the fan, a unit of poor casing design and requiring high velocities will be credited with work which is useless to the mine. It is up to the manufacturer to build fans, air drifts and connections of such proportions that no appreciable pressure loss occurs between the fan and the mine.

While it is good practice to keep aircourses as clean as possible, it is not always good economy to clean out the falls. The expense may be greater than the decrease in power cost, even over a period of years. On the other hand, economy might result from changing the fan wheel to meet the equivalent orifice of the mine.

In discussion, Mr. Robinson said a center reading of air velocity might give a 25 per cent higher value than the average for the entire cross-section of the entry. C. M. Smith, University of Illinois, concurred with him, saying that his investigations have shown a wide diversity in velocities between different points in the cross-sectional area. Paul Weir thought that the introduction of a modern fan for the same volume and pressure would effect a saving of as much as 50 per cent in power. Mr. Robinson added that an investigation of fifteen mines in central Pennsylvania showed that 50 per cent of the power used is for ventilation; that of 25 mines studied in Illinois, 22 had fans too large.

Opening the discussion following the reading of a paper on automatic controls of pumping equipment by J. M. Johnson, chief engineer, Bell & Zoller Coal & Mining Co., abstracted elsewhere in this issue, Mr. Weir said that sporadic operation of mines has turned attention to the high labor cost of manually attended pumps in Illinois mines. He declared the five suction valves on a single 5,000-ft. suction line at Zeigler No. 1, covered in Mr. Johnson's paper, were an innovation much worth while. His company has even made its small pump units automatic.

Department of Labor Reports Shrinkage in Pay Envelope At Bituminous Mines

DECLINES in working time and earnings from the 1929 figures are registered in bituminous coal mining in 1931, according to a study made by the U. S. Department of Labor and published in the *Monthly Labor Review* of October, 1931. The study showed that the number of days worked per half month by miners and loaders (Table I) dropped from 9.1 in 1929 to 7.0 in 1931, while the average hourly earnings, based on time at the face, including lunch, fell from 68.7 to 59.9c. Daily earnings declined from $5.50 in 1929 to $4.82 in 1931. Earnings for one-half month decreased from $49.85 in 1929 to $33.82 in 1931.

The decline from 1929 to 1931 in the earnings per hour at the face of miners and loaders was a continuation of a steady decrease of several years' duration, which brought the hourly rate down to 59.9c. in 1931, against 91.5c. in 1922. Earnings per start also dropped in each of the years in which a study was made, declining from $7.03 in 1922 to $4.82 in 1931. Earnings per half month were $33.82 in 1931 and $62.30 in 1922, showing a decline in each year studied, except for a rise in 1926, due largely to an increase in the number of starts and hours worked.

The average number of starts for all employees other than miners and loaders dropped from 10.2 in 1929 to 8.3 in 1931 (Table II). At the same time, earnings per half month fell from $52.57 to $41.58. Earnings per hour at work and per day, however, fell only slightly behind the 1929 figures, the hourly realization dropping from 60.5 to 59.5c. and the daily total declining from $5.17 to $5.02.

From 1922 to 1931, declines in earnings per hour at work and per start for all employees other than miners and loaders occurred in each year in which a study was made. Earnings per hour dropped from 75.3c. in 1922 to 59.5c. in 1931, while earnings per start declined from $6.55 to $5.02. Earnings per half month, except in 1926, dropped in each year studied to $41.58 in 1931, against $66.17 in 1922.

Table I—Average Starts, Hours, and Earnings of Miners and Loaders by Years

Year (See Note, Next Page)	Number of Mines	Number of Wage Earners	Average Starts Per Half Month	Average Hours at Work or at the Face: Per Half Month	Average Hours at Work or at the Face: Per Start	Average Earnings: Per Hour at Work or at the Face	Average Earnings: Per Half Month	Average Earnings: Per Start
1922*...........	200	33,360	8.9	68.1	7.7	$0.915	$62.30	$7.03
1924...........	599	91,167	8.3	64.6	7.8	.843	54.44	6.60
1926...........	556	96,010	9.5	75.4	7.9	.817	61.61	6.46
1929...........	535	99,405	9.1	72.6	8.0	.687	49.85	5.50
1931...........	469	90,063	7.0	56.5	8.1	.599	33.82	4.82

*Includes data for Utah, Washington, and Wyoming.

Table II—Average Starts, Hours, and Earnings of All Employees Other Than Miners and Loaders, by Years

Year (See Note)								
1922*...........	200	19,388	10.1†	87.8	8.7†	$0.753	$66.17	$6.55†
1924...........	599	49,552	9.8‡	83.1	8.5‡	.696	57.81	5.92‡
1926...........	556	52,145	10.7	91.7	8.6	.664	60.87	5.70
1929...........	535	52,806	10.2	87.0	8.6	.605	52.57	5.17
1931...........	469	47,725	8.3	69.8	8.4	.595	41.58	5.02

*Includes data for Utah, Washington, and Wyoming. †Not including data for 327 employees whose starts were not reported. ‡ Not including data for 636 employees whose starts were not reported.

Table III—Average Starts, Hours, and Earnings of Miners and Loaders by Occupations in 1929 and 1931

Occupation	Year (See Note)								
Loaders, contract	1929	65	584	9.7	82.9	8.6	$0.869	$72.07	$7.45
	1931	42	405	7.3	62.2	8.6	.744	46.27	6.37
Loaders, hand...	1929	475	70,853	8.9	70.6	7.9	.648	45.78	5.15
	1931	413	65,172	7.0	56.0	8.0	.561	31.40	4.49
Miners, hand or pick.........	1929	230	19,666	9.4	74.7	7.9	.673	50.29	5.33
	1931	201	16,963	6.8	54.0	7.9	.589	31.83	4.67
Cutters.........	1929	456	5,937	10.0	85.0	8.5	1.018	86.52	8.68
	1931	411	5,554	7.7	65.2	8.5	.940	61.32	8.01
Helpers.........	1929	136	765	9.0	81.3	9.0	.703	57.25	6.34
	1931	112	599	6.7	62.8	9.3	.608	38.17	5.66
Machine loaders	1929	28	423	9.8	84.5	8.6	.810	68.39	7.00
	1931	35	992	7.4	63.5	8.6	.843	53.51	7.27
Gang miners....	1929	33	1,177	9.5	79.7	8.4	1.010	80.50	8.45
	1931	18	378	9.9	84.0	8.5	.774	65.05	6.55

The averages for 1931 were computed from data covering hours and earnings of individual employees at 469 mines in Alabama, Colorado, Illinois, Indiana, Kansas, Kentucky, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia for a half-monthly pay period in the first quarter. Figures for 1931 are for 137,788 employees, or 27 per cent of the total of 502,993 reported for the United States by the U. S. Bureau of Mines in 1929; in the eleven states covered by the study, the number was 30 per cent of the 454,815 men employed. Of the 137,788 included in the report, 124,309, or 90 per cent, were underground or "inside" wage earners.

Declines in the number of starts per half month, hours worked, and earnings were registered in 1931 in all the occupations included in the miners' and loaders' classification (Table III) except in the case of employees working on loading machines. These workers received $7.27 per day in 1931, against $7 in 1929, but, in accordance with the general drop in all classifications, experienced a decline in the number of starts per half month, hours worked, and earnings per hour and per half month. Days worked, hours, and earnings of all employees other than miners and loaders are shown for the different occupations in Table IV. Average starts per half month, hours worked, and earnings per half month dropped, but, in accordance with the summary in Table II, the earnings per hour and per day were only slightly lower in 1931 than in 1929.

Days and hours worked and earnings for miners and loaders in 1929 and 1931 are shown by states in Table V. Earnings per hour at the face per half month, and per day were lowest in 1931 in Tennessee. Slight increases in hourly earnings were registered in 1931 in Illinois and Indiana. The latter state also showed higher hourly earnings than any other of the eleven in 1931.

State showings on number of days worked, hours worked, and earnings are set forth in Table VI for all employees other than miners and loaders. Average hourly earnings were smallest in Tennessee in 1931, but the number of starts increased from 8.0 to 8.2 per half month, making the earnings per day almost as large as in 1929. Hourly earnings in 1931 showed an increase over the 1929 figures in Alabama, Indiana, Illinois, and Kentucky. Average hourly earnings were greatest in Illinois in 1931, standing at 78.9c.

Table IV—Average Starts, Hours, and Earnings of All Employees Other Than Miners and Loaders by Occupations in 1929 and 1931

Inside Work Occupation	Year (See Note)	Number of Mines	Number of Wage Earners	Average Starts Per Half Month	Average Hours at Work or at the Face: Per Half Month	Per Start	Average Earnings: Per Hour at Work or at the Face	Per Half Month	Per Start
Brakemen	1929	505	4,854	9.5	81.0	8.5	$0.596	$48.31	$5.08
	1931	454	4,339	7.4	62.6	8.5	.576	36.05	4.89
Brattice, timbermen	1929	456	2,901	10.6	88.3	8.3	.648	57.19	5.39
	1931	409	2,669	8.1	65.6	8.1	.626	41.10	5.08
Cagers	1929	192	392	10.9	96.1	8.8	.685	65.79	6.03
	1931	163	284	8.6	74.7	8.7	.668	49.89	5.79
Drivers	1929	282	3,811	9.5	77.8	8.2	.637	49.52	5.24
	1931	237	2,945	7.4	59.8	8.1	.602	36.02	4.86
Laborers	1929	456	7,842	9.0	75.2	8.3	.544	40.90	4.53
	1931	415	6,530	7.3	59.9	8.2	.542	32.50	4.43
Motormen	1929	504	4,860	10.3	89.6	8.7	.649	58.21	5.64
	1931	444	4,527	7.9	68.3	8.6	.624	42.59	5.37
Pumpmen	1929	390	1,148	12.3	113.5	9.2	.550	62.45	5.06
	1931	347	882	11.1	96.7	8.7	.529	51.17	4.62
Trackmen	1929	532	4,653	10.4	85.8	8.3	.635	54.47	5.26
	1931	466	4,151	8.2	66.9	8.2	.608	40.65	4.97
Trappers (boys)	1929	200	633	9.4	75.6	8.1	.354	26.79	2.86
	1931	127	388	6.6	53.3	8.1	.335	17.88	2.71
Other employees	1929	518	6,814	10.7	92.1	8.6	.721	66.38	6.18
	1931	461	7,531	9.2	77.0	8.4	.726	55.92	6.11
Total (inside)	1929	535	37,908	10.0	84.8	8.5	.626	53.10	5.30
	1931	469	34,246	8.1	67.4	8.3	.621	41.85	5.18
Outside Work Occupation	**Year (See Note)**								
Blacksmiths	1929	516	811	11.3	99.5	8.8	.678	67.47	5.96
	1931	452	642	9.3	80.8	8.6	.650	52.47	5.61
Carpenters, carmen	1929	471	1,458	10.8	92.9	8.6	.612	56.84	5.24
	1931	418	1,334	9.2	77.6	8.5	.581	45.04	4.91
Engineers	1929	313	652	12.8	111.9	8.7	.711	79.56	6.21
	1931	271	540	12.8	109.5	8.5	.695	76.13	5.94
Laborers	1929	527	7,834	10.0	86.8	8.7	.493	42.78	4.30
	1931	462	6,954	7.7	66.7	8.7	.473	31.53	4.09
Other employees	1929	506	4,143	11.1	98.7	8.9	.583	57.53	5.18
	1931	456	4,009	9.9	86.5	8.7	.568	49.13	4.96
Total (outside)	1929	534	14,898	10.6	92.5	8.8	.554	51.21	4.85
	1931	465	13,479	8.8	76.1	8.7	.538	40.89	4.65
Total (inside and outside)	1929	535	52,806	10.2	87.0	8.6	.605	52.57	5.17
	1931	469	47,725	8.3	69.8	8.4	.595	41.58	5.02

Table V—Average Starts, Hours, and Earnings of Miners and Loaders by States in 1929 and 1931

State	Year (See Note)	Number of Mines	Number of Wage Earners	Average Starts Per Half Month	Hours Per Half Month	Hours Per Start	Earnings Per Hour	Earnings Per Half Month	Earnings Per Start
Alabama	1929	22	4,470	8.3	74.2	8.9	$0.453	$33.58	$4.03
	1931	19	4,541	6.0	51.8	8.6	.431	22.32	3.69
Colorado	1929	16	1,989	6.8	51.8	7.6	.815	42.22	6.18
	1931	17	2,389	6.2	50.3	8.1	.740	37.19	6.00
Illinois	1929	37	14,104	9.6	77.9	8.1	.867	67.55	7.04
	1931	39	11,539	6.1	49.4	8.1	.869	42.94	7.05
Indiana	1929	29	4,691	8.6	63.5	7.4	.926	58.85	6.83
	1931	19	2,514	5.6	39.9	7.1	.956	38.12	6.77
Kansas	1929	8	1,349	7.0	49.7	7.1	.712	35.39	5.03
	1931	8	1,594	5.0	39.4	7.9	.617	24.33	4.88
Kentucky	1929	64	11,037	8.4	68.2	8.1	.634	43.24	5.15
	1931	65	10,801	5.8	47.0	8.1	.569	26.74	4.60
Ohio	1929	41	7,625	9.0	70.5	7.8	.622	43.83	4.87
	1931	32	6,840	7.2	56.9	7.9	.506	28.79	3.99
Pennsylvania	1929	136	29,665	9.5	77.7	8.2	.645	50.13	5.27
	1931	125	28,519	7.9	62.5	8.0	.567	35.45	4.51
Tennessee	1929	15	1,183	7.0	53.8	7.7	.500	26.91	3.86
	1931	14	1,265	6.7	56.0	8.4	.372	20.82	3.12
Virginia	1929	22	2,601	9.8	74.3	7.6	.568	42.23	4.30
	1931	16	2,533	8.9	69.1	7.8	.515	35.59	4.01
West Virginia	1929	145	20,421	9.1	70.8	7.8	.689	48.77	5.35
	1931	115	17,578	7.4	61.2	8.2	.572	34.96	4.72
Total	1929	535	99,405	9.1	72.6	8.0	.687	49.85	5.50
	1631	469	90,063	7.0	56.5	8.1	.599	33.82	4.82

Table VI—Average Starts, Hours, and Earnings of All Employees Other Than Miners and Loaders by States in 1929 and 1931

State	Year (See Note)	Number of Mines	Number of Wage Earners	Average Starts Per Half Month	Hours Per Half Month	Hours Per Start	Earnings Per Hour	Earnings Per Half Month	Earnings Per Start
Alabama	1929	22	3,019	9.5	86.1	9.1	$0.399	$34.32	$3.62
	1931	19	2,476	7.5	64.0	8.6	.402	25.74	3.45
Colorado	1929	16	1,012	8.7	72.8	8.4	.778	56.64	6.53
	1931	17	1,142	7.5	62.6	8.3	.777	48.63	6.45
Illinois	1929	37	6,226	11.2	91.6	8.2	.780	71.40	6.38
	1931	39	7,646	8.0	65.4	8.2	.789	51.59	6.45
Indiana	1929	29	2,082	10.5	85.1	8.1	.776	66.02	6.26
	1931	19	1,473	8.8	69.4	7.9	.783	54.31	6.18
Kansas	1929	8	289	9.8	80.7	8.3	.649	52.39	5.37
	1931	8	310	6.8	55.7	8.2	.646	35.94	5.31
Kentucky	1929	64	6,924	9.6	83.7	8.7	.533	44.63	4.64
	1931	65	6,755	6.9	58.5	8.4	.534	31.26	4.50
Ohio	1929	41	2,783	10.5	86.6	8.2	.612	53.01	5.03
	1931	32	2,392	8.8	71.4	8.2	.544	38.88	4.44
Pennsylvania	1929	136	12,935	10.7	93.8	8.7	.639	59.98	5.59
	1931	125	11,819	9.1	77.3	8.5	.610	47.18	5.20
Tennessee	1929	15	763	8.0	64.4	8.1	.406	26.16	3.28
	1931	14	518	8.2	66.6	8.1	.393	26.13	3.19
Virginia	1929	22	2,098	10.7	91.7	8.6	.466	42.79	4.00
	1931	16	1,899	8.7	76.5	8.8	.452	34.56	3.96
West Virginia	1929	145	14,675	9.7	82.6	8.5	.558	46.04	4.76
	1931	115	11,295	8.5	72.9	8.6	.532	38.83	4.57
Total	1929	535	52,806	10.2	87.0	8.6	.605	52.57	5.17
	1931	469	47,725	8.3	69.8	8.4	.595	41.58	5.02

Note: Data for each year are for one half month only in the particular year; the half month chosen varies from year to year.

Coal Age

Sydney A. Hale, *Editor*

New York, December, 1931

Engineers wanted

TODAY a number of mine engineers are idle. That these men are jobless certainly is no sign that the profession has too many followers. If anything, what the coal industry needs is more engineering, not less.

At no time have the attributes of the engineer better fitted the immediate needs of coal mining than now. With markets substantially off; plant operations adjusted to low working schedules; jobs and processes changed to a new order; and with finances sternly guarded, margins of business are so reduced that only an analytical mind can exact the most from them. That type of mind is a heritage of the engineering profession.

Alert management will take advantage of the present opportunity and choose from the unusually large field of engineers available for service. By so doing, it will better cope not merely with the perplexing problems at hand but also with those of the future.

Near neighbors

FROM the Middle Ages is derived the notion that a man bitten by a dog could be cured by a hair from the dog that bit him. However, nonsensical such a belief was, it is certain that the cure for acidifying mine water is the limestone usually present in associated measures, for limestone and high pyrite are rarely far apart.

This because both have a common origin—the sea. It was the sea that formed large deposits of lime organisms which eventually solidified into rock. It was the sea that carried the gypsum or calcium sulphate which, by the aid of coal bacteria and iron oxides, was converted into pyrite. Thus, to that "that ole davil, sea," can be traced the causes of acidity in coal mines, and from its action can be obtained correctives for that acidification.

Unfortunately, as the mines are in sulphury parts of the measures and there are no mines in the lime rock, the acid water derives but little correction from lime waters. The water falling on the soil reaches the crevices in the rock made by mining and goes by preference to the coal mine, operating—or even sometimes when abandoned—passing by the openings in the lime rock through which the water used to travel. Thus streams with a marked alkalinity give place to waters which are frequently strongly acid and at best are at times mildly alkaline.

In a large part of West Virginia there is little pyrite and limestones are thin and rare. D. B. Reger describes the limestone horizons as "phantoms"; they should be there and sometimes, though rarely, they are there, but usually they are not. In some sequences or cycles—to use a theory suggested for the sequent following of clay, sandstone, shale, and coal—limestone is absent and pyrite is in low percentage. In Pennsylvania both pyrite and limestone are prevalent. Thus, in the Redstone sequence the limestone is prevalent and the coal pyritic, giving water with a high degree of acidity.

Coal vs. gas

NATURAL-GAS experts lay much stress on the heat value of their product as attested by the calorimeter, and on the greater completeness with which gas burns as compared with coal. However, the question of heating value is not one of potential heat units, nor yet of heat units liberated, but of heat actually used. For the moment, nothing need be said about the large quantity of water vapor generated by natural gas in its combustion, nor about the losses of heat due to the water being necessarily carried as live steam up the chimney. As that loss is quite generally recognized by technicians, if not by the public, the subject may well be dismissed, at least for the nonce.

What calls for discussion is the loss of heat from the gas flame that results from the simple form in which that heat is found. The heat of the gas flame is almost entirely that of the heated gases as they emerge from the zone of ignition—namely, convective heat. The heat of the coal fire is more complex. It has been largely absorbed by glowing solids—carbon and refractive ash—which give out radiant energy that travels freely through the gases, not with them, thus passing from the hot coals to the furnace walls. Convective heat is like that of an intensely hot wind; radiant heat resembles the sun's rays as concentrated by a magnifying glass.

Nearly always the top of the coal bed in the house furnace consists of unignited coal. One can hold one's hand above the fire and not be scorched or burned. Evidently, neither convective nor radiant heat is in any large quantity above the fire, but hidden under a wonderful insulating mantle are to be found glowing coals giving out an abundance of radiant heat. Despite the nonconducting quality of this mantle, however, it takes so much heat from escaping gases that they arrive at its surface relatively cool. It is radiant and not convective heat which passes to the walls of the water ring around the fire bed just where the water is coolest and most receptive to such a transfer.

Compare this with gas. One can place one's hand around a bunsen burner and not be scorched. That intensely hot flame carries almost all its heat to its apex, for that heat is nearly all convective. If it is allowed to play on bricks, or if it is deflected by a curved surface, it will distribute heat, or if it meets a cool surface it will warm it; but if these aids to heat conservation are not provided, nearly all the heat is wasted up the chimney. In such a case, thermal units are emitted by a gas flame to little purpose. Natural gas needs equipment suited to its characteristics if any degree of efficiency in its use is to be attained.

Open coal fire: bane and blessing?

AT last the British have found a protagonist for the open coal fires which Americans condemned long, long ago as dirty, wasteful, and inefficacious. Our British friends defended them, and we made, in turn, remarks regarding British psychology and conservatism. In rebuttal we were told that the Briton liked his fire; it was cheerful and appealing. All of which did not entirely explain.

Now, Marie Carmichael Stopes, the woman who invented those words of much debate: vitrain, clarain, durain, and fusain—and somehow made them stick even better than our own: anthraxylon, lucid and opaque attrite, and mother of coal—is making a battle for the open hearth which she asserts gives forth rays that do more than cheer. The vitrain bands, she tells the Royal Society, affect the photographic plate so as to imprint a clear image on it. Dr. J. D. Fulton, at the University of Glasgow, also adds a hearty "Aye, Aye," He took some chickens with their vitality all run down and exposed them to the rays of a bright coal fire and noted that they became lively and well in an hour.

A wonderful thing is the open hearth! Your Briton, who travels around in the smoky atmosphere of his basket grate and in the fog largely caused thereby, is returned to life and vigor by the radiant heat of that same despised grate. It is London's great curse. Marie Stopes would have us believe it is also London's great blessing. Children, she says, should bask in the heat rays of the open coal fire without benefit of apparel for five or ten minutes and they will then forget the fog clouds that come sweeping up the Channel.

But Marie Stopes believes the healing rays of the fire come from the flame, so she does not advocate the use of coke or even of the semi-coke of commerce. She suggests a fuel lying between semi-coke and raw coal that would flame well and smoke not at all if such a combination is possible. If one could make the United States citizen believe this theory, it would help low-temperature carbonization immensely, and it should build up the demand for coal by reason of the loss of fuel values which accompanies carbonization and because of the displacement of natural gas and oil.

First, however, a little study with the old cannonball stove might reveal the fact that it is not the flame but the radiant heat that does the work. In which case why not advocate open anthracite hearths as a health measure? Perhaps for the lack of such rays we suffer the protracted colds of the winter season. Here is a line for research into which much money may be expended or only a little, as one may please.

Incidentally, the study might develop whether the radiance desired comes from the coal or the ash and from hot solids or flames. It is a new idea that red and infra-red rays are perhaps as necessary to vitality as violet and ultra-violet rays. It has hitherto been believed that all the former rays did was to dry clothes and remove the summer's rain, but now it is suggested that both ends of the visual spectrum and the center also aid in promoting photogenesis, though of different sorts.

When to change horses

MACHINERY may be replaced either because it is worn out or because another machine can be purchased which will save enough out of its *additional* profits to pay amortization and interest charges on the new machine, plus a margin for safety. At first blush, it might seem, in the latter case, that these additional profits on the new machine must complete the amortization on the equipment discarded; but we are concerned here neither with the accustomed nor total profits derived from the operation of the machine but only with the additional savings which must pay for the new equipment.

Despite lower or inferior production, it is assumed that the old machine during the remaining years of its useful life would have paid with interest the amortization charges still outstanding at the time it was discarded. Were this not true, the equipment was being carried on the books at more than its real value. But the theoretical new machine is as good as the old one and superior to it because of its newness and consequent longer anticipated life, and because of its improved features. The item of improved features is counted upon to pay for amortization and interest, and leave a margin of safety; equivalency in merit with the older machine pays for amortization and interest still charged against the discarded equipment, and the increased life expectancy of the newer equipment is "pure velvet."

One could afford to buy a new and improved machine, therefore, even though it might not seem likely to pay by its superior qualities for its entire amortization and interest charges. In general, however, such an act might be imprudent unless the useful life of the old equipment was nearly ended, because new machinery sometimes does not yield all the benefits anticipated. But when so large a safety factor as 20 per cent is demanded over and above amortization and interest charges, as is customary with some companies, some allowance could safely be made for the new lease of life resulting from the introduction of the new machinery.

NOTES

. . . from Across the Sea

ONE of the new methods of mining coal in Germany is called "broad-cutting," because the machines make an undercut of about 11 ft. along a 12-ft. face, which itself is an offset from a much longer wall of coal. T. F. S. Brass, who has been making a tour of Germany in which he investigated German mining methods, describes the operations of a face in the Aachen coal field (Fig. 1) where the coal is 20 to 25 ft. thick and the inclination of the seam is from 20 to 25 deg. The short 12-ft. face is level and advances up the pitch and the long wall of which it forms a part extends straight up the pitch and is advanced along the strike by the broad-cutting operation.

As the coal when mined has merely to be directed downhill by the "fillers," four men are able to average 19.6 tons per man. Apparently three of these men work at the face, and one man is placed lower down to direct the coal into the upper end of the chute. At the foot of the chute are two men who fill the cars on the road at the lower end of the main wall. These Mr. Brass terms "loaders." In the road at the upper end of that wall are two men who unload cars of stowing material into a chute and two men who receive it and pack it into the goaf. Apparently this work continues through three shifts, the cutting, filling, and loading being prosecuted for two shifts only. The coal breaks away from the face as the coal is undercut. Thus there are eight man-shifts of fillers, two man-shifts of coal cutters, twelve man-shifts of packers and four man-shifts of loaders, a total of 26, bringing the tonnage down to about 6 tons per man-shift. This, of course, overlooks entirely the men on the surface who fill the cars with waste for use in the goaf.

In addition there must be additional costs for transporting and lowering the waste, the costs being decreased by the fact that the cars have in any case to return to the working faces and can be transported almost as cheaply under load as when empty and that the weight of the waste reduces the burden on the hoist considerably. However, the handling of the waste from the surface to the face must be a source of much expense and some confusion. To this, however, the German operator has learned to submit. In measuring the output of German mines per man-shift, one must always remember the backfilling labor, which in this mine takes as large a force of men (twelve man-shifts) as "filling" (eight) and "loading" (four) combined. The place produces 156 short tons daily.

In another mine is a straight long-

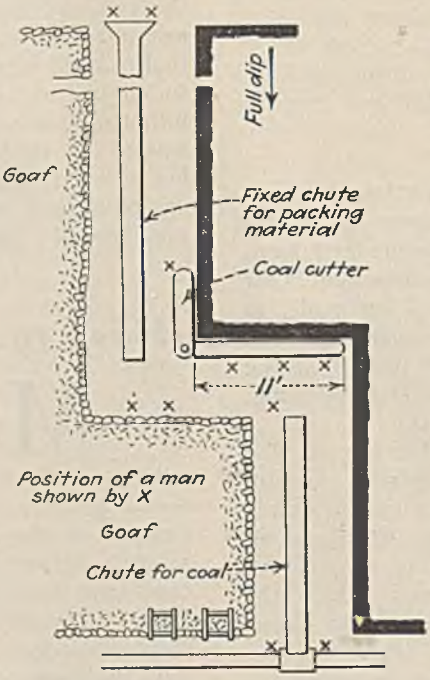


Fig. 1—Broad-Cutting on Aachen Coal Face

wall face 69 ft. long on an inclination of 90 deg. The seam thickness is 3 ft. 3 in., and the tonnage of the face is 107½ short tons daily. Here twelve fillers are employed and four loaders, making a filling rate of 9 short tons per filler and an aggregate rate for filling, loading and packing of 5.3 short tons per man. Packing is relatively easy, requiring only six men, probably because the backfilling is dumped into place and packs without much trouble.

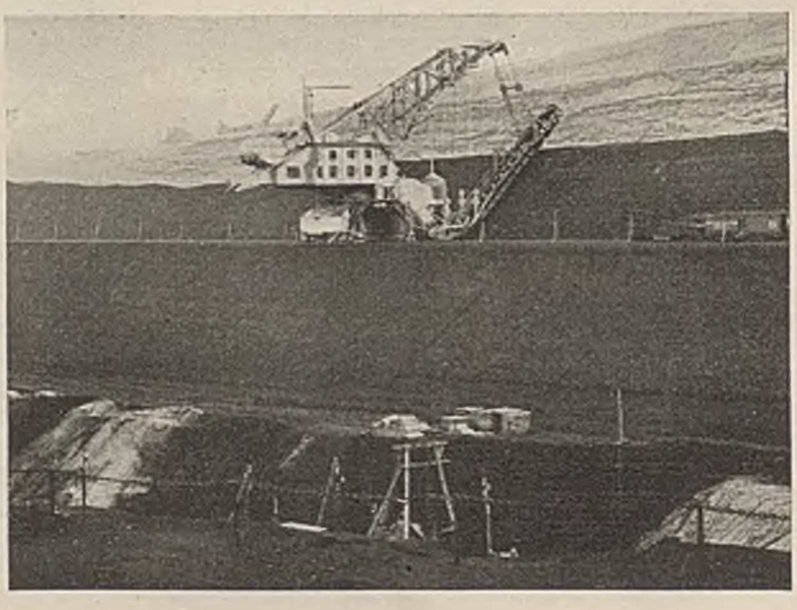
Mr. Brass says that the consumption of compressed air in the Ruhr mines is large. At one colliery 138 cu.ft. of air was used per minute for every short ton of coal mined per day. This mine produced 4,150 short tons daily. Another mine producing 4,780 tons used about 98 cu.ft. of air per minute per short ton of coal produced. In the high-pressure mains which are used to charge the compressed-air locomotive the air is at a pressure of about 2,250 lb. per sq.in. In the low-pressure pipes the air is at about 90 lb. per sq.in. This air is used for operating mine hoists, conveyors and pneumatic picks, and other general purposes.

The low-pressure compressed-air pipes in shafts are of 18-in. diameter; in main levels, 14 to 18 in.; in cross-measure drifts, 7 to 10 in.; in blind or "staple" shafts, 7 in.; in roadways leading to faces, 4 in.; and at the face, 1 to 4 in. The pipes, when in roadways, are always hung from the roof or sides. At many mines a special staff of fitters is kept on duty to detect leakages and repair them and do other general repair work. The mains are connected so that the air can travel in either direction, thus in case of pipe leakage or breakage the air from one direction can be shut off while repairs are being made. This also helps to balance the loads between districts.

Velocity of the ventilation currents is regulated by law. The custom of mining several seams between two sets of levels leads to rather a complicated system of ventilation, and as the velocity of the air in roadways leading to faces is sometimes insufficient, blowers have been introduced to remove gas pockets.

Rubber belting, says Mr. Brass, is rarely used in Germany for conveying at the face, though the value of its use in gates has been generally recognized. Coal cutters are slowly recovering their

Fig. 2—Excavating a Stripped Lignite Face at Halle, Germany, With Bucket Scraper



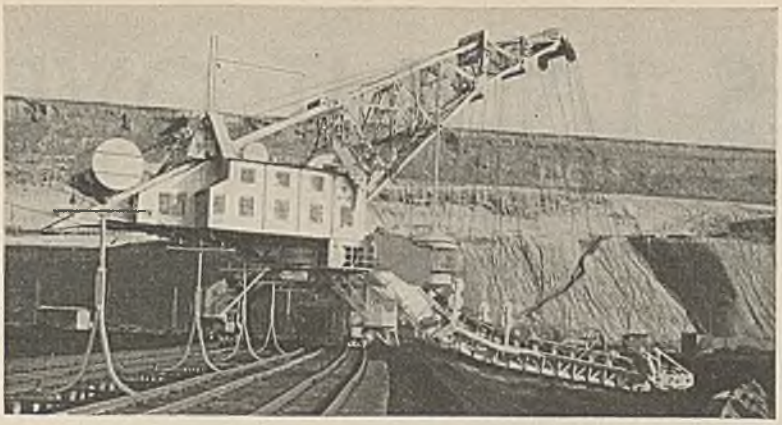


Fig. 3—Bucket Scoop, or Eimerhagger, Digging and Loading Coal

place in German mining practice. At two of the more up-to-date collieries in the Ruhr district, 68 and 45 per cent respectively of the coal was undercut. At one mine, galvanized troughs are in use. They give a freer travel to the coal, owing to the reduced friction, and they last well. The cost of galvanizing is said to be about 50c. per trough.

The majestic proportions of German bucket excavators is well shown in two illustrations (Figs. 2 and 3) forwarded us by a correspondent. This excavator is in operation at the lignite mines of the Gewerkschaft Michel und Vesta, near Halle, central Germany. It was manufactured by the Maschinenfabrick Buchen R. Wolf Actiengesellschaft of Magdeburg, Germany. The height of the excavator over the rails is 82 ft.; the buckets will excavate upward to a height of $52\frac{1}{2}$ ft. and to an equal depth. The designed capacity is 1,373 cu.yd. per hour, but when the lost time due to stoppages and inadequately filled buckets is considered the actual working average is 1,112 cu.yd. per hour. The excavator is supported on 48 wheels arranged so as to give each part equal support. As the upper part of the machine is capable of swinging the excavating parts, the equipment from one level will excavate coal of 105 ft. in thickness. The excavator is driven electrically and two men suffice for the operation. These machines are the largest of those now used for the mining of German coal.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Tests on Timber Pit Props, by S. M. Dixon and M. A. Hogan. Paper 72, Safety in Mines Research Board, British Library of Information, New York City. 82 pp., $6 \times 9\frac{5}{8}$ in.; cloth. Price, 55c.

So little has been done in this country to ascertain the strength of props that the report by the British Safety in Mines Research Board comes as a welcome addition to the literature on the subject, though it deals, of course, with European woods. The monographers declare that of the most variable batch of props tested, the strongest post was twice as strong as the average prop, and the average prop was twice as strong as the weakest, which shows how greatly props vary from a normal figure. Timber dried by storage in a room, and containing presumably 10 to 15 per cent of moisture, is about 50 per cent stronger than saturated timber.

Scots pine props 5 ft. long broke under 32.2 tons of load, whereas home-grown larch posts failed under only 17.3 tons. However, the larch props were irregular in section, were not very straight, and had a thick coating of bark. It is of interest to note that though the Scots pine had the greater strength, the average diameter of the props was a trifle less than that of the larch props. Dry Norway props 6 ft. long and of 6 in. diameter sustained 55 tons, or 3,530 lb., per sq.in.

Round untapered props are very rigid and shorten under maximum load only 0.20 to 0.52 per cent—that is, for a 6-ft. prop, 0.012 to 0.031 in. A 4x4-in. joist prop, which failed by buckling at a unit stress of 18 tons per sq.in., had shortened 0.15 per cent, or, for a 6-ft. length, 0.009 in.—a shortening of much the same order.

It was found that unless the area of the small end of the taper is less than half the area of the cross-section of the prop, a tapered prop will not begin to burr but will fail suddenly like an untapered prop. To make certain that the prop will burr it is suggested that the diameter of the small end of the taper be half the diameter of the prop; its area would then be one-quarter that of the main cross-section. The maximum load carried by a tapered prop is considerably less than that carried by an untapered prop of the same size. It is suggested that this is due to the eccentricity of loading caused by the burring of the tapered end. Here the reviewer may perhaps be excused for wondering whether the man who sets the prop wants it to burr at the end or sink into the clay.

With a testing machine the load is only in part dynamic. When the prop gives way, the testing machine does not increase its pressure, because its head advances only as fast as the feed permits. Perhaps the roof when unbroken or wedged in place acts in the same manner. Strange to say, relative crushing strengths of the props tested with quick, medium, and slow loading, according to the monograph, are 100:82.6:77.5. It is ascertained that a prop will fail at a lower load if subjected to slow, repeated, or sustained loading.—R. Dawson Hall.

* * *

Electricity for Coal Mining Students, by J. Stevenson and W. Miller, Mining Department, Royal Technical College, Glasgow, Scotland. Crosby, Lockwood & Son, Stationer's Hall Court, Ludgate Hill, E.C.4, London, England. 250 pp., $4\frac{3}{4} \times 7\frac{1}{8}$; cloth. Price, 7s. 6d. net.

The aim of this volume, as stated in the preface is "to provide a textbook on electricity for mining students preparing for the Mines Department examination for colliery manager's certificates of competency." Explanations are as simple as possible, yet theory is incorporated to the extent that trigonometry is involved, and a thorough understanding of the volume would be difficult in places unless the reader had the equivalent of about a year of college engineering.

Seventy-two pages are devoted to fundamental principles and definitions, and to an explanation of dynamo action, all without particular reference to coal mining. The rest of the volume, with the exception of two chapters, deals with the principles, uses and mining applications of cables; switchgear; motors and control; distribution gear; instruments; signaling, lighting and batteries. The other two chapters are devoted to efficiency of machines, horsepower calculations, power factor, and generation versus power purchase.

In the discussion of power generation it is stated that, as a rule, the mine can generate its own power at lower cost than the usual rate charged for purchased power, and that the service from the mine plant is fully as reliable. Space devoted to the use and testing of earthing cores (grounding conductors) in trailing cables and to inclosed fittings for use with underground cable distribution are about the only indications of practices and equipment differing from those in coal mines of the United States.—J. H. Edwards.

THE BOSSES TALK IT OVER

MAINTENANCE CUTS—

They sat down in the foreman's office. "Mac," began the super, "Dad, here, says we're spending too much for maintenance work in these hard times. He thinks we could hold off certain jobs temporarily—perhaps road cleaning, or pulling track until the rails are needed."

"It seems to me," interrupted the Old Man, "that we ought to be able to schedule these jobs in the order of their importance and do some of them less frequently. We're going to have to give up something for a time."

"But Dad," pleaded the foreman, "We do schedule. What is more, you can't produce cheaply unless everything is up to snuff. Hard times? Do you expect better days soon? Won't we be better off doing the work now than later?"

"We can't always do what we want to do, Mac," the Old Man concluded. "This is a question of expediency."

WHAT DO YOU THINK?

1. Who is right in this argument?

2. From your own experience, if a cut must be made, in what order of importance would you put the various maintenance jobs? List them briefly.

3. What is your method of scheduling and controlling plant upkeep?

4. Do you budget or set up labor quotas for this work?

All superintendents, foremen, electrical and mechanical men are urged to discuss these questions. Acceptable letters will be paid for

Should a man seriously injured be held at the plant for a doctor's examination? The bosses discussed this problem in November. What the readers think is told in the letters following.

A Doctor Should Be Within Call of the Mine at All Times

In the handling of injuries at the mines, great strides have been made since the World War. Prior to that time every step in the handling of the patient, from the place of injury to his home or the hospital (if he got there alive), was unfavorable to his chances of recovery. Once, unaided, I walked with a patient two miles to a doctor's office. Two of his fingers were taken off, and I managed to control profuse bleeding on the way. We both were nearly exhausted when we finally got there. But now, with the cooperation of the federal and state departments of mines, and the company doctors, educational campaigns in the treatment and handling of injuries, many lives are being saved which in an earlier day would have been lost.

First-aid is the most efficient humane organization associated with coal mining or any other industry.

I have in mind a group of mines where injury is reported promptly. Where there is any question as to the seriousness of it, the doctor and the ambulance arrive at the mine mouth almost simultaneously with the patient. First-aid equipment, materials and efficiently trained employees are located strategically in these mines, so that little time is lost making the patient as comfortable as his injuries will permit. The company doctor makes the examination, and the ambulance takes the patient to his home or the hospital.

If the patient's injuries are serious and painful the doctor certainly can make his trip to the hospital more comfortable, the while enheartening with encouraging words and pain relieving drugs. Where it is practicable for the doctor to be promptly on hand in the case of a serious injury, and I believe this is nearly always possible, he will be able to do the patient good, even after he has received adequate first-aid treatment. W. H. Noone.

Davis, W. Va.

Always Keep Detention Room Free From Medical Reminders

As a safety engineer of many years' experience, I believe a man seriously injured should be rushed to the hospital as soon as possible. Otherwise many things might occur to break down his resistance and his fighting spirit. In the first place, the doctor may not be immediately available and delay may prove fatal. Secondly, the doctor could do nothing after arrival except to determine the extent of the injury if the victim has already been given proper first-aid treatment.

First-aid is often called the bridge between the accident and the doctor. But in cases of serious injury, it is the bridge between the injury and the hospital. Having received first aid, an injured man does not need the doctor if the case is one for the hospital.

Keep up the man's courage as a matter of common sense. Keep his body warm; give him a stimulant; keep his mind off his injury by talking about unrelated subjects; make him smile, and keep him smiling. Don't give him a chance to think about his injuries. Don't leave him alone.

Every mine plant should be equipped with a room set aside for detention of the injured. This room should be void of surgical instruments, medicine, and first-aid supplies. It should be well lighted with a soft light and its walls should be covered with a figured paper. There should be cheery pictures, clear large ones that can be easily seen from any part of the room. Other furnishings should be an iron stand for supporting the stretcher, two comfortable chairs, a table, lavatory, sofa, and towels. This room must be kept clean and warm at all times.

Let us consider the effect of this atmosphere on an injured man when he is brought into it. When he first enters he is cold; the room is warm. Therefore, he becomes more comfortable. His attendants come in, they wash themselves and him—more comfort. As he lies on the stretcher he sees no instruments or other reminders of his injury. His eyes wander to the pictures and they interest him. He traces the design of the wallpaper. Contentment settles over him after his companions, seated in comfortable chairs, talk to him of pleasant things. He forgets his injury and is at rest.

M. B. Connaway.
Charleston, W. Va.

Keep Up His Courage

A man seriously injured should not be held at the mine plant any longer than the time it takes the first-aid men to fix him up. He should be rushed to the hospital, which is prepared to make the necessary examination, take X-rays, and attend his needs. This the doctor could not do at the mine plant.

Do everything to keep up the courage of the injured man. You might tell him that he will be all right and should leave everything up to the doctors and nurses. Somebody is falling down on the job when the situation arises where people crowd around a man who is hurt. Keep cheerful and talk casually about anything but his condition.

Stickney, W. Va. S. J. Hall.

Be Prepared for Emergencies

From my own observation of accident cases at the mines, I believe a seriously injured man, after receiving first aid, should immediately be taken to the hospital. He should not be held at the plant for a doctor's examination unless the officials are absolutely sure that the doctor is on his way. It usually happens that the injured person could be at the hospital before the physician arrives at the plant.

To be injured is bad enough, without having the victim further aggravated by repeated questioning on matters pertaining to the accident, disposition of tools, etc. The company should be prepared at all times for emergencies of this kind. It is well to keep hidden the identity of the man and the nature of his injuries until the victim is removed from the property.

A few husky men should be appointed in advance as deputies to keep unauthorized persons from entering the colliery first-aid room, also to keep the curious at least fifty feet away from the outside of the building. There should be quiet and avoidance of confusion. George McDonald.
Pottsville, Pa.

First Aid at the Working Face

It goes without saying that all the workers should be trained in first aid, and the plant adequately equipped to this end. If a man with a serious fracture is not handled and treated by trained men, he may be caused to suffer unnecessary pain and to remain injured beyond recovery. After first aid has been given, every precaution should be used in transporting him from the face to the outside. Otherwise, all the good work may be undone. If the doctor is delayed, the man should be rushed to the hospital, since all he would do at the plant would be to administer first aid, which treatment has already been given.

Encouragement usually does an injured person more good than medicine. As long as there is life, the men who are handling the injured one should never give up hope, and should in no way convey the thought to him that his recovery seems doubtful. Be cheerful, sympathetic, and assuring. Under no condition should the curious be allowed to surround the patient, shaking their heads, and passing opinions. To prevent this, certain men should be appointed whose duty it is to keep the crowd away. This last point is something which should be emphasized at the safety meetings.

Arthur J. Pugh.
McAlpin, W. Va.

Confidence in the Physician Is the Important Element

Most modern coal mines have competent first-aid men in every section with an adequate supply of first-aid equipment in readiness for any emergency. In the event of an accident these men are notified immediately and hasten to the scene of the happening to stay the flow of blood from a wound, maybe; or to lend temporary support to fractures; to administer a stimulant in case of severe shock; and to see that the victim is kept warm. That is all that any first-aid man should be allowed to do in any serious accident. The doctor should be sent for immediately and be ready to take charge of the victim as soon as he reaches the surface.

The shrewd company doctor will make it his business to study the personnel of the mine and gain their confidence and respect. It should be no great difficulty to catalog every employee of the mine. A personal interest in the pastimes each follows during off-work hours will do much to promote a spirit of good will. Then when a serious accident does happen to one of these men, the company doctor is in the happy capacity of physician and friend, and as such can work wonders in restoring the mental equilibrium of the victim and overcome barriers that would be almost insurmountable to the average strange doctor, no matter how competent he might be. I've seen many a crooked smile light up the battered countenance of many a human remnant on the entrance of a physician who also was a friend.

Panama, Ill. Alexander Bennett.

Intelligent First-Aid Talks

When a man is injured in the mine, his fellow workers are likely to become unduly upset, a situation which has a bad effect upon the injured. Yet there is no class of industrial workers that can beat the coal miner in giving aid to his fellow man. The miner seems to be naturally inclined in this direction; but even so, he must be properly educated in the correct procedure of first-aid treatment. When a man is badly hurt, his chances for recovery depend in a large measure on the first-aid treatment and handling he receives.

It is important to let the patients know that all is being done that can possibly be done—quickly, but not awkwardly or hurriedly. Patients are keenly observant of your frame of mind. If you look worried, they will worry. Tell them a story—anything to take their minds off themselves.

Linton, Ind. W. H. Luxton.

Severely Injured Should Be Rushed to the Hospital

It is not always advisable to hold a severely injured man at the mine until the arrival of the doctor. This might have been necessary in earlier days, but now almost every mine has a more or less competent first-aid organization. Injured men leave the mine today bandaged, splinted, attended for shock, and for transportation to the hospital.

Even though a perfect splint job is done on a broken pelvis, we are told that bladder punctures generally accompany the injury; that only in the first hour or so will an operation prove successful. In such cases, therefore, delay would be seriously detrimental by causing great loss of blood from inward bleeding. This does not mean that the injured man should not be treated before being sent to the hospital.

The 1930 revised edition of the first-aid manual put out by the U. S. Bureau of Mines, when mastered, will give the first-aid men a knowledge adequate to cover the scope of injuries most frequently occurring at the mines. Incidentally, first aid-men and equipment should be made as much a part of mining as any phase of the operation. And the foremen should be the leaders; if not they, who then?

Surely there are things a doctor can

do at the mine. His presence is worth much to an injured man, buoying his spirits and alleviating pain. But when all is said and done, the important work remains to be completed in the hospital.

Keeping up the courage of an injured person is largely a matter for the first-aid man's judgment. He should see that a friend of the injured is at hand, should watch his own attitude, and attempt to keep everything as normal as possible—the conversation, and general behavior of those assisting. Give the man a cigarette if he asks for one.

Every injury attracts the curious, but these can be quietly dispersed by an official of the company; the higher his authority, the better. Speaking of authority, first-aid men should be ranked according to their competence. This method avoids conflict of opinion at critical times and stimulates interest in first aid. Frank Stank.

Taylor Springs, Ill.

Plant Location Decides

This question of detaining an injured man at the plant for a doctor's examination depends on the location of the plant in reference to distance to a hospital, method of transportation, etc.; also availability of a doctor. When it is possible, as it is at the mine where I am now employed, the doctor should by all means give the man an examination before he is moved.

The number of times an injured man is sent direct to a hospital, after first aid is rendered, before he gets to a doctor, is seldom. But as one of the questions implies, adequate first aid has been rendered. Therefore it would be unkind to the man to cause him further pain through extra handling. However, I believe the doctor in most cases is able to make life just a little more pleasant to one who is injured.

To keep up his courage at times is difficult. As a rule, there is generally a close friend or relative at hand who can help a lot. After some particulars concerning the accident are learned, the injured should not be talked with further about his troubles, and his mind should be diverted. At plants where the company maintains a hospital, as at the mine where I am now employed, it is an easy task to keep the curious away, but at plants not so conveniently arranged, it is necessary to have some responsible person act as guard. Lloyd Bush.

Indianola, Pa.

A.B.C. Record of Yardage

Much time is spent running down old yardage marks for remeasurement when disputes arise. Almost invariably the settlement is a compromise. If the following system were followed, this trouble would be eliminated.

The yardage of each half month should be marked and indicated in alphabetical order. For instance, let the first measurement be *A*, and use this letter in the working place to indicate the yardage for that period. The yardage for the second period would be indicated by *B*, etc. A further refinement can be carried out by marking a blueprint by this alphabetical arrangement, indicating the date with each marking. Companies using the old method must readily see the advantage of the alphabet in overcoming an aggravating and costly problem. W. H. Luxton.

Linton, Ind.

Recent Patents

Slate Jig: 1,822,298. Stephen J. Kerrigan, Mahanoy Plane, Pa. Sept. 8, 1931.

Process and Mechanism for Separating Intermixed Divided Materials; 1,822,840. Kenneth Davis, Ebensburg, Pa., assignor to Peale-Davis Co., Wilmington, Del. Sept. 8, 1931.

Retreating Longwall Face Mining Machine: 1,824,727. A. M. Marion, Pittsburgh, Pa., and E. C. Gerry, Canonsburg, Pa. Sept. 22, 1931.

Blasting Cartridge, Percussion Cap, Detonator, Detonating Fuse: 1,824,848. Oldrich Turek, Pizen, Czechoslovakia. Sept. 29, 1931.

Miner's Cap: 1,824,840. John Ruffing, Sr., Nokomis, Ill., assignor of one-half to W. C. Argust, Taylorville, Ill. Sept. 29, 1931.

Mine Car: 1,824,841. Hugh W. Sanford, Knoxville, Tenn. Sept. 29, 1931.

Mining Machine: 1,824,953. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., Chicago. Sept. 29, 1931.

Mining Machine; 1,824,954. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., Chicago. Sept. 29, 1931.

Mining Machine; 1,824,965. Charles F. Osgood, Claremont, N. H., assignor to Sullivan Machinery Co., Chicago. Sept. 29, 1931.

Check Holder for Mine Dump Cars; 1,825,057. Joseph Dropulich, Houston, Pa. Sept. 29, 1931.

Mine Car Compressor: 1,819,710. Fred D. Holdsworth, Claremont, N. H., assignor to Sullivan Machinery Co., Chicago. Aug. 18, 1931.

Door Operating Mechanism for Dump Cars: 1,820,525. W. L. Burner, Columbus, Ohio, assignor to Western Wheeled Scraper Co., Aurora, Ill. Aug. 25, 1931.

Blasting Device: 1,820,566. David Hodge, Centralia, Ill., assignor to Safety Mining Co., Chicago. Aug. 25, 1931.

Mine Car: 1,809,707. George E. Jones, Jr., and P. S. McCallen, Knoxville, Tenn., assignors to Sanford Investment Co., Wilmington, Del. June 9, 1931.

System and Method of Hydraulic Mining; 1,810,571. H. L. Mead, Brewster, Fla., assignor to American Cyanamid Co., New York City. June 16, 1931.

Method of Carbonizing Coal: 1,810,828. Charles Hayes, Paris, France, assignor to Coal Carbonization Co., New York City. June 16, 1931.

Separating Jig: 1,811,756. Peter Maradeo, Nesquehoning, Pa. June 23, 1931.

Loading Machine: 1,811,927. Frank A. Halleck, Michigan City, Ind., assignor to Sullivan Machinery Co., Chicago. June 30, 1931.

Apparatus for Controlling Air in Dry Separating Tables; 1,812,071. Ray W. Arms, Chicago, assignor to Roberts & Schaefer Co., Chicago. June 30, 1931.

Publications Received

Re-treatment of Sayreton Jig Middlings on Coal-Washing Tables, by A. C. Richardson and B. W. Gandrud. R. I. 3,101; 5 pp., illustrated. Bureau of Mines, Washington, D. C. Gives results of treating jig middlings on a coal-washing table at the Bureau of Mines laboratory at Tuscaloosa, Ala.

The Overheating of Rubber-Sheathed Trailing Cables, by L. C. Ilsley and A. B. Hooker. R. I. 3,104; 10 pp., illustrated. Bureau of Mines, Washington, D. C.

The Pressures Produced on Blowing Electric Fuse Links: The Effect of the Surrounding Atmosphere, by G. Allsop and P. B. Smith. Safety in Mines Research Board, Paper No. 67; 19 pp. Price, 6d. net. H. M. Stationery Office, Adastral House, Kingsway, W.C. 2, London, England.

The Wasatch Plateau Coal Field, Utah, by Edmund M. Spieker. Bulletin 819; 210 pp., illustrated. Price, $1.30 (paper). U. S. Geological Survey, Washington, D. C. Covers a report of an investigation undertaken primarily for obtaining geologic and economic data required in administering coal provisions of the mineral leasing law, also to secure information on the general geology of the field.

Labor Agreements in Coal Mines, by Louis Bloch. Pp. 513. Russell Sage Foundation, New York City. A case study of the administration of agreements between miners' and operators' organizations in the bituminous coal mines of Illinois. Part I covers the agreement and its administration; Part II, the agreement interpreted in practice; Part III, enforcement.

Trade Literature

Bearing. Robins Conveying Belt Co., New York City—Bulletin No. 81, 11 pp., illustrated, describes Robins-Jones bearing.

Cars. Automatic and remote-control cars are illustrated and described in Bulletin No. 1,239, 11 pp., issued by Atlas Car & Mfg. Co., Cleveland, Ohio.

Car Spotters. Important features, dimensions, capacities, speeds, etc., for car spotters are covered in the 12-pp., illustrated, Book No. 1,292, issued by H. W. Caldwell & Son Co., Chicago.

Bearings. Aetna Ball Bearing Mfg. Co., Chicago—68-pp. catalog on ball thrust and radial roller bearings.

Pumps. The following catalogs have been issued by Worthington Pump & Machinery Corporation, Harrison, N. J.; Piston pumps, horizontal duplex, block valve type; specification sheet W-112-S12, 4 pp. Piston pump, horizontal duplex, type G.S.R.; specification sheet W-112-S14, 4 pp. Power pumps, horizontal triplex, single acting; specification sheet D-413-S1A, 4 pp. Power pumps, horizontal-duplex, double-plunger; specification sheet D-412-S3, 2 pp. Power pumps, horizontal duplex, piston pattern; specification sheet D-412-S2A, 4 pp. Centrifugal pumps, type W, multi-stage turbine; specification sheet W-319-S1, 4 pp. Centrifugal pumps, type D (Monobloc); specification sheet W-321-S1, 8 pp. Centrifugal pumps, type LL, single-stage volute; specification sheet W-312-S9, 4 pp. Centrifugal pumps, type U, three-stage volute; specification sheet W-318-S8, 4 pp.

Wiring Devices. Economy Electric Products Co., Chicago—16-pp. illustrated handbook of industrial wiring devices, featuring its Red Cap insulators.

Belts. Diamond Rubber Co., Inc., Akron, Ohio—Pp. 39, illustrated. Covers conveyor and elevator belt practice.

Valves. Chapman Valve Mfg. Co., Indian Orchard, Mass. Folder, illustrated, giving prices, weights, and description of forged esteel globe, angle, and check valves.

Shovel. Bucyrus-Erie Co., South Milwaukee, Wis. Pp. 24, illustrated. Describes the 32-B, 1-yard shovel, convertible into dragline, clamshell, or lifting crane, for gasoline, diesel, or electric power.

Electrical Equipment. General Electric Co., Schenectady, N. Y. GEA-77D; 20 pp., illustrated. Covers the application and design of Capacitors for power-factor correction.

Locomotives. General Electric Co., Schenectady, N. Y. Bulletin GEA-707C, 8 pp., illustrated, entitled "The Modernization of Mine Locomotives," includes brief descriptions of modern devices and parts, also alterations in locomotive equipment.

Pipe Fittings. Bonney Forge & Tool Works, Allentown, Pa. Bulletin WT-12; 8 pp., illustrated. Describes the uses of Weldolets and Thredolets.

Chain Drives. Morse Chain Co., Ithaca, N. Y. Pp. 56, illustrated. Gives complete data on its silent-chain stock drives, including information on the selection of drives, prices, etc.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Fan Signal Works by Pressure Less Than 0.2 Inch

WHEN the Union Pacific Coal Co. ordered a signal to be placed on the ventilating fan at each of its mines, no particular device was specified other than that it function positively and satisfactorily. Prior to the general order the Hanna mines had tried several types of signals, including electric blinkers attached to prime movers and signals operated by fan pressure. However, none of these was entirely satisfactory, their weakness lying in mechanical defects. Positive operation was particularly difficult on fans of low water gage.

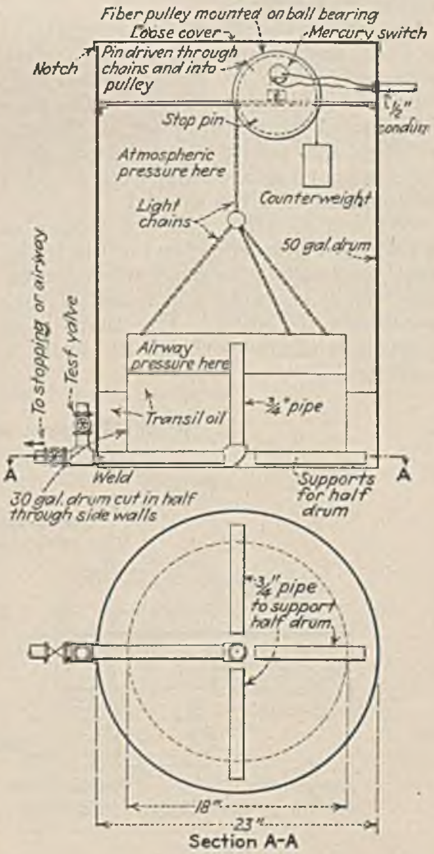
All these troubles, writes E. R. Henningsen, chief electrician of the Hanna group, have been eliminated by a signal which functions positively on pressure far less than 0.2 in. water gage, as a result of increasing the area of certain parts. The principle of the apparatus is similar to that of the simple U-tube water gage, the air space in the large drum used being equivalent to the open end of the U-tube.

The chief mechanical element is a 50-gal. oil drum, with a vertical ¾-in. pipe fastened in the bottom and leading to the airway, as the sketch shows; over this pipe, half a 30-gal. drum is suspended in an inverted position by a small chain which passes around a grooved fiber pulley fixed in the top of the drum. Sufficient counterbalance is fastened to the other end of the chain to raise the small drum until the stop pin prevents further travel.

A small pin driven through the chain and into the pulley eliminates slipping. A mercury contact switch is mounted on the side of the pulley. The space inside the small drum is sealed from atmospheric pressure by enough transil oil to cover the lower edge of the drum about 1 in. at the upper limit of travel.

If water is used instead of oil, the difference between the height of the water inside the small drum and the height of water outside would be the same as the difference between the water columns in the two legs of the U-tube water gage.

Operates on Principle of U-Tube But in a Big Way



Section A-A

Therefore the small drum will have a pressure exerted on it, in pounds, equal to the weight of the differential volume of water inside the small drum—that is, the volume above the water level outside. Oil is used simply to avoid freezing in the winter months.

When the space above the oil inside the small drum is subjected to the pressure of the airway, there is exerted through the ¾-in. pipe a pressure on the top of the small drum tending to raise the counterbalance. This pressure is the weight of the atmosphere which enters the large drum through the notch under the cover, and is ample to push down the small drum, raising the counterbalance and causing the pulley to revolve until the mercury contact switch is in open position. When at the bottom of its travel the small drum rests on supports which keep it level.

Resistance Meter Is Aid to Electrical Maintenance

In too many instances the maintenance departments of large coal companies are without proper instruments for determining the condition of the insulation of electrical equipment and wiring. When there is no knowledge of weakening insulation the result is a breakdown which may impose a serious operating delay.

Although a d.c. voltmeter can be used to measure resistance, this method has so many limitations and disadvantages that it is seldom used for making regular tests of insulation resistance. An ohm-meter of the type comprising a hand-driven d.c. generator, combined perhaps with a Wheatstone bridge, is the instrument required. These are known by manufacturers' trade names such as Megohmer, Meg Tester, Bridge-Megger, and so on.

These names come from the prefix "mega" denoting a million, or from the resistance unit "megohm," which is 1,000,000 ohms. Ordinarily the insulation resistance of circuits and machines in good condition is well above 1 megohm and may be far above 100 megohms; consequently the megohm is the unit commonly used in tests of this character.

Intelligent use of the instrument depends on a knowledge of factors which affect the readings. For a given insulating material the resistance varies directly as the thickness and inversely as the area. Of two machines having insulations of the same character and thickness the larger machine can be expected to have a lower resistance.

A very small quantity of moisture may be the reason for abnormally low readings. A motor which, during normal operation, has an insulation resistance of 150 megohms may drop to a few megohms upon standing idle several days in a damp room. Temperature of the insulation also has a marked effect on the resistance.

By making regular tests on equipment and recording these with proper notations as to temperature and other governing factors, data are soon accumulated which become an indispensable guide in the interpretation of insulation resistance values.

With the bridge attachment the instrument can be used also for accurate measurement of low- or high-resistance conductor circuits. For instance, it provides a means of checking individual field coils of d.c. generators and motors. Many other uses, such as determining the condition or specification of a resistor, present themselves as the electrician becomes familiar with the instrument.

For general use in maintenance of mining equipment it is preferable to select an instrument having a 500-volt generator. Lower and higher voltages are available, but 500 volts serves best for all-purpose testing.

Saving Effort

Just how much value have the operating ideas appearing regularly in these pages?—Mining men who are inclined to annex a question mark to this mental query should, for their own good, pause and analyze. As individuals they frequently meet up with problems which they solve by dint of brain-racking and trial methods. Should these doubters glean the back issues of *Coal Age,* they would save themselves much effort, in a process which would be reassuring and suggest a host of other improvements. Incidentally, contributed ideas are paid for liberally, $5 or more for each one accepted. The ideas should be illustrated by sketch or photograph.

Safety Gate Is Interlocked With Refuse Feeder

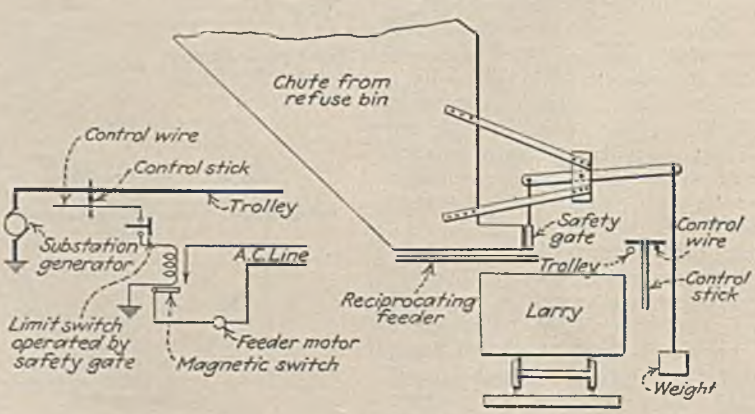
Recent improvements at a shaft mine in the Appalachian region included the purchase of a low-cab 30-ton electric "Differential Steel" refuse car and a 15-ton trailer. Although the refuse loading chute was equipped with a horizontal reciprocating feeder which extends and discharges several feet beyond the side of the chute, it was found that there was some chance of material dropping to the ground when the larry was away from the loading terminal and the feeder stopped. A safety gate was added and an electric interlock arranged with the feeder starting equipment.

As indicated by the accompanying drawing, the feeder is started by the larry operative without his getting out of the cab. He carries a control stick made of insulating material and topped with a bar of metal. To start the feeder he takes this stick, reaches out of the cab window and hangs the stick across the trolley wire and a small control wire which parallels it for about 75 ft. at the loading terminal. This makes a d.c. connection through a solenoid coil which closes an a.c. contactor and starts the feeder.

In the d.c. control circuit, however, is a limit switch operated by the safety gate and having its contact closed only when the safety gate is open. This gate is operated by reaching out of the cab window and pulling up or down on a rope supporting a counterweight which is hung close to the ground.

Without a safety gate the danger of a rock falling from the end of the feeder was practically nil except when the refuse bin was empty and a car of rock was dumped into it. The chute is in a location where workmen are likely to walk under it.

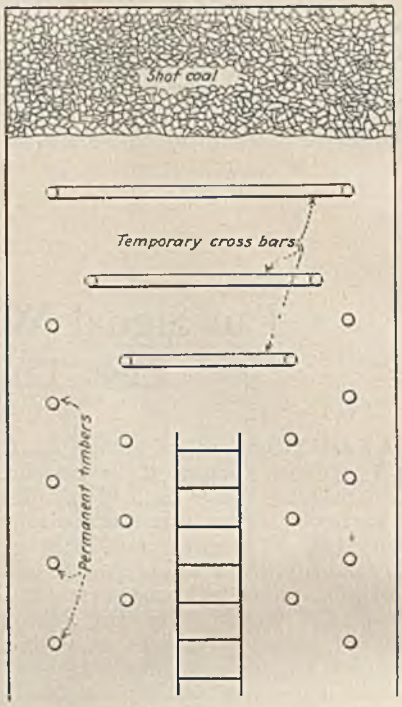
Wiring Diagram and Operating Scheme



Machine Loading Under Loose Roof Aided by "V" Timbering

For machine loading in rooms where close timbering is required, the "V" timbering method can be used to advantage. This scheme provides ample room for safely maneuvering the machine about the face, without reducing the output of the unit, says K. E. Caine, mining engineer, Joy Mfg. Co.

As shown in the sketch, the crossbars are set temporarily in such manner as to allow the loading unit to reach each corner of the place. Either light H-beams or new rail should be used for the crossbars. After the cut has been loaded out, permanent timbers can be set and the temporary crossbars taken down and moved forward.



"V" Method of Face Timbering

At one operation in Pennsylvania, light screw jacks are used to support these cross members. Their use simplifies the operation of moving forward.

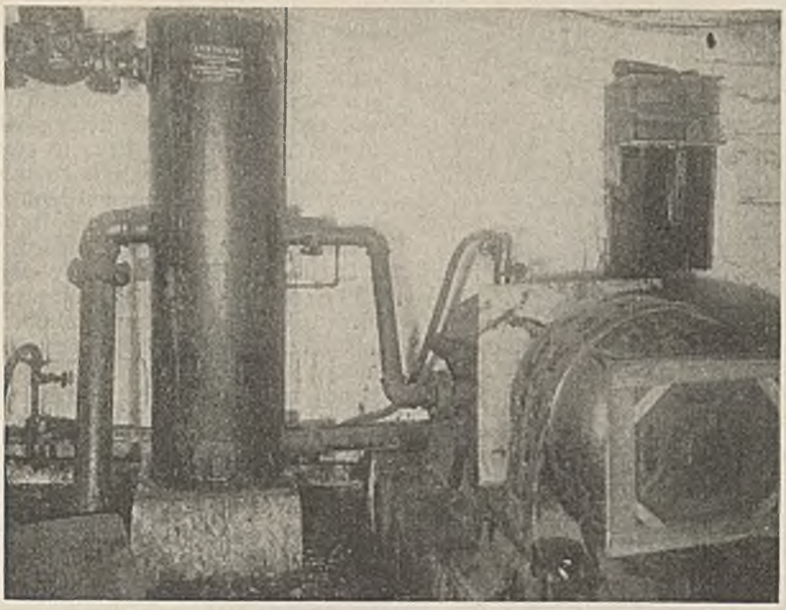


Fig. 1—Automatic Primer in Use at Valier Mine

Storage in Suction Provides Automatic Priming

Simplicity is the outstanding feature of the tank storage method of automatic priming. There are variations in design but the principle of operation in every case remains the same. Fig. 1 is from a recent photograph of an installation which has been in use about three years at the bottom of the auxiliary shaft at Valier, Ill.

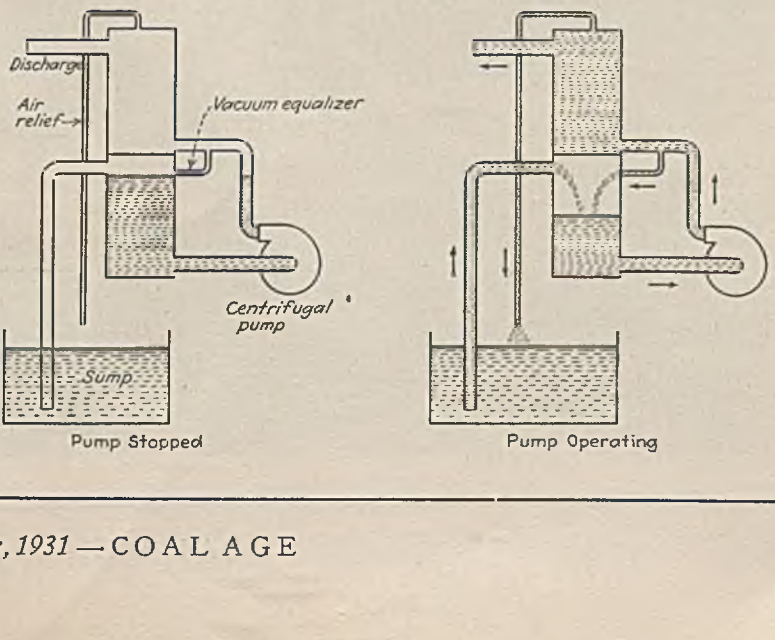
As detailed in Fig. 2, the primer consists of a two-compartment tank the bottom half of which is connected in series with the suction line and the top half in series with the discharge. A small pipe, which is without valves and is termed the air relief, discharges to the sump but does not have the end submerged. The vacuum equalizer is another small pipe installed where accessible for cleaning, but in effect acting like a small hole in the partition between compartments of the tank.

Upon starting the pump, lowering of the water level in the bottom compartment creates sufficient vacuum, or, more properly speaking, reduces the tank pressure sufficient to start flow from the sump. After the pump stops, water from the upper compartment fills the lower ready for the restart. Volume of the tank, and length, volume, and head of the suction line must be in proper engineering proportions.

No foot valve is needed in the sump and no check valves should be installed between the pump and priming tank. A check valve can be installed in the main discharge line if desired. If the water is reasonably clean the air relief pipe can be replaced by an automatic air relief valve, which will save the small circulation loss.

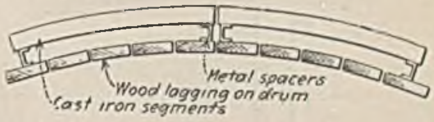
The installation pictured is of an Apco primer of the Automatic Primer Co., Chicago, working with a Fairbanks-Morse pumping unit consisting of a 60-hp., 3,600-r.p.m., ball-bearing motor driving a 100-g.p.m. two-stage pump.

Fig. 2—The Primer Includes No Moving Parts



Spacers Reduced Heating of Brake on Incline Drum

Destructive heating of brakes on wood lagged drums of self-acting car and monitor planes is a problem as old as the extensive use of wire rope in mining, but one that has been intensified at certain mines by the speeding up of operations. Recently two companies operating in southern West Virginia eliminated the trouble by providing for air circulation under the brake segments. The method used is illustrated in



Arrangement to Allow the Escape of Heat

principle in the accompanying sketch. Instead of the segments resting directly on the wood lagging, with but slight dissipation of heat from the bottom by radiation and conduction, spacers of cast iron or steel were installed to elevate the segments and thereby provide an air circulation space of 2 in. or so between the segment and lagging.

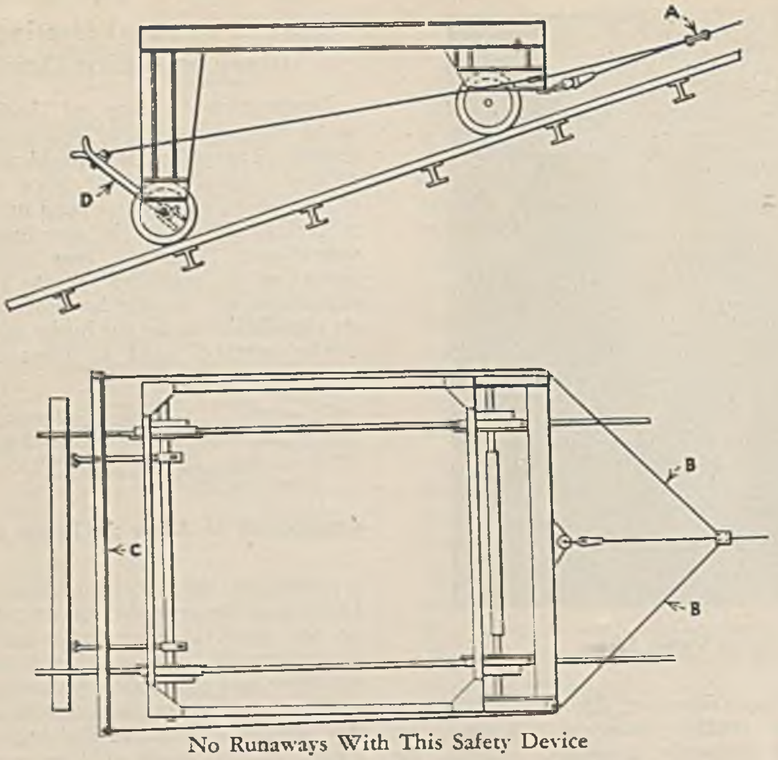
Broken Rope Sets Sprags On Incline Car

Some sort of reliable stop device should be provided which would function to arrest the running away of tram cars in the event the rope broke on slope or incline. Perhaps the most common of all simple mechanisms for this purpose is the trailing sprag. Two characteristics of this arrangement condemn its use. One is that the sprag, in trailing, bumps and clanks on the track bed. The other is that the sprag must be lifted, and therefore is inoperative in the descent.

W. J. Leonard, North Broomhill, Morpeth, England, describes a design in which the sprag never touches the ground unless the pull rope breaks. The sprag is equally effective whether the equipment is traveling up or down the slope.

It will be seen from the sketch that the car is attached centrally to the pull rope, and that at a distance of about a yard from the socket clamp *A* is attached. From this clamp two ropes, *B*, of lighter section than the main rope, diverge and pass around each side of the car to an angle bar, *C*, at the rear. Two sprag or catch bars mounted loosely to the rear axle are bolted to this angle bar.

When the pull rope is in tension, the sprag bars remain in an upraised position. But should this rope break at any point in its length, the sprag bars, by reason of their weight, will fall, dig into ties, and stop the car. The angle bar is purposely made longer than the track gage so that it will slide on the rail



No Runaways With This Safety Device

until a tie is encountered. It is important, naturally, that all the secondary fastenings be of sufficient strength to take the weight of the car should the main socket be drawn or should the rope break near this socket.

Contactor Heat Due to Poor Insulation of Iron

Overheating or burning of the holding coil of an a.c. control contactor is likely to be attributed to improper coil design or to abnormal voltage when the real trouble may be in the magnetic circuit of the contactor. This difficulty, or any other that involves overheating, of course, is not likely to occur with any except line contactors or others which are held closed for long periods.

Any mechanical disarrangement which prevents complete closing of the armature and holds an air gap in the magnetic circuit will cause an increase in holding coil current. Such a condition, however, is easily detected by ordinary inspection. Another cause which may be baffling when encountered for the first time, is eddy currents in the laminated magnetic circuit or in the clamps or bolts which tie the laminations together. The contactor then assumes the rôle of a transformer. The current in the holding coil, which becomes the primary of the transformer, increases in proportion to the current circulating through the iron or bolts constituting a secondary.

A recent case in illustration arose at an automatic substation supplying a bituminous mine. The line contactor holding coil developed overheating which finally became so severe that a new coil had to be installed every few weeks. The whole contactor heated and the laminations changed from the characteristic black to a rusty red color. During the trouble a maintenance man tightened two bolts that pass through matched holes in the armature laminations. These bolts, which hold the laminations together, appeared to have loosened an unusual amount due to the heating.

Later it was noted that on a similar contactor which was not heating there are fiber washers under the heads and nuts of the armature lamination clamping bolts. Apparently due to heat those on the other contactor had disintegrated and worn away. This left the bolts loose, and the subsequent tightening without insulation caused the bolts to complete a circuit including the side laminations. That effect and the tight contact of laminations on which the insulating paint had burned off provided lower resistance paths for the eddy currents, and resulted in a coil load increase sufficient to cause frequent burn-outs.

What started the early stages of overheating is not known. The proper remedy in such a case, however, is to take the laminations apart, paint them, and properly insulate the clamping bolts.

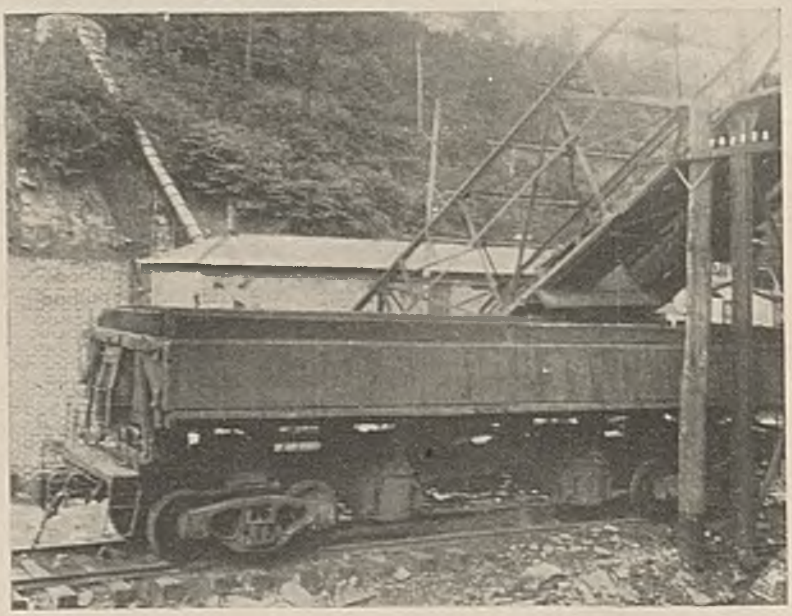
Railroad Is Commissioned to Dispose of Mine Refuse

In mountainous districts where refuse dumping space is seldom available close to the tipple, usual methods of disposal entail a large investment and require the services of at least one man. At No. 2 mine of the C. H. Mead Coal Co., Eastgulf, W. Va., mine rock is wasted with equipment representing a nominal investment and without the services of an operative.

The equipment consists of a standard-gage railroad dump car of large capacity. This is spotted on a track beneath an inclined trestle leading from the slope portal to a coal dump in the top of the tipple. Rock is dumped through a hole in this trestle and directly into the railroad dump car. When the car is filled the railroad company pulls it away and dumps the material along fills where space is available and it is desirable to have more material.

The dump car is of the air-operated type and has a body capacity for approximately 80 tons of mine rock.

Dump Car Spotted Under Haulage Trestle



WORD from the FIELD

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations in November are as follows:

LINTON-SUMMIT COAL Co., Terre Haute, Ind.; contract closed with the McNally-Pittsburg Mfg. Corporation for preparation plant to be installed at a new mine. Lump and egg will be handpicked, while the 3 in. x 0 coal will be cleaned in a Norton washer and later separated into two sizes of nut and one size of slack. Capacity of the plant is 250 tons per hour, and the capacity of the Norton washer is 150 tons per hour. Facilities will be installed for mixing the sizes, and also for crushing when necessary. The larger sizes will be loaded over four loading booms.

REPPLIER COAL Co., Buck Run, Pa.; contract closed with the Hydrotator Co. for the installation of a Hydrotator to clean 20 tons per hour of barley coal.

REPUBLIC STEEL CORPORATION, Sayreton, Ala.; rewashing plant with a capacity of 170 tons per day now in operation. The washery consists of a Type "S," Model 31, single-compartment Montgomery jig equipped with pan feeder, automatic slate gate, water control, tanks, bins, and elevators. Capacity of the auxiliary equipment has been increased to allow installation of a second jig if needed. Feed is the undersize from a screen with ¾-in. square holes. This screen handles the middlings and refuse from the primary jigs.

SUSQUEHANNA COLLIERIES Co., Glen Lyon, Pa.; contract closed with the Hydrorator Co. for the installation of a Hydrotator to clean 15 tons per hour of No. 3 buckwheat.

Kansas Boosts Its Coal

Production and utilization of Kansas coal was the theme of a two-day meeting at the University of Kansas, Lawrence, Nov. 20-21. Papers dealt with the mining and preparation of coal within the state, the use of Kansas coal in industrial and home heating, comparisons between Kansas coal and that from other states, and the use and servicing of heat regulators and stokers.

Formation of a permanent organization to carry on the work of expanding the use of Kansas coal took place on Nov. 10 at a conference between Governor Woodring and representatives of the operators, miners, and the public. K. A. Spencer, Pittsburg, Kan., Pittsburg & Midway Coal Mining Co., was appointed chairman of the general committee in charge of the campaign. Other members are: Henry Allai, District 14, United Mine Workers, Pittsburg, and Harry Turner, National Retail Coal Merchants' Association, Topeka.

Box-Car Shipments Started

Two southern Illinois producers, the Old Ben Coal Corporation and the Bell & Zoller Coal & Mining Co., announced the inauguration of box-car shipments on Nov. 13, and it is expected that other companies will follow the plan. The step was taken, it is reported, to satisfy the demands of certain retailers, particularly in the Northwest, for coal in smaller quantities, and to prevent pilferage en route. Egg, nut, and stove will be shipped by Old Ben, while the Bell & Zoller company has provided facilities for dispatching all sizes.

Coal Production Off

Bituminous coal production, hampered by warm weather, dropped to 30,200,000 net tons in November, according to preliminary figures compiled by the U. S. Bureau of Mines. The output in October was 35,700,000 tons, while the total for November 1930, was 38,122,000 tons. Anthracite production is estimated at 4,140,000 net tons in November, against 6,551,000 tons in October, and 5,116,000 tons in November, 1930.

Total production of bituminous coal for the year to Nov. 28 was 346,415,000 tons, against 420,013,000 net tons in the same period in 1930 and 484,091,000 tons in 1929. Anthracite production for the first eleven months of this year amounted to 54,859,000 tons, against 62,713,000 tons in the same months in 1930.

Bituminous Coal-Mining Deficit Decreases in 1929

Bituminous coal mining companies showed a decrease of 45 per cent in net loss in 1929, as compared with the total for the preceding year, according to figures released Nov. 30 by the Bureau of Internal Revenue. For the industry as a whole, there was a net deficit of $11,303,853 in 1929; income tax payments totaled $3,940,062, bringing the aggregate loss up to $15,243,915 for the year. The deficit of the industry in 1928 was $24,508,330, and income tax payments amounted to $3,441,860, bring the total up to $27,950,190.

Companies mining coal, lignite, and peat totaled 2,342 in 1929, against 2,705 in 1928. A total net income of $39,396,569 was reported by 905 companies in 1929, while 1,437 showed an aggregate loss of $50,700,422. There were 162 inactive companies. In 1928, 863 companies showed a total net profit of $33,477,073, and 1,842 reported an aggregate deficit of $57,985,403.

To Cooperate With Utilities

Cooperation between public utilities and the bituminous coal industry will be fostered by a committee of the National Coal Association, named by C. E. Bockus, president, early in December. The personnel of the committee is as follows:

H. E. Howard, chairman, Pyramid Coal Corporation, Chicago; O. L. Alexander, Pocahontas Fuel Co., New York City; George J. Anderson, Consolidation Coal Co., New York City; James Bonnyman, Blue Diamond Coal Co., Cincinnati, Ohio; C. A. Cabell, Carbon Fuel Co., Charleston, W. Va.; J. R. Crowe, Reliance Coal Corporation, Kansas City, Mo.; Henry T. DeBardeleben, DeBardeleben Coal Corp., Birmingham, Ala.; R. H. Knode, Stonega Coke & Coal Co., Philadelphia, Pa.; George H. Love, Union Collieries Co., Pittsburgh, Pa.; E. C. Mahan, Southern Coal & Coke Co., Knoxville, Tenn.; Charles O'Neill, Peale, Peacock & Kerr, Inc., New York City; J. W. Searles, Pennsylvania Coal & Coke Corporation, New York City; R. H. Sherwood, Central Indiana Coal Co., Indianapolis, Ind.; George K. Smith, Sunday Creek Coal Co., Columbus, Ohio, and F. H. Woods, O'Gara Coal Co., Chicago.

District Sales Agencies and Mergers Proposed To Stabilize Bituminous Industry

DISTRICT sales agencies in each of the bituminous coal-producing districts of the country and consolidation of the coal properties in each of these regions were among the measures for the stabilization of the bituminous coal industry approved by a committee of National Coal Association directors (formed to consider measures for rehabilitating the industry) at a meeting in New York City, Dec. 3. The general resolution containing these recommendations, which was introduced by C. C. Dickinson, president, Dickinson Fuel Co., Charleston, W. Va., and passed unanimously, outlined the situation in the industry as follows:

It is the sense of this committee that the underlying cause of the existing unsatisfactory condition in the coal industry is the high delivered cost of coal, notwithstanding the low mine price. This high delivered cost of coal results in the substitution of oil, gas, and water power for millions of tons of coal, as well as in heavy capital expenditures in order to effect combustion economies.

To meet this situation the committee recommended: The formation of central sales agencies; physical consolidation of properties; passage of a tariff that will prevent the continued displacement of coal and of American labor by the importation of foreign oil; reduction of freight rates; promotion of the program of The Committee of Ten—Coal and Heating Industries; continuation of the special sub-committee of fourteen which formulated the report on physical mergers and central sales agencies.

Committees were named by Chairman J. G. Bradley, president, Elk River Coal & Lumber Co., Dundon, W. Va., to promote the organization of sales agencies or mergers in the various districts. The personnel of the organization committees is as follows:

Harlan District (Kentucky)—R. C. Tway, R. C. Tway Coal Co., Louisville, Ky.; D. B. Cornett, Cornett-Lewis Coal Co., Louisville, Ky.; W. J. Cunningham, Crummies Creek Coal Co., Crummies, Ky.; S. J. Dickenson, Mary Helen Coal Corporation, Coalgood, Ky.; B. W. Whitfield, Harlan Collieries Co., Brookside, Ky.

Hazard District (Kentucky) — Irvin Davis, Hatfield-Campbell Creek Coal Co., Cincinnati, Ohio; James Bonnyman, Blue Diamond Coal Co., Cincinnati, Ohio; J. H. Bowling, Crawford Coal Corporation, Lexington, Ky.; W. E. Davis, Davis Collieries Co., Lexington, Ky.; John P. Gorman, John P. Gorman Coal Co., Lexington Ky.

Southern Appalachian District (Tennessee and Kentucky)—J. E. Butler, Stearns Coal & Lumber Co., Stearns, Ky.; E. C. Mahan, Southern Coal & Coke Co., Knoxville, Tenn.; Chas. M. Moore, Moore Coal Co., Knoxville, Tenn.

West Kentucky—C. F. Richardson, West Kentucky Coal Co., Sturgis, Ky.; Brent Hart, Hart Coal Corporation, Mortons Gap, Ky.; Monro B. Lanier, Monro-Warrior Coal & Coke Co., Birmingham, Ala.; C. M. Martin, Greenville Coal Co., Greenville, Ky.

Big Sandy District (Kentucky)—A. D. W. Smith, North-East Coal Co., Philadelphia, Pa.; J. Noble Snider, Consolidation Coal Co., New York City; C. W. Watson, Elk Horn Coal Corporation, Fleming, Ky.

Indiana—Homer B. Talley, Coal Bluff Mining Co., Terre Haute, Ind.; Geo. A. Enos, Enos Coal Mining Co., Cleveland, Ohio; H. M. Ferguson, Ferguson Coal Co., Clinton, Ind.; David Ingle, Ingle Coal Co., Evansville, Ind.; R. H. Sherwood, Central Indiana Coal Co., Indianapolis, Ind.

Alabama—M. W. Bush, Alabama By-Products Corporation; A. B. Aldridge, Southeastern Fuel Co.; C. S. Bissell, Black Diamond Coal Mining Co.; H. M. Brooks, Alabama Fuel & Iron Co.; H. T. DeBardeleben, DeBardeleben Coal Corporation; D. A. Thomas, Montevallo Coal Mining Co.; S. L. Yerkes, Grider Coal Sales Agency; all of Birmingham, Ala.

West Virginia Smokeless District—T. B. Davis, Island Creek Coal Co., New York City; O. L. Alexander, Pocahontas Fuel Co., New York City; C. E. Dunlap, Berwind-White Coal Mining Co., New York City; R. H. Gross, New River Co., Boston, Mass.; R. H. Knode, Stonega Coke & Coal Co., Philadelphia, Pa.; J. P. Williams, Jr., Koppers Coal Co., Pittsburgh, Pa.

Kanawha District (West Virginia)—C. A. Cabell, Carbon Fuel Co., Charleston, W. Va.; Wm. J. Clothier, Boone County Coal Corporation, Philadelphia, Pa.; Irvin Davis, Hatfield-Campbell Creek Coal Co., Cincinnati, Ohio; C. C. Dickinson, Dickinson Fuel Co., Charleston, W. Va.; C. R. Moriarty, Cabin Creek Consolidated Coal Co., Cincinnati, Ohio; L. M. Webb, Webb Coal Mining Co., Cincinnati, Ohio.

Logan (West Virginia)—J. D. Francis, Island Creek Coal Co., Huntington, W. Va.; John C. Cosgrove, West Virginia Coal & Coke Co., Johnstown, Pa.; H. E. Jones, Logan County Coal Corporation, Charleston, W. Va.

Williamson (West Virginia and Kentucky)—W. M. Ritter, Red Jacket Consolidated Coal & Coke Co., Washington, D. C.; G. S. Patterson, Sycamore Coal Co., Huntington, W. Va.; W. A. Richards, Majestic Collieries Co., Bluefield, W. Va.; E. M. Tierney, Sharon Coal & Coke Co., Washington, D. C.

Northern West Virginia—C. H. Jenkins, Hutchinson Coal Co., Fairmont, W. Va.; H. L. Findlay, Simpson Creek Collieries Co., Cleveland, Ohio; Robert C. Hill, Consolidation Coal Co., New York; John M. Jamison, Jamison Coal & Coke Co., Greensburg, Pa.; Edward Page, New England Coal & Coke Co., Boston, Mass.; E. H. Reppert, Reppert Coal Co., Flemington, W. Va.

Southwest Virginia—D. D. Hull, Jr., Virginia Iron, Coal & Coke Co., Roanoke, Va.; C. E. Bockus, Clinchfield Coal Corporation, New York City; R. S. Graham, Wise Coal & Coke Co., Norton, Va.; Calvin Holmes, Holmes-Darst Coal Co., Cincinnati, Ohio; Arlo Pardee, Blackwood Coal & Coke Co., Philadelphia, Pa.; R. E. Taggart, Stonega Coke & Coal Co., Philadelphia, Pa.

Marking the center of population of the United States, a monument of coal blocks has been erected at Linton, Ind., and dedicated by Governor Harry Leslie. Linton marks the latest point in the westward movement of the center of population across Indiana. Bloomington was the center in 1910 and Spencer held the honor in 1920.

Ohio—H. L. Findlay, Youghiogheny & Ohio Coal Co., Cleveland, Ohio; F. W. Braggins, Lorain Coal & Dock Co., Columbus, Ohio; C. H. Bromley, United States Coal Co., Cleveland, Ohio; Wm. Collins, Hanna Coal Co., Cleveland, Ohio; Wm. Emery, Jr., Cambridge Collieries Co., Cleveland, Ohio; Fred Essex, Essex Coal Co., Columbus, Ohio; George M. Jones, Ohio Collieries Co., Toledo, Ohio; J. C. Nelms, Ohio & Pennsylvania Coal Co., Cleveland, Ohio; George K. Smith, Sunday Creek Coal Co., Columbus, Ohio; John A. Teegarden, New York Coal Co., Columbus, Ohio; Whitney Warner, Warner Collieries Co., Cleveland, Ohio.

Illinois—D. W. Buchanan, Old Ben Coal Corporation, Chicago; George B. Harrington, Chicago, Wilmington & Franklin Coal Co., Chicago; W. J. Jenkins, Consolidated Coal Co. of St. Louis, St. Louis, Mo.; W. K. Kavanaugh, Southern Coal, Coke & Mining Co., St. Louis, Mo.; Rice Miller, Hillsboro Coal Co., Hillsboro, Ill.; T. C. Mullins, Northern Illinois Coal Corporation, Chicago; George W. Reed, Peabody Coal Co., Chicago; F. H. Woods, Pres., O'Gara Coal Co., Chicago.

Freeport Thick Vein District (Pennsylvania)—Geo. H. Love, Union Collieries Co., Pittsburgh, Pa.; J. B. Ford, Ford Collieries Co., Detroit, Mich.; C. F. Hosford, Jr., Butler Consolidated Coal Co., Butler, Pa.

Western Pennsylvania—J. D. A. Morrow, Pittsburgh Coal Co., Pittsburgh, Pa.; H. F. Bovard, Keystone Coal & Coke Co., Greensburg, Pa.; W. M. Henderson, Henderson Coal Co., Pittsburgh, Pa.; Ralph Jamison, Jamison Coal & Coke Co., Greensburg, Pa.; E. B. Leisenring, Westmoreland Coal Co., Philadelphia, Pa.; F. B. Lockhart, Hillman Coal & Coke Co., Pittsburgh, Pa.; H. L. Findlay, Youghiogheny & Ohio Coal Co., Cleveland, Ohio; M. W. McClane, McClane Mining Co., Pittsburgh, Pa.; Scott Stewart, W. J. Rainey, Inc., New York; J. T. M. Stoneroad, Carnegie Coal Corporation, Pittsburgh, Pa.; F. E. Taplin, North American Coal Corporation, Cleveland, Ohio.

Central Pennsylvania—B. M. Clark, Rochester & Pittsburgh Coal Co., Indiana, Pa.; L. G. Ball, Heisley Coal Co., Philadelphia, Pa.; G. Dawson Coleman, Ebensburg Coal Co., Philadelphia, Pa.; J. F. Macklin, Monroe Coal Mining Co., Philadelphia, Pa.; W. A. Marshall, W. A. Marshall & Co., New York; L. C. Madeira, III, Madeira, Hill & Co., Philadelphia, Pa.; Chas. O'Neill, Peale, Peacock & Kerr, Inc., New York; C. A. Owen, Imperial Coal Corporation, New York; J. W. Searles, Pennsylvania Coal & Coke Corporation, New York, H. C. Voorhees, Madeira, Hill & Co., Philadelphia, Pa.

Colorado and New Mexico—Douglas Millard, Colorado Fuel & Iron Co., Denver, Colo.; H. C. Marchant, Pinnacle-Kemmerer Fuel Co., Denver, Colo.; B. W. Snodgrass, Victor-American Fuel Co., Denver, Colo.

Utah—John B. Marks, Independent Coal & Coke Co., Salt Lake City, Utah; Otto Herres, United States Fuel Co., Salt Lake City, Utah; L. R. Weber, Liberty Fuel Co., Salt Lake City, Utah.

Washington—N. D. Moore, Pacific Coast Coal Co., Seattle, Wash.; E. P. Lucas, Bellingham Coal Mines, Seattle, Wash.

Montana—Forrest Richardson, Roundup Coal Mining Co., Omaha, Neb.; F. W. C. Whyte, Anaconda Copper Mining Co., Anaconda, Mont.

Southern Wyoming—T. J. O'Brien, Gunn-Quealy Coal Co., Salt Lake City, Utah. L. T. Dee, Lion Coal Co., Ogden, Utah.

Northern Wyoming—Michael Gallagher, Sheridan-Wyoming Coal Co., New York; R. J. Ireland, Owl Creek Coal Co., Amityville, N. Y.

Kansas, Missouri, Arkansas, and Oklahoma—Ira Clemens, Commercial Fuel Co., Pittsburg, Kan.; J. R. Crowe, Crowe Coal Co., Kansas City, Mo.; Grant Stauffer, Majestic Coal Mining Co., Kansas City, Mo.

The report of the special committee which drew the plan for central sales agencies; the opinion of William J. Donovan, former Assistant Attorney General, on the legality of the proposed sales agencies and consolidations; the contract form to be entered into by the district sales agencies and the individual coal producers; and the contract form to be entered into by the agencies and their sub-agents have been embodied in a pamphlet issued by the National Coal

Terre Haute Men Hold Safety Banquet

Four hundred coal and safety men attended the first safety banquet of the Terre Haute (Ind.) Mine Foremen's Club and Safety Council, held in that city on Nov. 7. Addresses on safety were given by Harvey Cartwright, secretary, Indiana Coal Operators' Association, Terre Haute; Francis Feehan, U. S. Bureau of Mines, Pittsburg, Kan.; J. L. Thompson, safety engineer, Chicago, Milwaukee, St. Paul & Pacific Ry.; John Kennedy, safety engineer, National Coal Association, Washington, D. C.; and H. P. Dutton, associate editor, "Factory and Industrial Management," Chicago. James H. Needhammer, president of the club and general superintendent, Jackson Hill Coal & Coke Co., Terre Haute, presided.

Association, copies of which may be obtained from the offices of the association in Washington, D. C.

The National Retail Coal Merchants' Association, through Milton E. Robinson, Jr., president, and Frank E. Carey, chairman of the bituminous relations committee, indorsed the district selling agency plan on Dec. 4 as a means of securing "orderly marketing and the stabilization of the industry" pending the consummation of consolidations of physical properties.

No action was taken at a meeting of representatives of the eight principal coal-producing states east of the Mississippi, held in Cincinnati, Ohio, Nov. 20, to consider ways and means of stabilizing the bituminous industry with the assistance of the governors of the states.

The Pennsylvania committee appointed by Governor Pinchot on Oct. 30 to further rehabilitation of the industry in Pennsylvania met several times in November to consider various proposals, but took no action on the adoption of any one. However, a bill sponsored by the Governor, and providing for the appointment of a commission of five members to confer with similar commissions appointed by the governors of other coal-producing states for the negotiation of a contract to reduce waste was introduced in the Pennsylvania Legislature on Nov. 9.

Passage of the Watson bill was urged as a means of stabilizing the bituminous industry by John L. Lewis, president, United Mine Workers, Dec. 4, at a meeting of the subcommittee of the U. S. Senate Committee of Manufactures investigating the formation of national economic council for business, as proposed in a bill by Senator La-Follette, Wisconsin.

Rationalization of the bituminous industry by setting up a gage to measure the natural survivors among the present operating companies and by the appointment of district, state, and national control boards was proposed by Ralph N. Harris, industrial engineer, before the meeting of the West Virginia Coal Mining Institute, held in Wheeling, W. Va., Nov. 27-28. Mr. Harris' analysis of the present-day situation, together with the remedies he proposes, are set forth on page 619 of this issue of *Coal Age*. At the Third International Conference on Bituminous Coal, held in Pittsburgh, Pa., in November, a committee was appointed to consider the various stabilization plans which have been offered in the past few years. This committee's recommendations are given in detail on page 614 of this issue.

New Size Offered in Illinois

Southern Illinois producers early in November introduced a new domestic size in an endeavor, according to reports, to obtain a larger share of the increasing business in the low-price class. The new size is a 2-in. lump, and is made by combining the regular 6-in. lump, 6x3-in. egg, and 3x2-in. nut after screening and cleaning.

To Push New Depletion Rules

Liberalization of the provisions of the Internal Revenue Act relating to the depletion allowance of bituminous mining properties will be actively sought in the coming session of Congress by the National Coal Association, according to a resolution of the tax and cost-accounting section approved by the board of directors. The resolution is as follows:

Resolved, That it be the sense of this meeting that every effort be made to secure a rate for depletion for coal mines of 33⅓ per cent of the net income before depletion; *provided*, that such depletion allowance shall not be less than 5 per cent of the gross income; and *provided further*, that in no case shall the depletion allowance be less than the depletion computed on March 1, 1913, or cost value.

Surface Destroyed by Stripping Included in Depletion

Cost of surface land destroyed in the stripping of coal may be added to the cost of coal in determining a reasonable allowance for depletion for income tax purposes, according to a decision of the U. S. Board of Tax Appeals in the Manchester Coal Co. case (Docket No. 33329, 24 B.T.A.).

Mines Make Safety Records

Hanna Coal Co. properties have achieved material reductions in the number of accidents as a result of a carefully planned and continuous safety campaign extending over a considerable period of time. A comparison of accidents in the first ten months of 1931 with the record in the same period in 1930 is shown in the following table:

	Per Cent Reduction in 1931	
	Compensable	Non-Compensable
Wheeling & Lake Erie Coal Mining Co.		
Dillonvale No. 1..	66	74
Lafferty No. 6....	71	42
Fairpoint No. 9...	82	35
Jefferson Coal Co.		
Piney Fork No. 1..	22	11
Piney Fork No. 2..	42	83

Alabama coal mines worked through the month of October with only one fatality, bringing the total for the first ten months of 1931 to 18, against 55 deaths in the same period in 1930. With the October figures, the tonnage mined per fatality in 1931 was 543,000, against 260,000 tons in 1930.

The Keystone (W. Va.) mine of the Koppers Coal Co. has been awarded the President's Trophy presented by the company to the mine with the best accident record during October. The Keystone mine operated throughout the entire month with a perfect no-accident record for the second time in the present year.

Permissible Plates Issued

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

(1) Jeffrey Mfg. Co.; Type 49-G conveyor; 2-hp. motor, 230 volts, d.c.; Approval 234, Oct. 2.

(2) Joy Mfg. Co.; Type 8-BU loading machine; 15-hp. motor, 500 volts, d.c.; Approval 235-A, Oct. 29.

(3) Mine Safety Appliances Co.; Edison, Model H hand lamp; Approval 1008H, Oct. 31.

(4) Mine Safety Appliances Co.; Edison, Model K hand lamp; Approval 1008K, Oct. 31.

The following cable was added to the list of "Specially Recommended Cables" during October:

BM-14, General Electric Co., No. 3 twin cable (19x7 stranding).

Southern Appalachian Operators Meet at Knoxville

Every operator present at the annual meeting of the Southern Appalachian Coal Operators' Association, held at Knoxville, Tenn., Nov. 27, expressed satisfaction with the accomplishments of the Southern Appalachian Efficiency Association, the organization of key men fostered and aided by the operators.

L. S. Safriet, manager of the Gatliff Coal Co., Gatliff, Ky., and president of the efficiency association, in a report of the activities, said that the days lost due to "failures" had been reduced from 188,238 in the first eight months of 1930 to 53,354 during the same period of 1931. He attributed this improvement in accident record largely to the work carried on by the efficiency association, expressed the belief that the activities also have resulted in a large saving in mine supplies and materials.

At the operators' meeting it was announced that the Mahan Jellico Coal Co., Packard, Ky., will receive the cup awarded annually by the Provident Life & Accident Assurance Co., of Chattanooga, to the mine making the greatest improvement in accident record over the preceding year.

Officers of the Southern Appalachian Coal Operators' Association for the coming year are: president, C. M. Moore, president, Moore Coal Co., Knoxville; first vice-president, R. S. Young, secretary-treasurer, Blue Diamond Coal Co., Knoxville; second vice-president N. B. Perkins, president, Southern Mining Co., Williamsburg, Ky.; and secretary-treasurer, R. E. Howe, Knoxville.

More Holmes Groups Organized

The Panhandle Council of the Joseph A. Holmes Safety Association was formed at a meeting in Burgettstown, Pa., in November. Over 60 representatives of the Carnegie Coal Co., Greensburg-Connellsville Coal & Coke Co., Langeloth Coal Co., Bertha Consumers Mining Co., Clinton Block Coal Co., Bulger Block Coal Co., Pennsylvania Department of Mines, and the U. S. Bureau of Mines were present. Patrick Nairn, inspector of the Pennsylvania Department of Mines, Pittsburgh, Pa., was chosen president. R. E. Bucknam, superintendent, Langeloth Coal Co., Slovan, Pa., and Joseph Lindon, general superintendent, Carnegie Coal Co., McDonald, Pa., were elected first and second vice-presidents respectively. John McIntyre, of the Langeloth organization, was chosen secretary-treasurer. Plans were laid for the organization of chapters.

Porter Coal Co. employees at Adamsville, Ala., formed two new chapters of the Joseph A. Holmes Safety Association on Nov. 13. One chapter is for white workers and the other will be composed of colored employees. Formation of the chapters brings the total number in the state up to 37.

Dr. H. C. Parmelee

Per Ton Freight Increase

Permission to increase rates on coal, coke, and anthracite 6c. per ton instead of $3 per car was granted to the railroads on Dec. 8 by the Interstate Commerce Commission in a decision on the application of the carriers for a general increase of 15 per cent in rates.

Committee of Ten Activities

A coal-heating show in connection with the annual meeting of the National Coal Association was approved at a meeting of The Committee of Ten—Coal and Heating Industries, held in Chicago, Nov. 23. The feasibility of the plan will be studied by a special committee. Air-conditioning was brought up by J. H. Walker, Detroit Edison Co., and the research committee was directed to follow developments, with particular reference to the use of coal as a source of energy.

Pittsburgh solid fuel men and representatives of the heating equipment industries met on Nov. 19 and selected a general committee to conduct the organization of a local heating association to cooperate with The Committee of Ten—Coal and Heating Industries. J. F. Flood, manager, retail department, Pittsburgh Coal Co., was made chairman of the pre-organization committee.

Cleveland (Ohio) solid fuel and equipment men met on Nov. 16 at the call of Harry L. Findlay, vice-president, Youghiogheny & Ohio Coal Co., to perfect plans for the formation of a local association to cooperate with The Committee of Ten—Coal and Heating Industries. An organization comittee was appointed, with Mr. Findlay as its chairman.

Baltimore (Md.) solid fuel and heating equipment men met on Dec. 4 to outline initial steps in the formation of a local association to cooperate with The Committee of Ten—Coal and Heating Industries. Douglas Gorman, president, Cumberland Coal Co., was elected chairman of the pre-organization committee.

Parmelee Made Vice-President

Dr. H. C. Parmelee, editorial director of the McGraw-Hill Publishing Co. since 1928, was elected to the office of vice-president early in November. Dr. Parmelee began his professional career in 1899 as an instructor at the University of Nebraska, where he majored in the chemical-physical group of studies. He was successively assistant chemist of the Union Pacific R.R., chief chemist of the Globe plant of the American Smelting & Refining Co., and a consulting chemist in Denver, Colo. Dr. Parmelee then entered the editorial field and, except for a year as president of the Colorado School of Mines in 1916-17, was successively editor of the *Mining Reporter,* editor of the *Western Chemist and Metallurgist,* western editor of *Chemical and Metallurgical Engineering,* and, finally, editor of the latter publication prior to becoming editorial director of the McGraw-Hill company.

Coal Classification Reviewed

Progress in coal classification was the general topic at the meeting of the sectional committee on the classification of coal of the American Society for Testing Materials, held in Pittsburgh, Pa., the week of Nov. 18. A progress report on the types of coal used for steam generation and a report on provisions of smoke abatement ordinances relating to differences in kind or quality of fuel were presented by the technical committee on use classification.

The technical committee on scientific classification discussed at some length a progress report dealing with the inclusion of the various United States coals in a system based on the calorific value and fixed carbon of the ash-free coal as mined. Members of the associate committee on coal classification of the National Research Council of Canada reported, informally, that surveys of the composition of Canadian coal were being made, and that special studies on the moisture-holding properties of coals of different rank were in progress.

Coal Stocks Rise

Commercial stocks of bituminous coal, used largely for industrial purposes, amounted to 34,500,000 tons on Oct. 1, 1931, according to the quarterly survey just completed by the U. S. Bureau of Mines. In comparison with the amount on hand at the beginning of the previous quarter, this is an increase of 4,400,000 tons but is 1,400,000 tons less than the quantity in storage on the same date last year.

Freight Prepayment Ended

Shippers of coal to Canada were relieved on Nov. 5 of the necessity of prepaying freight charges on all sizes except slack by a decision of the eastern railroads.

Wages Cut in Northern West Virginia; Southwest Experiences Disorders

NON-UNION operators in northern West Virgina, following a meeting of the Fairmont Coal Operators' Association held in Clarksburg, Nov. 30, announced a uniform wage scale for all operations in the area, involving in many cases reductions from the wages formerly paid and, in a few instances, increases to bring individual scales up to the new standard. The new non-union scale provides for base rates of 28c. to 30c. per ton for loading and $2.80 to $3.40 for day labor. The union scale, which was reduced from 30c. for loading machine-cut coal and $3.60 for day labor on Oct. 2, is now 22½c. for loading and $2.70 for day labor. Prior to the adoption of the new scale, the Consolidation Coal Co., Bethlehem Mines Corporation, Jamison Coal & Coke Co., and New England Fuel & Transportation Co. paid 36c. to 39c. for loading on machine sections and $4.40 to $4.50 for skilled labor underground.

Ohio & Pennsylvania Coal Co. miners at Cadiz, Ohio, returned to work late in November after accepting a wage cut of 6 per cent. The mine had been closed about a month before when the 425 employees walked out. Operations were resumed at the Millfield (Ohio) mine of the Sunday Creek Coal Co. on Nov. 25, when the miners terminated a strike of four weeks' duration over the assignment of motormen. The men agreed to refrain from interfering in the assignment of workers.

A number of central Pennsylvania producers announced wage cuts on Nov. 16, and this action was followed by strikes at several operations. These were adjusted, however, with the result that all the mines affected were again in operation at the end of the month.

The Missouri City (Mo.) Coal Co. signed a four-year contract with the United Mine Workers early in November, thus bringing all of the Clay County operations into the union fold. The Mosby Block Coal Co., Clay County Coal Co., and the Fairplay Coal & Development Co., had previously entered into compacts, and the action of the Missouri City company brought the total number of mines affected up to five.

Attacks on non-union workers in Lexington County, Missouri, where union miners have been attempting to secure contracts, caused the operators to appeal to the Governor on Nov. 7 for protection. As a result, the assistant attorney general was dispatched to the county to prosecute members of mobs responsible for attacks on non-union miners at Higginsville and Corder, Nov. 5 and 6. Union organizers have demanded that the operators sign a union contract at the 1917 scale, while the operators contend that they are now paying 70 to 85 per cent of the 1917 scale and can pay no more because of competition from Illinois mines.

Eight hundred Henryetta district (Okla.) miners were on strike on the first of November in demand for wages in keeping with sales prices. The strike was voted after the operators refused to confer with miners' representatives concerning wage cuts, said to be from $5 to $3.60 per day for day work, with a corresponding reduction from the old loading figure of 83c. per ton.

Clinton (Ind.) unemployed miners abandoned plans for accepting work at a scale below that provided for in the union contract late in November. The original proposals followed statements by the operators that the field would be able to compete with other districts on a scale of $4 a day, but were abandoned after officials of District 11 expressed opposition.

Negotiations between Nova Scotia miners and the Dominion Steel & Coal Corporation, Ltd., were abandoned on Nov. 6 to allow the local unions to vote on the proposal of the company for wage reductions varying from 10 to 25 per cent. Day men, according to the company's plans, would be cut 10 per cent, and contract workers 15 and 25 per cent.

Ward Succeeds Clayton

Geo. S. Ward, for several years assistant secretary, was elected secretary of the Harlan County Coal Operators' Association at the annual meeting held Nov. 18 at Harlan, Ky. Mr. Ward succeeds the late E. R. Clayton, and will have his headquarters in Harlan. S. J. Dickenson, secretary-treasurer, Mary Helen Coal Corporation, Coalgood, Ky., was chosen president for the ensuing year, and B. W. Whitfield, Sr., president, Harlan Collieries Co., Brookside, Ky., was elected vice-president.

New members of the executive board are: Pearl Bassham, Harlan-Wallins Coal Corporation; C. B. Burchfield, Black Star Coal Co.; E. B. Childers, Black Mountain Corporation; D. B. Cornett, Cornett-Lewis Coal Co.; R. W. Creech, Creech Coal Co.; W. A. Ellison, Mahan-Ellison Coal Corporation; Elzo Guthrie, Harlan Fuel Co.; Elmer D. Hall, Three Point Coal Co.; L. P. Johnson, Crummies Creek Coal Co.; John Marland, King Harlan Coal Co.; and R. C. Tway, R. C. Tway Coal Co.

Washington Institute Date Set

The annual mining institute of the College of Mines, University of Washington, will be held in Seattle the week beginning Jan. 18. Courses given during the progress of the meeting are open, without charge, to any person interested in mining or metallurgy, and the sessions will be held at the Mines Laboratory. In addition to the regular faculty of the College of Mines, speakers prominent in the mining industry in the Pacific Northwest will address the institute.

Geo. S. Ward

Association Activities

Col. W. D. Ord, Alexandria, Va., president of the Empire Coal & Coke Co. and treasurer of the National Coal Association, was reelected president of the Smokeless Coal Operator's Association of West Virginia at the annual meeting held in New York City, Dec. 2. Other officers, also reelected, are: vice-presidents, Ralph Knode, Philadelphia, Pa., president, Stonega Coke & Coal Co., and W. A. Richards, Bluefield, W. Va., president, Pemberton Coal & Coke Co; secretary, Holly Stover, Washington, D. C.; and treasurer, H. R. Hawthorne, secretary and general counsel, Pocahontas Fuel Co., New York City.

George Dunglinson, Jr., manager, fuel department, Norfolk & Western Ry., Bluefield, W. Va., was reelected president of the Operators' Association of the Williamson Field at the annual meeting held at Williamson, W. Va., last month. E. E. Ritter, general manager, Red Jacket Consolidated Coal & Coke Co., Red Jacket, W. Va., was again chosen vice-president, while W. S. Leckie, vice-president, Leckie Collieries Co., Aflex, Ky., and Joseph J. Ardigo, Williamson, were returned to the offices of treasurer and secretary, respectively. Operators chosen for the board of directors are: George B. Baker, Tierney Mining Co.; Geo. W. Coffey, War Eagle Coal Co.; L. D. Huestis, Wheeling Steel Corporation; T. H. Huddy, Sudduth Fuel Co.; J. D. McLaughlin, Earlston Coal Co.; W. A. Richards, Majestic Collieries Co.; and L. E. Woods, Crystal Block Coal & Coke Co.

Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co., was reelected president of the Alabama Mining Institute at a meeting of the board of governors held in November. A. B. Aldridge, vice-president, Stith Coal Co., was again chosen vice-president, and James L. Davidson and Hubert E. Mills were reelected secretary, and assistant secretary and statistician, respectively.

Personal Notes

Five Lehigh Valley Coal Co. officials received new assignments in a program of advancements and transfers put into effect in November. SHELDON JONES, West Pittston, Pa., efficiency engineer for the company, was made superintendent of the Hazleton Division, vice R. A. EVANS, Hazleton, who was assigned to special duties. N. L. FETTERMAN, superintendent of the Luzerne Division. Forty Fort, was made superintendent of the Lackawanna Division. GEORGE P. GALLAGHER, superintendent of the Exeter colliery, West Pittston, succeeded Mr. Fetterman, while W. A. REUTELHUBER, superintendent of the Lackawanna Division, Kingston, was appointed superintendent of mechanical mining for the company's operations.

CLARK M. JOHNSON, master mechanic, Leith mine, H. C. Frick Coke Co., Uniontown, Pa., was awarded the Elbert Gary Gold Medal in November on the strength of his record of almost 51 years of service at the operation. Mr. Johnson started at the mine as a laborer in 1880 and worked his way up to the position he now holds in 1902.

E. J. CARLYLE, since 1904 engaged in metallurgical work and the construction of smelters and refiners in several countries, was elected secretary-treasurer of the Canadian Institute of Mining and Metallurgy in November. Mr. Carlyle succeeds the late George C. MacKenzie.

JOHN C. BRYDON, Scranton, Pa., has resigned as vice-president of the anthracite and bituminous operations of the Pittston Co., Northwestern Mining & Exchange Co., and Blossburg Coal Co., all with headquarters in Scranton. Mr. Brydon is succeeded by G. M. GILLETTE, for some time general manager of the three companies.

GEORGE W. KILPATRICK, Beaver Falls, Pa., has been elected president of the United Pocahontas Coal Co., Crumpler, W. Va., succeeding the late Worth Kilpatrick.

Obituary

F. C. COSEO, chief designing engineer of the Jeffrey Manufacturing Co., Columbus, Ohio, died Nov. 12 at the Skelton (W. Va.) mine of the New River Co. of acute dilation of the heart.

HARRY K. CORTRIGHT, vice-president of the Boucher-Cortright Coal Co., Beaverdale, Pa., died at his home in Bethayres, near Philadelphia, Pa., Nov. 9. Mr. Cortright, who was 49, entered the coal business in 1904, and was connected with several operating and wholesale companies until ill health forced his retirement from active service in 1925.

W. D. BRENNAN, president of the Utah Fuel Co. and of the Utah Coal Producers' Association, died Nov. 1 of a heart attack, which he suffered on board a train returning from Washington, D. C., to his home in Salt Lake City, Utah. Mr. Brennan, who was 52, became president of the Utah Fuel Co. on Jan. 1, 1930; for ten years prior to that time he was manager of the Stag Canon branch of the Phelps Dodge Corporation.

The Late W. D. Brennan

JOHN L. WHITE, general superintendent of the Penker Coal Mining Co. since its organization fifteen years ago, died suddenly on Nov. 19 at his home in Portage, Pa. Mr. White's career in the coal industry in central and western Pennsylvania covered a period of fifty years, during which time he was mine official, contractor, and independent operator, in addition to holding positions with the Pittsburgh Terminal Coal Corporation and the Rochester & Pittsburgh Coal & Iron Co. Part of his activities were devoted to opening new mines, and he assisted in sinking the Sonman and Puritan shafts.

JAMES STONE WHITELEY, co-founder of the Baker-Whiteley Coal Co., Hooversville, Pa., in 1876 and its president until his retirement a year ago, died Nov. 13, at his home in Baltimore, Md., at the age of 76.

Utah Railroad Men Organize To Aid Coal Shipments

Utah railroad men employed by the Union Pacific R.R. and affiliated carriers have formed the Railroads Protective Employees' Association for the purpose of using all legitimate and lawful means for increasing the business of their employers. Eight hundred men have enrolled, and the movement is reported to have the support of the retail coal men of the state, who see in it a curb on the activities of trucks and truckmen.

Coming Meetings

Coal Mining Institute of America. annual meeting, Dec. 16 and 17, in Auditorium of Chamber of Commerce Bldg., Pittsburgh, Pa.

American Society of Heating and Ventilating Engineers; second exposition, Cleveland, Ohio, Jan. 25-29, 1932.

Industrial Notes

THE NAME of the Pittsburg Boiler & Machine Co., with sales offices at 2007 Engineering Building, Chicago, and works at Pittsburg, Kan., was changed to the MCNALLY-PITTSBURG MFG. CORPORATION, Nov. 1.

H. W. HAAPANEN, mining engineer, formerly connected with a number of coal-mining companies and with the Fairmont Mining Machinery Co., has been appointed district representative of the Webster & Weller Mfg. Cos. in West Virginia, with headquarters at Charleston.

ANACONDA WIRE & CABLE CO., New York City, has appointed F. W. BROWER as manager of rubber wire sales and H. N. OTIS as sales promotion manager.

R. L. GRAY, vice-president of the Kansas City Bolt & Nut Co., Kansas City, Mo., and vice-president and general manager of the Sheffield Steel Corporation, its successor, since 1925, was elected president of the Sheffield company on Nov. 3. W. L. ALLEN was chosen chairman of the board on the same date.

TRUSCON STEEL CO., Youngstown, Ohio, has taken over the Berger Mfg. Co. Building Products Division, Canton, Ohio, and will operate it as the Berger Building Products Division of the Truscon company.

LINDROOTH, SHUBART & CO., Denver, Colo., specializing in the mining machinery business, have been appointed dealers for the Westinghouse Electric & Mfg. Co. in Colorado, New Mexico, Wyoming, Utah, and Montana.

SHEPARD NILES CRANE & HOIST CO. has removed its Chicago office to 564 West Monroe St.

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J., has made the following changes in its sales organization: assistant general manager of sales in charge of resale activities, J. J. SUMMERSBY, JR., formerly in charge of the Holyoke works; manager of sales of the resale and meter divisions, GEORGE B. CUMMING, for 21 years connected with the General Electric Co.; sales manager, contractors' division, CARL F. OESCHLE, who participated in the organization and development of Metalweld, Inc.; manager, rock drill sales and service, CHARLES A. HIRSCHBERG, since 1924 a member of the Worthington staff. F. W. HANKINS was named as Mr. Cumming's assistant. H. GLOVER and W. M. VINNEDGE were appointed assistant managers under Mr. Oeschle. E. E. HOFFMAN, assistant general sales manager, Wico Electric Co., has joined the New York City sales staff as assistant manager. EUGENE S. HILEY and EARL C. STEWART have joined the sales staff of the rock drill division.

Fatality Rate Rises Slightly in October, But Is Lower Than a Year Ago

REPORTS received by the U. S. Bureau of Mines from state mine inspectors showed that 130 men were killed in coal mines during October, an increase of 21 over the preceding month, but a decrease of 69 from the October, 1930, record. Production of coal in October of the present year was 42,251,000 tons, an increase of 5,974,000 tons over September and a decrease of 9,430,000 tons from October, 1930. For every million tons of coal mined in October the death rate was 3.08. This rate is slightly higher than that for September (3.00), during which month 109 deaths occurred and 36,277,000 tons of coal was mined. The October rate, however, was more favorable than that for October a year ago, when the death rate was 3.85, based on 199 fatalities and an output of 51,681,000 tons of coal.

Reports covering bituminous mines in all states showed that 91 men were killed in mining 35,700,000 tons of coal during October, the fatality rate being 2.55 per million tons—a better record than that for October a year ago, when the death rate was 3.42, based upon 151 fatalities and a production of 44,150,000 tons of coal. Reports for September, 1931, showed a death rate of 2.35, based on 75 deaths and 31,919,000 tons.

In the anthracite mines of Pennsylvania, 39 men were killed by accidents during October, as compared with 34 in September of the present year and 48 in October, 1930. Fatality rates per million tons of coal mined were 5.95, 7.80, and 6.37, respectively, thus showing more favorable conditions in October, 1931.

During the 10-month period from January to October of the present year, 1,214 men lost their lives in the mining of 368,459,000 tons of coal, resulting in a death rate of 3.29. Reports for the same period in 1930 showed 1,661 deaths and 441,951,000 tons of coal produced and a fatality rate of 3.76 per million tons. The 10-month record for bituminous mines alone during 1931 was 876 deaths and a rate of 2.76, as compared with 1,279 deaths and a rate of 3.33 for the same period in 1930. The anthracite record for the 1931 period was 338 deaths and a fatality rate of 6.66, as compared with 382 deaths and a rate of 6.57 for the 10-month period of 1930.

There were no major disasters in October—that is, no disaster in which five or more lives were lost. There have been four such disasters thus far in 1931, causing the death of 46 men. Three of these disasters occurred in January in bituminous mines and one in May in an anthracite mine. Based exclusively on these disasters, the death rates were 0.125 in 1931 and 0.285 in 1930, when there were nine major disasters causing 126 deaths. The major disasters thus far in 1931 occurred at the rate of 1.09 separate disasters (as distinguished from the number of deaths resulting from the disaster) for each hundred million tons of coal produced, as compared with 2.04 for the corresponding period in 1930. With the close of October, the bituminous coal-mining industry has completed nine months of operation without an accident causing five or more deaths, either an explosion or any other type of major disaster. This favorable record has not been equaled in more than a third of a century.

Comparing the accident record for the first ten months of 1931 with that for the same months of 1930, a reduction is noted in the fatality rates for falls of roof and coal, haulage, gas or dust explosions, explosives, and electricity, which are the principal causes of deaths in coal mines. The comparative rates are as follows:

Cause	1930 Fatalities	1930 Rate	Jan.-Oct., 1930 Fatalities	Jan.-Oct., 1930 Rate	Jan.-Oct., 1931 Fatalities	Jan.-Oct., 1931 Rate
All causes	2,014	3.793	1,661	3.758	1,214	3.295
Falls of roof and coal	1,067	2.009	913	2.066	695	1.886
Haulage	303	.571	259	.586	208	.565
Gas or dust explosions:						
Local explosions	61	.115	57	.129	26	.070
Major explosions	214	.403	115	.260	46	.125
Explosives	78	.147	65	.147	33	.090
Electricity	76	.143	67	.151	53	.144
Miscellaneous	215	.405	185	.419	153	.415

Coal-Mine Fatalities During October, 1931, by Causes and States

(Compiled by Bureau of Mines and published by *Coal Age*)

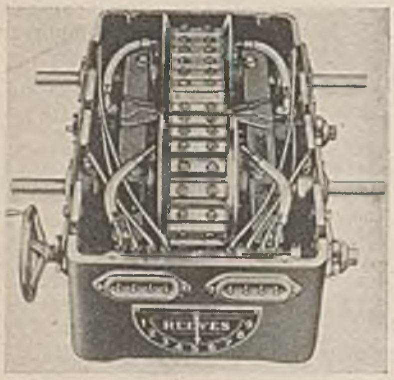
State	Underground												Shaft					Surface							Total by States	
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip, or bucket	Other causes	Total	Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	1931	1930
Alabama	1											1													1	4
Alaska																									0	0
Arkansas																									0	1
Colorado	2	1	1									4													4	5
Illinois	4		1									5				3	3								8	11
Indiana							2				1	3													3	4
Iowa	1		1									2													2	2
Kansas																									0	0
Kentucky	9	1	1	3					1			15													15	19
Maryland	1											1													1	0
Michigan																									0	0
Missouri																									0	1
Montana							1					1													1	0
New Mexico			2									2													2	1
North Dakota	2				1							3													3	0
Ohio	2					1						3							1					1	4	12
Oklahoma																									0	31
Pennsylvania (bituminous)	7	1	3				1					12			1		1								13	22
South Dakota																									0	0
Tennessee	2											2													2	3
Texas																									0	0
Utah	1	1										2													2	2
Virginia	3		1									4													4	4
Washington																									0	1
West Virginia	8	2	5	2	1		6					24													24	28
Wyoming	1	1										2													2	0
Total (bituminous)	44	7	15	5	2	1	10		1		1	86			1	3	4		1					1	91	151
Pennsylvania (anthracite)	16	5	3	4	3						4	35	1				1		1			2		3	39	48
Total, October, 1931	60	12	18	9	5	1	10		1		5	121	1		1	3	5		2			2		4	130	
Total, October, 1930	92	20	20	35	5	5	3	1	1		7	189						4		2			4	10		199

WHAT'S NEW

IN COAL-MINING EQUIPMENT

Speed Transmission Unit Is Inclosed

Reeves Pulley Co., Columbus, Ind., has designed a new inclosed speed transmission unit with a centralized lubrication system. All standard operating parts, the company states, are inclosed in a cast-iron case which affords complete protection from water, live steam, chemical fumes, or abrasives. Minor adjustments or replacements of the V-belt may be made by



Inclosed Variable-Speed Transmission Unit, Showing Lubrication

lifting the cover. For major overhauling, the operating part may be removed as a unit. Complete lubrication is assured, it is asserted, through forced-feed fittings located at one end of the transmission unit. Flexible copper tubes lead to all the bearings which must be greased. The transmission unit is built in six sizes from a fraction to 10 hp. in all speed ranges, the company says. Also, it is declared, the unit may be mounted on the floor or ceiling, or in a vertical position, as conditions demand.

Ball-Bearing Compressors

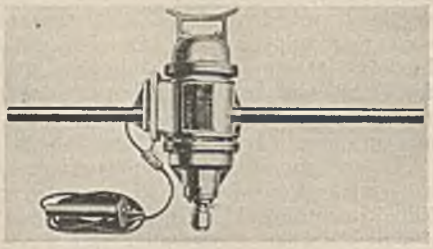
New models and new capacity ranges have been added to the vertical, single-acting compressor line of the Sullivan Machinery Co., Chicago. "WL-1" belt and V-belt driven and "WL-11" direct motor-driven compressors are of the single-cylinder, single-acting types, constructed with heavy-duty ball bearings for the crankshaft. Compactness, simplicity, and sturdiness are emphasized by the company. The cylinder is cast separately from the frame, and the head, containing the inlet and discharge valves, may be attached in any one of four horizontal positions for convenience in making pipe connections. These units provide displacements ranging from 27 to 87 cu.ft. per min. The Sullivan "sweep control" inloading system is provided, the choice of several regulating systems, ranging from manual to fully automatic start and stop operation, are available. These units are designed for air pressures up to 125 lb. per sq.in.

"WL-2" and "WL-4" belt-driven units are available in two- and four-cylinder models, respectively, and are similar to the direct-connected units ("WL-22" and "WL-44") already available. V-belts also may be used with any desirable form of power unit; in such cases, the units are mounted on a subbase which supports the compressor, motor, and V-belt drive. Capacities range from 119 to 348 cu.ft. of free air per minute. Four-cylinder units are of the balanced V-type, with cylinders set at an angle of 90 deg. and only one crankshaft. This construction is said to result in a short and compact machine. Four cylinders instead of two permit use of reciprocating parts weighing only one-third that for similar parts in a two-cylinder model, it is asserted. Light weight of the small moving element holds vibration to a minimum. "Wafer" valves, "sweep control" unloading, water-cooled cylinders, and automatic lubrication characterize these two models.

Gas-Proof Coal Drill

Two men exerting all their strength cannot overload the motor armature of the new, portable, approved, gas-proof, electric coal drill offered by the Ohio Brass Co., Mansfield, Ohio, it is asserted. In the possible event of an extensive overload, a quickly renewable fuse in the switch compartment supplies protection to the motor. The weight of the drill is 62 lb., and it is rated at 5 hp. for 20 min. This power, it is asserted, is sufficient to twist off an auger, thus eliminating delays resulting from the bits sticking while the drill is running.

The Ohio Brass drill has been approved by the U. S. Bureau of Mines, the maker states, and can be used in gaseous atmospheres at 250 volts. On 500-volt operation, a resistance placed at the mouth of the place reduces the voltage to the required figure. Handles and breastplates are completely insulated, the company states. The switch, a 20-amp., quick-break, standard type, is located in the end of one of the handles. SKF annular and Timken roller bearings are used. The motor is cooled by a blower, and is dust- and gas-proof. Standard flat taper chucks are



Ohio Brass Portable Gas-Proof Drill

furnished unless special designs are requested. Ordinarily, 50 ft. of duplex "Tyrex" No. 16 wire is supplied with an O-B fused trolley tap and an O-B rail clamp. Longer wires are available at an extra charge.

Rust-Resisting Tin Plate

Republic Steel Corporation, Youngstown, Ohio, has developed Toncan iron-tin plate. The basic constituents of the new plate are the same as those of Toncan copper-molybdenum iron, the manufacturer states, and it is endowed with the rust- and corrosion-resisting characteristics of Toncan iron. The new plate can be supplied in all base weights and sizes and, in addition to other rust-resisting applications, is adaptable to the various architectural uses: gutters, flashing, conductor pipe, etc.

Dipper Front Cleans Coal

The Voit dipper front for use on power-shovel dippers is now offered by the American Manganese Steel Co., Chicago Heights, Ill. Distinctive features of the equipment, according to the company, are the several scraper blades on the outside of the front. Two of the blades form a V and the other runs transversely across the back of the dipper front. In addition, a longitudinal blade may be inserted into the open end of the V. In coal stripping, it is claimed, the Voit front cleans the bone coal and slate off the top of the coal seam. In this way, the coal can be loaded without the employment of additional cleaning facilities. The transverse scraper at the back also is

Voit Dipper Front

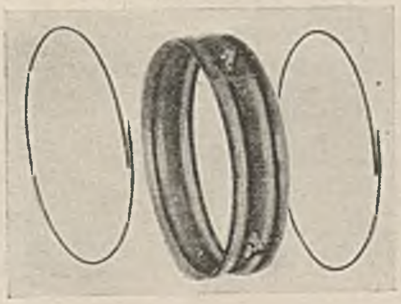
advantageous, it is asserted, in that it keeps mud and similar material from interfering with the operation of the dipper latch.

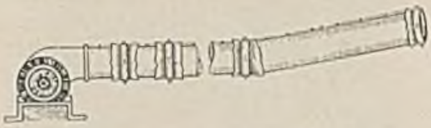
To assist in the reclamation and repair of manganese steel equipment, the company has developed the "Amsco" manganese steel welding rod. Manganese content of the rod, according to the company, is 13.5 to 14 per cent, which, with other elements, gives a deposit when arc-welded that is equal in toughness and wear resistance to manganese steel. It is stocked in A. S. & W. gage 5, 36 in. long. For hard-surfacing, the company offers the No. 459 welding rod, which is said to have a high-resistance to abrasion. It is a cast rod $\frac{3}{16}$ in. in diameter. The company recommends it for hard-surfacing dipper teeth, pulverizer hammers, and other equipment subject to severe wear.

Ventilating Tube Offered

American Brattice Cloth Co., Warsaw, Ind., and H. J. Hersey & Co., Salt Lake City, Utah, offer "Mine-Vent," a flexible ventilating pipe for use in mines. A feature of the equipment, according to the manufacturers, is the coupling, shown in the accompanying illustration. To insert a length of tubing into the coupling, the steel ring is first slipped over the end, after which the tubing is folded back in the form of a cuff. By compressing the ring, the tubing can be inserted into the coupling. Use of the coupling, the makers declare, facilitates joining lengths; allows the use of odd lengths without sewing; offers the possibility of adjusting the length of the line by shortening the cuffs; eliminates twisted installations, because of the ease with which the tubing can be rotated in the coupling; and allows slight angles to be made by pulling out one side of the cuff more than the other.

"Mine-Vent" Coupling





Installation of "Mine-Vent"

"Mine-Vent" can be secured in 15-, 25-, 50-, 75-, and 100-ft. lengths in diameters of 8, 12, and 16 in. Angles, ells, tees, and other special forms are available. Fan connections and suspension collars are not necessary, the company states. The tubing is hung from a wire passing through eyelets on the outside. Eyelets also are made on the couplings to assist in suspension.

Electric Space Heater

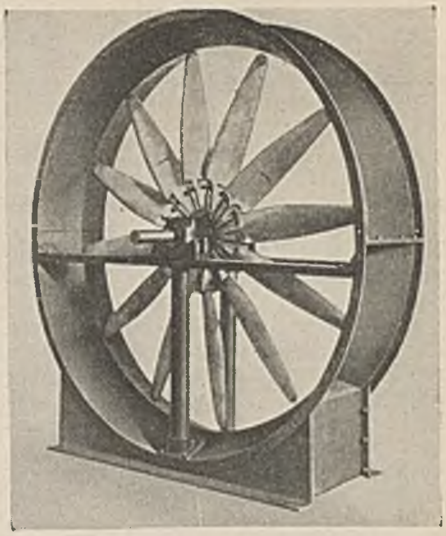
Cutler-Hammer, Inc., Milwaukee, Wis., offers a new, electric space heater, manufactured in 2-ft. lengths. The heating element, said to be of a new design, is nickel chromium alloy. A highly refractory granular compound is used for insulation. No cement or spacers are used, the company states, and the elements are imbedded in the insulating compound under such high pressure that the unit is immune to vibration and blows. Rated capacity of the heaters is 500 watts, and they can be furnished for operation at 100-125 or 200-250 volts, either alternating or direct current. High overload capacity is built into the units, the company declares, to prevent damage.

Variable-Speed Stoker Drive

Link-Belt Co., Chicago, offers a new, variable-speed stoker drive as a standardized unit for underfeed, screw-type stokers. The unit is compact and efficient as a speed-reducing transmission, the company declares. It is made in various sizes for stokers with capacities ranging from 50 to 1,200 lb. of coal per hour. Speed changes are made through a single lever.

Mine Fan Developed

The new "Aerovane" mine fan is offered by the Jeffrey Mfg. Co., Columbus, Ohio, which declares that it has approximately twice the efficiency of the present disk or propeller fans when operating over a wide range of duties.



Jeffrey "Aerovane" Mine Fan

The blades of the fan are patterned after the airplane propeller, and the company asserts that it is the only disk or propeller fan that will maintain an efficiency of 65 per cent or more when delivering between 40 and 80 per cent of the maximum volume of air. According to the manufacturer, the "Aerovane" fan will replace any disk or propeller fan and quickly save enough in the form of lower power consumption to pay for itself. Also, the "Aerovane" fan will replace many centrifugal fans, it is declared, where large volumes with high pressures are not required.

Gate Valve Sealed With Oil

The "Lubrotite" gate valve, which is constructed with a duct system that allows the introduction of lubricant between the seating surfaces to act as a seal, is offered by Reading-Pratt & Cady Co., Inc., Bridgeport, Conn. Use of the lubricant seal, the company says, keeps the valve tight even if the seating surfaces should be scratched or otherwise damaged. Other advantages pointed out are: valves operate 25 to 50 per cent easier, the oil film guards against corrosion and damage, the lubricant seal frees set wedges, and the life of the valve is longer. General dimensions are the same as those of non-lubricated valves, it is stated, and they can be used without the lubricant if desired

Speed Reducers for Small Drives

Two new, double-reduction, Herringbone-Maag speed reducers for small electric motor drives have been announced by the W. A. Jones Foundry & Machine Co., Chicago. The smaller machine (90-D) is $18\frac{3}{4}$ in. long and $12\frac{3}{4}$ in. wide, while the dimensions of the larger are: length, $21\frac{3}{4}$ in.; width, 14 in. An extensive list of ratios is carried in stock, the company says.

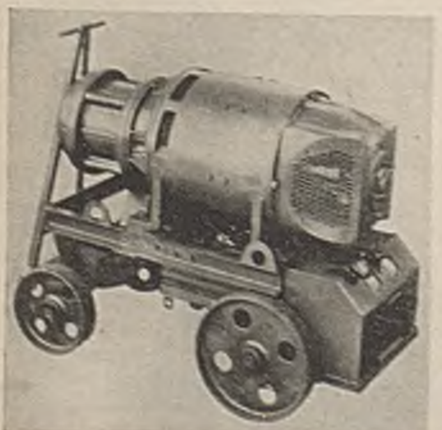
Equipment for Controlling Power Use Offered Coal-Mining Men

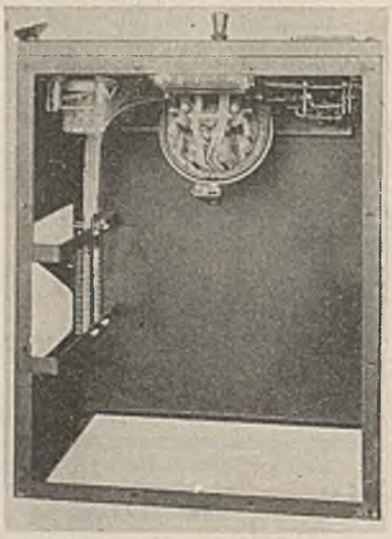
A NEW motor-starting switch (CR-1062-C2) for use with general-purpose motors has been developed by the General Electric Co., Schenectady, N. Y. It is particularly adapted to pedestal mounting, and is of the three-pole type with double-break, umbrella-shaped, silver contacts. These contacts, it is said, reduce arcs to a minimum even when the rotor is stalled, thus providing a high factor of safety. Thermal overload relays are inclosed to forestall damage, but can readily be removed. Relay heaters are protected against mechanical injury.

The operating mechanism has a snap action, trips free on overloads, and also protects the motor against single-phasing. A drawn-shell cover and case protects the switch against a high percentage of moisture, the company says. Cover design allows easy access for inspection and repair. Recess mounting is permitted by a molded switch handle operating from the front of the case. Holes are provided for locking the switch in the "off" position. For wall or machine operation, the switch is mounted in the case with the overload relays at the bottom to provide a straight run of wiring through the switch and overload relays to the motor. For pedestal mounting, the switches are supplied as for wall mounting, but are removed from the case when wiring.

General Electric Co. has announced a new line of single-operator welding sets with the latest type of motors and a distinctive design of generator. Types are: WD-21, 22, 23, 24, and 26, covering the 100-, 200-, 300-, 400-, and 600-amp. ratings, respectively. Both portable and stationary sets are included in the line, the basic type being stationary with slight changes necessary to make them portable. Types include those for operation on either alternating or direct current at all standard voltages, and, in the case of alternating current, at all

Portable Arc Welding Set; Type WD-23 Generator, Induction Motor





Control Desk for Transfer Bridge (CR-7499-Y1)

standard frequencies. Two- and three-phase gasoline sets also will be available.

Sets are self-excited, with a tapped series field for major current adjustments and a shunt field rheostat to give duplex voltage control. Improved welding characteristics, compactness, light weight, and two-bearing construction also are pointed out, and the company states that improvements include practically instantaneous voltage recovery to nearly full open-circuit voltage; duplex voltage control with provisions for surplus voltage when long leads are used; and a method of control preferred by a majority of welding operators.

For use with conveyor and remotely controlled haulage or larry car systems, as well as other applications, the General Electric Co. has introduced an improved benchboard. The mounting scheme, it is explained, has been changed to allow the use of standard controllers, pushbuttons, indicating lamps, and other equipment, thus simplifying maintenance. Individual devices are mounted directly from the top of the board or frame. This system, it is asserted, eliminates special supporting brackets and extensions. More room is provided within the frame for wiring and inspection, and the construction is more rigid, it is stated.

General Electric Co. now offers recording instruments in which photoelectric and pliotron tubes are incorporated to relieve the instrument of the mechanical burden of the recording pen, which, according to the company, decreases the sensitivity of instruments of which it is a part. In the photoelectric recorder, the inking pen is driven by a small high-torque element receiving current from an auxiliary supply, and not from the circuit being measured. The indicating element carries only a small galvanometer mirror, requiring the minimum of current from the circuit. By means of a photoelectric circuit and a special optical system, the movements of the indicating element are followed by the recording element, the latter making its record on the paper. Errors are reduced with the new system, the company says, and recorders can easily be constructed to give a full-scale deflection of 20 microamperes with a power requirement (taken from the measured circuit) of 1 microwatt. There is no upward limit to the rating of the indicating element, it is asserted, and the recorders are adapted to practically all types of service.

A new, outdoor-type "Novalux" photoelectric controller has been developed by the General Electric Co. for controlling all types of outdoor lighting equipment. The unit responds to the increase and decrease in daylight intensity, and is equipped with thermal relays to prevent instantaneous operation in response to momentary interruption of the light falling on the unit. Adjustments are provided to allow the unit to close the external circuit at any light intensity between 1 and 10 foot candles, and to open the circuit at any intensity from 1½ to 4 times that required to close the circuit.

The "Senior," a new and larger type of handy floodlight, is offered by the General Electric Co. for general utility use. Weight of the light is 6 lb., height is 15 in. with supporting stand, and the depth is 12½ in. from the center of the lens to the tip of the lamp holder. The diameter of the special heat-resisting lens is 10 in. A 200-watt, inside frosted, general-service lamp, with a 6-in. light center and a medium screw base, is used. Vertical and horizontal adjustments are obtained by means of wing nuts in the swivel support and base.

A new solenoid-operated valve (CR-9507-A1) for controlling liquids and gases under pressure has been developed by the General Electric Co. Standard pipe threads are used on the valves, which are of the unbalanced type, requiring, it is declared, little power for operation. A standard solenoid is used. Coils are designed for continuous duty, and the solenoids, the manufacturer asserts, are selected to give ample power for operation.

CR-9507 Solenoid Valve