COAL AGE

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

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New York, January, 1933

An Audit of Progress

CONDEMNATION of the bituminous industry for its alleged failure to set its house in order is freely and frequently made by critics who have little conception of the magnitude of the task. It seems particularly pertinent at this season of the year, when audits are in order, to inquire whether this facile verdict is justified by the facts. The proposed program for stabilization, first published by *Coal Age* in September, 1931, offers a convenient check-sheet for this work. That program, it will be recalled, was primarily a coordination of many proposals which had been urged individually by leaders in the soft-coal industry. The major objectives set up, seven in number, were:

1. *Production control based on a modification of the Sherman act.*
2. *Sound merchandising.*
3. *Stabilized industrial relations.*
4. *More mechanization.*
5. *Coordinated research to develop new uses for coal.*
6. *More consolidations.*
7. *More safety.*

The reactions of the industry to this program gave unmistakable evidence of widespread interest and, for the most part, of favorable reception. No one, least of all the editors of *Coal Age,* expected immediate and complete acceptance of so comprehensive a plan in its entirety. The problems are too complex, the interplay of conflicting interests too close, for that. The best that reasonably could be hoped for was an early attack upon some of the more pressing problems which the program discussed.

This hope has not been disappointed. Centering first upon the district selling agency as the easiest step in the direction of physical consolidations of producing companies, many leaders in the industry have labored to create a group of selling agencies which would not only bring physical mergers nearer but which also would contribute materially to sounder merchandising methods and would introduce some measure of production control. The legality of such a movement was promptly challenged by the federal government and its immediate fate now rests with the Supreme Court. "Immediate fate" is stressed because recent weeks have seen the beginnings of a movement to unite the natural-resource industries in a common program for a modification of the anti-trust laws which would specifically sanction reasonable and effective cooperation between producers.

Another late development is a quickened interest in coordinated research effort to defend the coal markets from further competitive inroads and, later, to extend these cooperative activities to research to develop new uses for coal. Safety, too, has made gains despite the depression; it would be churlishly unfair to deny a share of the credit for this improvement to the National Coal Association, which has done much to inspire greater executive interest in safety problems.

Much, of course, remains to be done; much that cries for early attention. But the progress already made is earnest that the industry is lacking neither in intelligence, initiative nor the will to work out its own destiny.

Buyer's Profit

EVERY MANUFACTURER of industrial equipment whose selling is attuned to the spirit of the times knows that his hopes of interesting hesitant purchasers to consider new capital investments today is dependent upon his ability to demonstrate that such an investment will yield a readily determinable profit to the buyer. What the equipment has done for other purchasers is persuasive, but what it will do for the

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prospective purchaser in his own factory or mine is even more convincing. Obviously, however, the sales engineer cannot talk to his prospective purchaser in definite terms of the purchaser's self-interest unless the buyer will meet him half way by making available current cost and operating data so that the manufacturer will be in a position to make a specific case study. Management reluctant to extend such cooperation invites disappointment for which it alone is responsible or closes the door on real opportunities to increase the earnings of the operations committed to its care.

The New Millennium

BRIMSTONE PUBLICITY, predicting the doom of our present industrial system within eighteen months, has made the word "technocracy" a part of the current of common speech and unloosed a new flood of fears and passions on a jittery world. Cool appraisal of the movement is difficult, first, because the studies upon which this terrifying prediction is based are still incomplete and, second, because it is not easy to separate the official pronouncements of the technocratic group from the claims and conclusions of their unofficial, and possibly unauthorized, spokesmen. In view of the widespread popular interest, however, such appraisal seems warranted.

Technocracy, according to its arch-apostle, Howard Scott, is a research group organized in 1920—and largely ignored until a few months ago—"to collect and collate data on the physical functioning of the social mechanism of the North American continent." In pursuance of that aim, the group has been engaged upon an "Energy Survey of North America." This research job contemplates the charting of the life history of some 3,000 industries in terms of total production, man-hours, workers, energy consumption and production units; preliminary studies of approximately 250 industries have been completed. Some of the details of this part of the work are admittedly fuzzy; some of the most dramatic claims with respect to increased machine capacity, it is privately achnowledged, are incorrect. Despite these defects, an impressive showing is made.

No new ground, however, has been broken in the studies so far made public. Every engineer and most business men long have been familiar with the steady reduction in man-hours per unit of production through the introduction of the machine. Where violent disagreement comes is with the contention of the technocrats that the machine already has turned upon the Frankensteins and that, unless we change our entire system, unemployment of catastrophic proportions is inevitable. The battalions of statistics showing increasing employment per thousand of population, absorption of workers in new industries and in new service fields are marshaled to do battle against the threats of destruction of employment opportunities which have been echoed at every advance in mechanization.

That the machine does create new social problems cannot, and should not, be denied. Most engineers and many economists frankly concede that technologic advance has outstripped social progress and that a readjustment is necessary. Mr. Scott himself bears witness that readjustment by a return to the pre-machine or pre-technological ways of living is unthinkable. To wait, as too many seem inclined to do, for some new industry, invention or discovery to absorb workers crowded out of their former employment by the machine, however, is hardly a tribute to industrial intelligence or business leadership.

Unfortunately, here Technocracy leaves us to our fate. All our political, social and industrial systems, it says, are outmoded and wrong and we can look for no help from the leaders in these systems. The price system and our debt structure must go: that is cardinal in Technocracy's creed. The curtain is raised for a moment on the new millennium where hours of labor are short, standards of living high and individual income consists of units of certification "of available energy converted" valid "only during the balanced load period for which they were issued." Paradise recedes as Mr. Scott declares that "Technocracy proposes no solution; it merely poses the problem raised by the technological introduction of energy factors in a modern industrial social mechanism." Industry, with perhaps a sharpened consciousness of the social problems of the machine, is left to find its own remedies for its ailments, and what should be a valuable research study suffers from premature and sensational exploitation.

CONVEYOR MINING

+ Overcomes Adverse Conditions

At Price-Pancoast Colliery

Starting a Conveyor Place by Hand.

By IVAN A. GIVEN
Assistant Editor, Coal Age

ANTHRACITE mining today is largely a matter of recovering coal left in areas which have been worked either once or twice in the past, or in developing thin veins which were neglected in the old days when thick coal was plentiful. While it is possible to recover the thicker coal by the use of mine cars, employment of this equipment in thin veins entails costly removal of rock to allow the cars to enter the places. Consequently, scrapers and conveyors are coming more and more into use in mining thin veins, and are widely used where the pitch is not too great. In many cases, scrapers and conveyors have furnished the only possible answer to the problem of mining thin coal at a reasonable cost, thus enabling the mines in question to keep up their tonnage and remain in operation.

Such a situation faced the Price-Pancoast Coal Co. several years ago. Thick veins had already been developed at the Throop (Pa.) operation, leaving the pillars standing. Much of the thinner coal also had been worked the same way. In addition, a squeeze in 1916 and a second one in 1919 had closed off a large part of the developed areas in the various veins. These conditions made economical operation with cars impossible, so the company was forced either to develop a cheaper method of mining or close down the entire operation. Shaker conveyors offered a solution, and the first shaker engine was installed in 1923, driving five places by a rope. Although this particular equipment proved to be unsatisfactory, the company was so thoroughly convinced of the feasibility of conveyor mining that it installed several Vulcan shakers in 1925. Since that time, it has added steadily to its shaker equipment, with the result that it had 72 units on hand at the end of 1932 and was producing almost 90 per cent of its tonnage mechanically. Between 1923 and 1932, Price-Pancoast officials worked steadily to perfect the shaker equipment and operating methods now in use. In August, 1930, shaker conveyors were first installed in the crushed sections of the Clark vein and later in the No. 2 and No. 4 Dunmore veins.

Fig. 1—Gangway Section, Showing Forepoling in Crushed Ground. Timbers Have Been Standing Sixteen Months.

The Price-Pancoast property, approximately rectangular in shape, lies on the southeastern slope of the northern anthracite basin. The long axis of the property runs approximately southeast to northwest, with the northwest boundary at the Lackawanna River. The veins have a general dip of 9 deg. to the northwest, and are reached by a shaft sunk between two anticlines running roughly east and west. Position and average thickness of the workable veins are shown in the accompanying columnar section (Fig. 2). The New County vein is worked by planes from the Clark vein, and the No. 3 and No. 4 Dunmore veins are reached by slopes from the bottom landing of the shaft in the No. 2 Dunmore.

In general, all the veins originally were developed by driving chambers 26 ft. wide on 50-ft. centers, leaving pillars approximately 24 ft. wide, and this system is followed in mining the small remaining areas of virgin coal in the southeastern portions of the No. 3 and No. 4 Dunmore veins. Except for these virgin areas, all the present work consists of recovering the pillars in squeezed ground with conveyors, except for a small amount of third-mining in the Diamond vein. The latter vein was originally developed in accordance with the general scheme of 50-ft. centers.

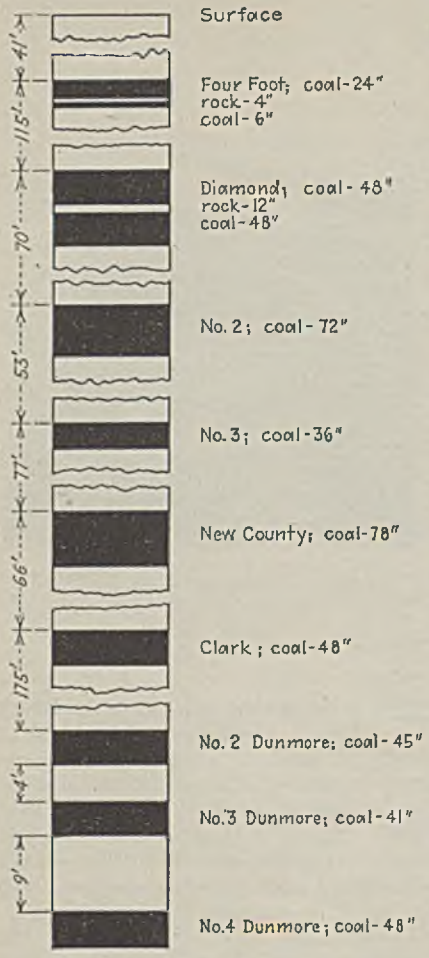


Fig. 2—Columnar Section, Showing Veins Worked at Price-Pancoast.

Second mining consisted of skipping the sides of the pillars to reduce their width to about 12 ft., after which the sections were flushed with culm. The remaining 12-ft. pillars, abandoned as unminable, are now being recovered with conveyors.

Recovery of the crushed sections in the Clark and No. 2 and No. 4 Dunmore veins is the most notable achievement in the company's conveyor-mining program, and the coal from these sections is in large part responsible for maintaining the tonnage of the mine. During the squeezes of 1916 and 1919, the openings in these two veins were filled with rock, and some of the coal pillars were subjected to crushing. In reopening the crushed sections, single gangways are driven as shown in Fig. 6. These gangways are cut through the pillars as far as possible, thus eliminating the handling of caved rock in all of the old openings except such crosscuts as may be encountered.

Development standards at Price-Pancoast provide for a minimum clearance of 2 ft. at the sides and 1 ft. over the top of the car after loading. Consequently, gangways in crushed ground are generally driven 11 to 12 ft. wide and 7½ ft. high. The height is gained by taking up the bottom rock under the pillars. The dimensions of the gangway permit the setting of one row of timbers on each side and the installation of collars across the top. The original height, in addition, allows for some settlement of the top and the installation of additional collars, while maintaining the standard height of 6 ft. above the rail.

Gangways in crushed ground generally are forepoled with 4-in. timbers, except in certain instances where the roof over the pillars is sound enough to stay up until it can be timbered. As the face advances, a gangway is timbered with selected round oak timbers on centers averaging 4 ft. Legs and collars are both made of 12-in. round timbers, and consecutive sets are spragged with 4-in. timbers at the top and bottom of each leg and at each end of the collars. As a result of experience gained in this type of work, the company has adopted the leg-and-collar joint shown in Fig. 7 to reduce the breakage of collars due to settlement of the overlying strata. As the roof comes down, the top of the leg has an opportunity to flatten out by crushing, thus saving the collar. The company also has found that the life of individual props in settling ground can be lengthened an average of four times by setting them on 4- or 5-in. soft wood blocks and using 3- to 4-in. soft wood cap pieces. The blocks and cap pieces absorb the settlement by crushing, thus preserving the timber.

No attempt is made in driving through crushed ground to take down rock to reach a permanent roof. Gangways are made exact size, and the timbers form the roof. Rock removed in driving is gobbed in the gangways as far as possible without reducing their width. Otherwise, it is loaded out in cars. Recently, however, the company has begun to mine out into the pillars on the side of the gangway opposite the chambers. The extra width is used as

The majority of mechanical loading programs are made or broken by the men who are called upon to operate the machines. A large part of the success of the Price-Pancoast program has been due to the fact that the company sought the cooperation of the employees. When conveyor mining was first considered, the company's situation was explained fully to the men, with the result that they accorded mechanical loading their full support. This spirit of cooperation has grown stronger year by year as officials and miners have joined efforts to evolve the present successful operating methods and equipment.

Installation of mechanical equipment, in general, brings about a reduction in the labor force. At the Price-Pancoast colliery, however, the use of conveyors was responsible for an increase of 25 per cent in the number of men employed, due to the fact that the company was able to mine veins which would have presented a prohibitive cost if hand methods were attempted.

Fig. 3—Driving up a Pillar With a Conveyor.

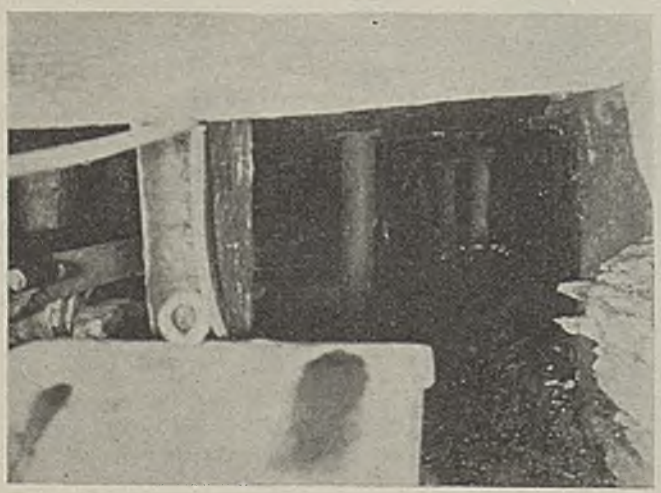
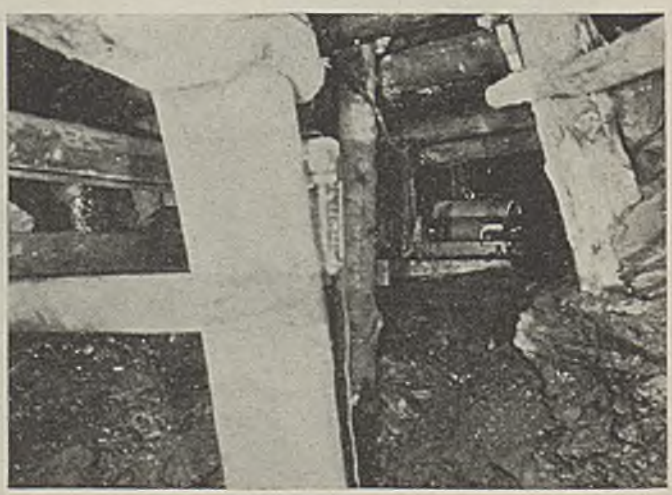


Fig. 4—Discharge End of Shaker Conveyor.



a rock storage, and where this can be done, the quantity of rock loaded out is materially reduced.

Recovery of the chamber pillars in crushed ground is done as the gangway advances. Otherwise, development expense would be prohibitive. The outstanding feature of the robbing system is the fact that all work, except for the crosscuts encountered, is done in the coal. The bottom is left in place, and the caved material in the old chambers is not disturbed. Pillar recovery takes place in two stages, first skipping up the side and, second, drawing back the remainder of the pillars by open-ending. The work is so scheduled that one conveyor is drawing back the pillars in one chamber while a second unit is skipping the pillars in another chamber (see Fig. 6).

Preliminary work in starting a pillar is done by hand until the opening is in far enough for the shaker engine to be set. In driving up the side of the pillar, just enough space is left for the shaker chute and three rows of 6-in. timbers. One row is set along the gob, another is set along the coal, and the third is placed along the shaker chute. Where the top is fairly good, individual props are used, but under bad top, 5- to 6-in. collars are employed. As a rule, the opening in going up a line of chamber pillars is about 6½ ft. wide. In bringing back the remainder of the pillars, the coal either is pitched out to the

Fig. 5—Conveyor Mounting Used at Price-Pancoast.

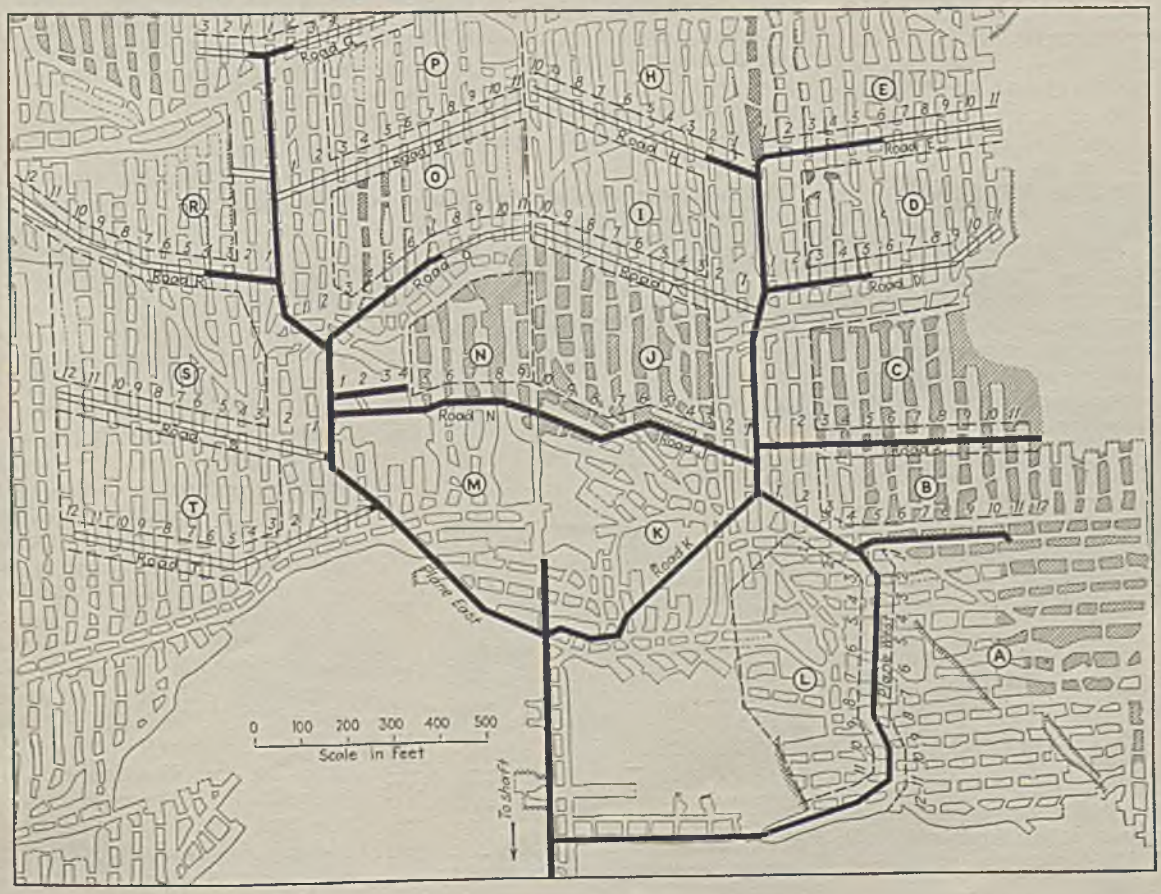
chute or an angle section or sections may be inserted in the conveyor to turn it around the end of the pillar, the method depending upon the width. To protect the gangway, a row of stumps is left on both sides until the last of the pillars is recovered. These stumps are then removed on the retreat, and the gangway is abandoned. Thus the life of a gangway ends when it reaches its limit.

By making the skips only 6½ ft. wide, the timber required is reduced 75 per cent from that which would be necessary if mine cars were used. One evidence of the feasibility of robbing on the advance in the crushed sections is the fact that gangways are still open six months after the pillars and stumps have been removed and, except for an occasional broken collar, compare favorably in condition with the main haulage road shown in Fig. 1. This is due to the fact that the rock in the chambers acts as a substitute for the coal pillars.

Mining on the advance is characteristic of only the crushed sections of the Clark, No. 2 and No. 4 Dunmore veins. In the other sections in the various veins, which include both pillar coal and a relatively small acreage of solid coal, the retreating system is standard. While these pillar sections have not been subjected to extreme effects of squeezing, the old openings have been obstructed, in general, by fallen material. Consequently, new gangways must be excavated to reach the majority of the pillars, and these, as in the crushed sections, are driven through the pillars in most cases. Chamber pillars are then recovered on the retreat. The same method of skipping with shaker conveyors employed in the crushed sections is used also in this work to avoid the timbering and rock handling that would be necessary in reopening old chambers.

Such solid coal as is left also is mined on the retreat. Development gangways are driven in the coal, and

Fig. 6—Development Plan Used in Recovering Chamber Pillars in the Crushed Sections of the Clark Vein.



enough bottom is lifted to give the desired height. The chambers are driven by shakers as the gangway advances. When it reaches its limit, the pillars are robbed on the retreat, using the same conveyors with which they were driven.

As shown in Fig. 2, the interval between the No. 2 and No. 3 Dunmore veins averages only 4 ft., while the interval between the No. 3 and No. 4 Dunmore veins is only 9 ft. In view of this condition, the original workings were columnized, but have since collapsed. The three Dunmore veins are at present operated largely from the No. 4, though some sections of No. 2 and No. 3 veins are reached from the shaft and slope landings, respectively. Rockholing is the general practice, of course, where the work is done from the No. 4 Dunmore vein. The interval between rockholes varies in accordance with the vein to be worked. From the No. 4 to the No. 2 Dunmore, rockholes are spaced 150 ft. apart. At the top of the rockholes, where the No. 3 Dunmore is minable, shakers are set up to extend a maximum distance of about 300 ft. Along the shakers, a second series of rockholes are driven 50 ft. apart through the 4-ft. interval, so that the top of each hole strikes the center of an individual pillar in the No. 2 Dunmore vein. This pillar is then mined out by pitching the coal to the rockhole which feeds onto the shaker conveyor. The shaker in turn discharges into the rockhole between the No. 3 and No. 4 Dunmore veins which feeds the coal into the car in the latter vein.

Where the No. 3 vein is not minable, rockholes 150 ft. apart are driven directly up to the No. 2 Dunmore vein. A shaker is set up at the top of the rockhole and extended sufficiently for working five sets of chamber pillars. Pillars are recovered with a second shaker, which feeds onto the first.

Mining operations at the Price-Pancoast property are controlled by yearly forecasts drawn up by the general manager and mining engineer in cooperation with the mine officials. The yearly forecasts are based on a five-year program drawn up in 1929; tonnage estimates, however, have been increased through successful mining of the crushed sections and other areas then considered unminable. Yearly programs are prepared on the assumption that full running time will be possible, which so far has been the case, and detail the exact starting date of each particular section and road, thus giving the mine officials an excellent opportunity for laying out and controlling their work and employing labor.

Table I gives the average performance of the shaker conveyors in use at Price-Pancoast in the first half of December, 1932. At that time, the average

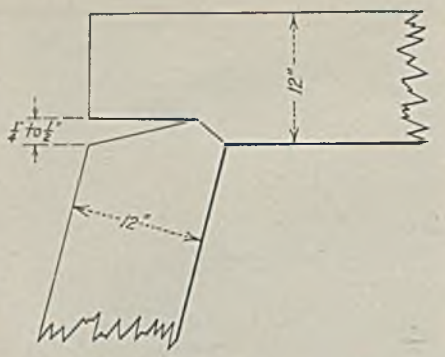


Fig. 7—Joint Used in Assembling Timber Sets.

number of machines working was 54 and the daily machine production was 1,433 gross tons, making the average output per machine per day 26.6 tons. Output per place is somewhat larger, inasmuch as some of the machines are used solely for relay work in rockholing in the Dunmore veins. The majority of the conveyors were operated two shifts of eight hours each; nineteen were worked three shifts; and four operated one shift. Average number of man-shifts per day in producing 1,433 gross tons was 219, making the average production per man per shift 6.5 tons.

In general, two men, a miner and laborer, comprise a conveyor crew and do all the work, though a few crews are made up of either three of four men. Compressed-air drills are used, and all firing throughout the mine is done electrically. In the first half of December, the average daily hand-loaded tonnage was 187, or 11.5 per cent of the total. Rock loaded into mine cars for disposal on the surface averaged 300 tons per day. With 54

Table I—Average Performance, Shakers in Operation at Price-Pancoast Mine, December, 1932.

Type of Conveyor	No. in Use	Number of Shifts Operated	Total Man-shifts per Day	Total Tons Loaded per Day*
Surface Vein				
Vulcan	1	1	2	14
Eickhoff (air)	2	1	3	15
Diamond Vein				
Vulcan	5	3	30	209
Schmidt-Kranz	1	1	4	21
No. 2 Vein				
Vulcan	7	2	24	160
No. 3 Vein				
Vulcan	2	2	10	71
New County Vein				
Vulcan	3	2	12	52
Clark Vein				
Schmidt-Kranz	4	2	32	208
Eickhoff	1			
Vulcan	4			
Ladel	1			
Nos. 2 and 3 Dunmore Veins				
Vulcan	6	3	24	163
Vulcan	5	2	20	136
Eickhoff	4	2	16	109
No. 4 Dunmore Vein				
Vulcan	3	3	18	122
Eickhoff	5	3	24	153
Total	54	..	219	1,433
Tons loaded by hand				187
Grand total				1,620
Tons rock loaded out				300

*Gross tons actually loaded into mine cars.

machines out of 72 on hand working in the first half of December, the remainder were accounted for as follows: not working, 10 air machines (used only in short places or gaseous sections); being moved and installed, 6; and in the shop for repairs, 2. Total machines on hand were made up of the following types: Eickhoff, electric, 13; Eickhoff, air, 12; Vulcan, 41; Schmidt-Kranz, 5; Ladel, 1. Power is supplied by 7½- and 10-hp. Westinghouse SK d.c. motors.

Shaker chutes are carried on wooden rollers (see Fig. 5) supported in wood brackets. Both rollers and brackets are made in the company's woodworking shop. The brackets are cut out of 3x6-in. scantlings. These are bored at the center and are bushed with 1¼-in. pipe. The wooden rollers are bored through the center to make a tight fit for a 1-in. shaft made of ordinary round steel. The rollers and brackets are assembled by nailing them to 1x6-in. boards, one at each end of the brackets. The assembly rests on the bottom, except where it is necessary to elevate the chutes to enable the conveyor to discharge into the mine cars.

All shaker engines are mounted on concrete foundations. The company feels that the use of jacks for holding the drives would be impracticable in the squeezed and settling ground encountered, inasmuch as it would be impossible to remove them after the roof settled. In addition, bolting drives to concrete foundations eliminates any possibility of movement, and, in driving up chambers in developing solid coal, the foundations are always ready for the machine when it is set up on the retreat. Mine rock is the chief ingredient used in the foundations. Height is dependent upon the amount the chute must be elevated to discharge into the car, and where this elevation is relatively great, the foundations are braced with two 6-in. timbers placed in line with the axis of the chutes. These timbers are embedded in the concrete and hitched into the bottom for permanency. Ten-foot chute sections are used over the drives to prevent fines from dropping into the engines; elsewhere, 8-ft. sections are standard.

Development is so arranged that the conveyors, where possible, will have the grade in their favor. Occasionally, however, it is necessary to bring the coal upgrade, and this has been done successfully on adverse slopes up to 5 deg. It frequently is necessary, as mentioned above, to turn the conveyors around the ends of the pillars in open-ending, and, in addition, where the pillar is irregular in section or changes direction, the direction of the shaker is changed. Shakers are made to follow the coal, and to do this, short angle sections (approximately 3 ft. in length)

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SHERWOOD MINES

+ Again Pioneer—This Time

In Dehydrating and Drilling

By R. DAWSON HALL
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MANY of the most important developments in the technique of strip mining have originated at the mines of the Central Indiana Coal Co. and the Sherwood-Templeton Coal Co., of Indianapolis, with mines located at Linton, Greene County, Indiana. Among their pioneering methods have been the introduction of washers at strip pits, the use of automatic drop-bottom pit cars, and the development of a calcium-chloride treatment to prevent coal from freezing, which treatment the companies have replaced recently by a new method of dehydration.

Horizontal drilling of overburden, which has met with great success and is now being used extensively in other strip mines, also was developed in the pits of the Central Indiana Coal Co.

The management of these companies, which is identical, has long been convinced that a link was missing in the wet method of washing coal. Manufacturers of washing equipment had never discovered a satisfactory means of extracting so much of the excess moisture in coal that the consumer would not be handicapped during winter months. Devices for dehydrating coal, such as centrifugal dryers and rotating drums, have two great objections: one, their initial cost, and the other, the fact that they degrade the coal, making an excessive quantity of fines.

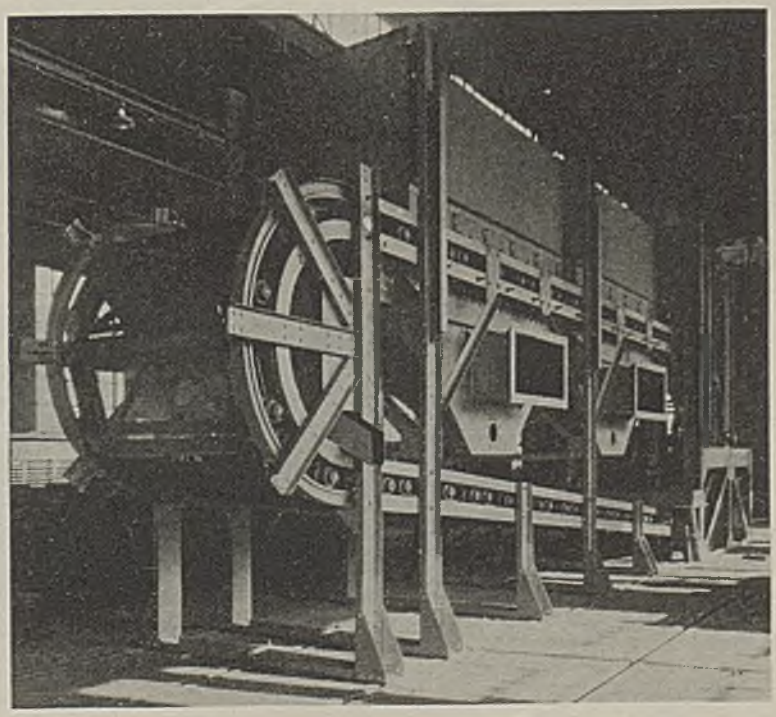
Excess water in the coal gives trouble only in the smaller sizes. It has been found that the sizes above ¾ in. do not retain excess moisture, but, through capillary attraction or skin friction, minus ¾-in. coal will hold water for many hours much like a sponge, the quantity of water being held depending upon the percentage of fine coal present. The problem therefore has been to extract excess free moisture from the ¾-in. screenings, other sizes giving but little trouble.

The first attempt by this company to meet the problem was through the use of calcium chloride, and for some years the difficulties from freezing were mitigated by the introduction of a calcium-chloride solution into the cars which had been loaded with screenings. The process used was to allow the cars to drip for 24 hours, during which time about 75 per cent of the free moisture would be eliminated by seepage.

In severe weather, it was necessary to keep heat around the bottom of the cars to prevent the cracks through which the water percolated from freezing and sealing the water inside the car. After 24 hours of dripping, a calcium-chloride solution was forced into the bottom of the cars under pressure by means of a spearhead or well point perforated at its end. This spearhead was forced down through the coal to a point a foot or so above the bottom of the car (which is the place where most of the moisture, hence the ice, is most troublesome). The calcium chloride thus introduced mixed with the moisture still remaining in the coal and to a certain extent prevented severe freezing.

Though this method proved helpful, the company decided early in 1931 to meet the problem by dehydration. With this end in view, the officials invited the Oliver United Filters Co., which made drying equipment for other products, such as salt, paper pulp, etc., to cooperate with them. After six months' experimentation at the Friar Tuck mine of

Fig. 1—Dehydrator, Friar Tuck Preparation Plant, Central Indiana Coal Co.



the Sherwood-Templeton Coal Co., apparatus was developed which has recently been placed on the market by the Oliver United Filters Co. The main unit consists of a conveyor resembling an apron conveyor such as is used for loading booms and picking tables. It consists of a series of trays with fine-mesh bronze screens.

Minus ¾-in. coal travels horizontally on this conveyor for a distance of about 25 ft., and at right angles to an inflow of hot air provided by a small furnace. The hot gases of the furnace are mixed with outside air, resulting in a mixture of air and gas which is kept at a temperature of from 500 to 700 deg. F. This air is drawn by an exhaust fan from the furnace into a mixing chamber and thence through the coal as it travels on the conveyor just described. As the coal moves along the conveyor in a horizontal layer about 4 in. thick, the hot air drives off its excess moisture as vapor.

Hot air, introduced at the top of the dehydrator, in passing through the coal picks up the moisture, then passes through the wire-mesh screen at the bottom of the conveyor, through the exhaust fan, and out into the atmosphere in the form of wet vapor. By an ingenious air-locking device around the conveyor, cold air is prevented from entering the dehydrator except such as is needed to reduce the hot furnace gases to a predetermined temperature. By regulating the temperature of the hot air and the speed with which is passes through the coal, enough excess water can be extracted to render the finished product safe from frost at any temperature to which it may be subjected.

By means of a thermocouple located in the duct going to the dehydrator, the temperature of the air passing through the coal is kept absolutely constant, and, with the exception of one man to tend the furnace, the device operates automatically. The advantage of this method of extracting excess water from coal is that the first cost is low and, further, that the coal is not disintegrated, because it passes through the machine without agitation of any kind. Hence, no additional fines are produced. The method of regulation also is found to be sensitive.

Operating cost consists of wages of one attendant and power required to drive the machinery. For 80-tons-per-hour output, this consists of one 60-hp. and two 5-hp. motors, the first operating the exhaust fan and the other two the stoker and conveyor. Friar Tuck mine produces about 2,400 tons of coal daily, the sizes below 4 in. being passed through the washer. The capacity of the dehydrator is approximately 80 tons per hour, which is sufficient to extract excess water from all coal of a size below ¾ in.

The horizontal method of drilling, to which reference has already been made, also is a most interesting development. In strip mining the big excavating shovels, now moving from 10 to 20 yards of material at one cycle of operation, dig the dirt, rock and shale overlying the coal and set it to one side, thus exposing the coal bed, which lies in a horizontal sheet from 4 to 6 ft. in thickness beneath the surface of the ground. At present, shovels are developed which thus uncover coal lying as much as 60 ft. below the original ground surface.

This stratified material over the coal generally is too hard to be dug by the shovels, powerful as they are, without first having been loosened by blasting. The conventional method of shooting has been to drill vertical holes from the top by means of well drills. Into these holes powder or dynamite is placed in sufficient quantities to shake up, or fragmentize, the material, so that the big dipper can be filled readily. In drilling these vertical holes it is necessary to penetrate layers of limestone and sandstone and other hard materials.

As the holes are vertical, they fill with water, making it necessary in most cases to use gelatin dynamite, a more expensive form of explosive than powder, but one unaffected by water. The complete cost of drilling and shooting overburden is from 15 to 30c. per ton of coal mined, depending on the height of the bank and the thickness of the coal mined. It forms a considerable item in strip mining.

The horizontal, or "grid," method of drilling and shooting as developed on these properties is revolutionary. Instead of drilling the coal from the top down through the hard material and tapping beds of wet sand and gravel, the method now used is to bore horizontal holes 3 or 6 in. in diameter, 2 or 3 ft. above the coal to a depth of 50 or 60 ft., the length of the hole being made to correspond to the cut or swath that the stripping shovel is expected to dig and cast to one side.

Directly over the coal seam the material is almost universally slate or shale. The drill, which is now being marketed by the Allendale Manufacturing Co., Inc., of Indianapolis, Ind., consists of a large auger operated by an electric motor, the auger head being equipped with a clawlike cutting tool known as the Molefoot bit. This machine, as now developed, will perforate almost any material except hard limestone. Holes are spaced 15 to 20 ft. apart. After a series of five to eight holes has been drilled, a small charge is exploded in the far end of each hole, known as the springing or chambering charge, which enlarges the end of the hole to enable it to take an added quantity of explosive. The series of holes is then loaded with powder, the charge being carried out to within 10 ft. of the hole opening. All the holes are then exploded simultaneously.

This method of shooting overburden has many advantages. By using horizontal holes, the explosives can be more evenly distributed throughout the surface to be loosened, thus economizing on powder. As the drilling is horizontal and the drill penetrates a homogeneous material, the bit cuts with comparative ease and the drilling cost per foot is reduced. Holes thus drilled generally are dry, permitting the use of powder as an explosive, which is much cheaper than dynamite. Because of the lowered drilling cost per foot and the saving in explosives through better distribution in the material to be shot, it has been found that the over-all cost of shooting overburden with horizontal drilling of boreholes in a favorable stratum generally can be decreased 50 per cent.

Fig. 2—Machine Drilling Horizontal Hole From Top of Coal Into High Wall at Allendale Mine.

WILL UNITED STATES

+ Follow Europe in Wide Use

Of Steel Arches, Posts and Straps?

By R. DAWSON HALL
Engineering Editor, Coal Age

Fig. 1—Steel Timbers in a Nova Scotia Mine.

ONLY in recent years has roof support in coal mines received intensive study, though a clear understanding of the subject is essential to safety. Roof support is of two kinds: permanent and temporary. Permanent roof support is planned to sustain forever the weight of the entire roof. These permanent supports are either the coal pillars themselves or backfilling.

Temporary support does not attempt the sustenance of the entire roof. That function is left to the unextracted coal. Its only purpose is to hold up the material which is or has become parted from the main roof above the space from which coal has been extracted. This has been termed the immediate roof. Any attempt on the part of the temporary support to do more than keep the loose rock up against the roof proper produces strains in that temporary support, which may exceed its strength and cause collapse, allowing rock which is broken across the bedding planes to fall. In fact, sometimes it is not desirable that the loose rock be held up against the main roof. All that is needed is that the support shall prevent the loose material from bending to such a degree that it will break.

It must be remembered that the loose material may be of great thickness. The expressions "drawrock" and "drawslate," so common in coal technology, usually are held to refer to material which is loose before mining or becomes loose soon after mining. If a rock does not sound like a drum when struck, it is not regarded as "drawrock."

Perhaps usage best determines the meaning of a word, but any rock that draws loose in the sagging of the roof is, in that sense, a drawrock, even if its thickness is 100 ft. and even if it gives no hollow sound or recognizable vibrations when struck by a bar. The work of the support is to hold up all such loose material, however thick, to a degree at least that will prevent breakage, so long as the support is expected to function, or, at least, for its natural life.

Crushed ground, where the roof is already fractured clear to the surface, introduces another condition, for here the stresses in the roof tend to form themselves into an arch over the rooms or headings in the coal or between permanent supports. Within the stress arch may be loose material needing support, and the ideal temporary support should suffice to hold up the broken rock within the arch and yet not attempt to resist any movement of the ground which has arched. Again, the material above the coal may be subject to oxidation and expansion, both vertical and lateral.

The temporary support, if it is to accomplish its work satisfactorily, must be ready to yield a little to accommodate the uneasy movement of the main roof under strain and the sagging of an extremely heavy drawrock—say 50 to 100 ft. thick—but it must support all broken material that would otherwise fall in the opening. Hence, it is said that these temporary supports should be "flexible."

Need to allow some roof movement has long been recognized, and indeed provided, by use of crushable caps, penetration of the floor, tapered posts, slack bedding, the bending of the prop, caving chambers and even baled-brush lagging. Such provisions show that for many years the "flexibility" of timber has been recognized as inadequate. Obviously, steel supports as ordinarily constructed in America will be found even less flexible, and that fact has been demonstrated. Yet there are plenty of roadways where steel sets with wood lagging have been found quite equal to their task, but that is where there is no crushed condition and no roof expansion, and the roof span is so short that the pillars save the steel from excessive loading. Steel sets merely perpetuate the ill design suggested by, and necessary, with timber. Steel should be designed to accord with its flexibilities. Moreover, the rectangular or trapezoidal support of the steel set is certainly not the way to uphold a roof that has already broken into the form of an arch.

In the anthracite region, many beds are worked one above another, and the roof becomes broken into a series of separate strata, and, these becoming fractured, the roof finally has strength only that results from the stresses forming themselves into arches which span from pillar to pillar. However, that does not furnish protection, because there is material below and within such an arch that for safety must be supported, unless it has already completely fallen.

Where there also is expansion of stratum, some such linings or flexible steel supports are indicated. Steel arches are to be recommended also even in those few cases where their flexible character is not needed but where the roof naturally arches to some height and the steel arch will fit the arch cavity and prevent the arching from extending further by caving. In mines are many such places. Hitherto, with a roof of arched shape and steel sets, timber has had to be erected above the steel caps, making a weak, unsafe, im-

Article read at the meeting of the Coal Mining Institute of America, Pittsburgh, Pa., Dec. 15, 1932.

permanent support and one that resists the passage of air and often harbors methane.

Flexible steel posts are helpful for roadways in longwall. They should be not only flexible but collapsible, so that they can be rapidly and safely drawn from a short distance, the operative being protected by other flexible steel posts which will afford safety. Large quantities of steel are used in Europe to support the side roads in longwall on which an immense load inevitably falls.

Steel arches, in their earlier development, were usually of horseshoe shape and constructed in two parts united at the top by a fishplate. Arches of that shape are still used in Great Britain, but they have decreasing popularity, because it has been found that the arch with straight legs, vertical or slanting, gives the better service. In fact, the slant leg seems, today, to get the vote.

Steel rails, new and rerolled, have been used extensively in England for this purpose. The tendency is toward increased cross-section, because the girder arches, even though strong enough in the plane of the arch, warp readily at right angles to that plane. The steel arch is expected to suffer some deformation, but this can be lessened by supplying the feet of the arch with steel or wood stilts which, being held to the girder only by friction, will allow the arch to slide down should the pressure become excessive.

When arches become deformed, they may be straightened: (1) by the use of a portable press that can be taken to the point where the arches have been deformed, or (2) by the use of a stationary press at the shaft bottom, or (3) by heating them in a furnace and straightening by a press on the surface.

The steel arch is not wholly foreign to American mine practice. Some time back James S. Pates, president, Export Coal Co., Pittsburgh, Pa., designed and patented a channel chamber arch, marketed by the Mine Safety Appliances Co. The arch had a 20-ft. radius and, having three telescoping parts, would span headings 11 to 14 ft. wide or 8 to 11 ft. wide.

More recently, the Commercial Shearing & Stamping Co., of Youngstown, Ohio, and the Truscon Steel Co., of Cleveland, Ohio, have introduced timber linings that may be used as a full arch or as a camber arch. The plates, which are corrugated, bolted on the inside and only about ⅜ in. thick, have been installed by several companies in both anthracite and bituminous coal regions. These tunnel linings have the advantage of supplying a fireproof lining, for there is rarely any reason to use any combustible material behind them. Moreover, the linings are both arches and lagging, thus saving the cost of the latter and avoiding the fire hazard that accompanies the use of such material where wood rather than steel is used.

British mine inspectors believe that steel arches have done much to increase safety and in their annual reports urge their use. In Great Britain, between 1,500 and 2,000 miles of roadways have been arched with steel, and in Nova Scotia, at the end or near the end of 1931, over two miles. The insert in the head of the article shows some of these steel timbers from a paper by A. S. McNeill and J. Kalbhenna read before the Mining Society of Nova Scotia.

Many Langham steel jacks have been used in the United States for the support of the roof. A much larger number of steel posts have been used in Great Britain. These usually are of much lighter construction, being light I-beams, or what are termed by the British "steel joists." Though nothing is more inflexible than the plain steel prop, it has its value because it is reliable and strong and because it can be put on a yielding base and covered by a yielding cap. The strength of wood posts is uncertain, and if one prop in a row fails of its duty, the others have to bear the burden, and trouble is likely to ensue. These posts can be cold-straightened when deformed and will lose little strength. In one instance such bent props actually proved, by government test, to be stronger after cold-straightening.

In Great Britain and Nova Scotia, many tube posts have been used (see the Security post illustrated in Fig. 3). The tubes are strengthened with a tightly fitting turned pine filler, 6 in. shorter than the tube, with hardwood plugs at each end, usually projecting some inches and driven in till they meet the pine core. The tube is 4¼ in. external diameter and ¼ in. thick, and the plug projects about 2½ in. The plugs are expected to become burred and crushed flat. If that happens, the post is shortened almost 5 in., allowing that much roof movement without the destruction or distortion of the post. These props should be well suited to rooms where props are soon recovered and to longwall where recovery is continuous. After being bent and cold-straightened, these tubes recover almost all their strength, and in one government test appeared to be stronger than ever.

A typical post, and one largely used in Britain, is the S. F. prop (see Fig. 2) which consists of a 3x3-in. steel joist with a footing at the base and a conical socket at the upper end held in place by a wedge which is driven into position when the prop is set. The end of the joint is cut at a suitable angle, and the wedge slides between it and the socket. The latter is secured to the joist by a sliding bolt, and the wedge is so arranged that it cannot fall out and be lost.

In the socket is placed a fitted tapered plug about 9 in. long and projecting 1½ in. When the weight comes on this wood plug, it is pushed into the socket and thus gives leeway for the roof to come down. However, when the joist has been used and the plug has been driven in, it is customary, at least at Cannock Chase Colliery, to use a 6x15x18 in. cap piece over the prop thereafter. Consequently, the yield in general is in the cap rather than in the wedged movement of the wood plug. The wedge makes it easy to set the post and to withdraw it, for the socket lifts about ¾ in. when the wedge is driven in and lowers about that much when driven out. These props should serve admirably as safety posts. They are simple and strong and readily can be straightened.

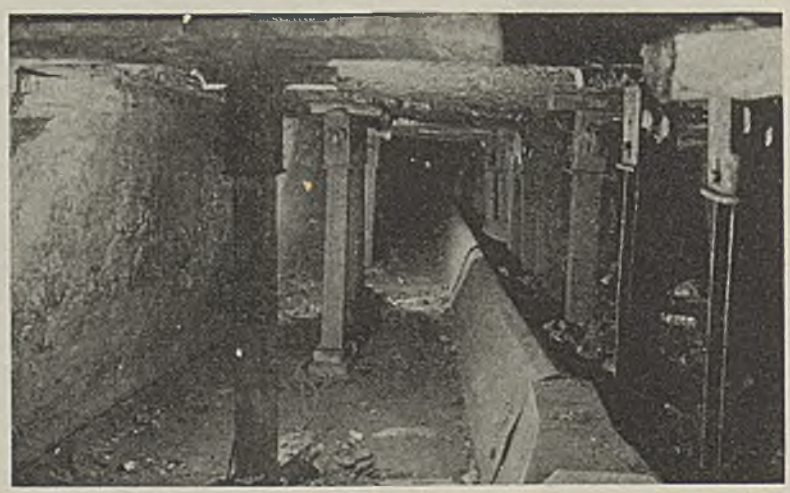


Fig. 2—Props With Adjustable Wedge Heads.

Other flexible posts are the Butterley, Connell, Nellen, Saar, New Saar, Cannock, Blitz, Tait, Berrisford, S.A.M., Mureaux and Schwarz. British studies show that the yielding, or flexible, type of prop has a lower ultimate crushing strength than the tube prop.

In the Yorkshire Division of Eng-

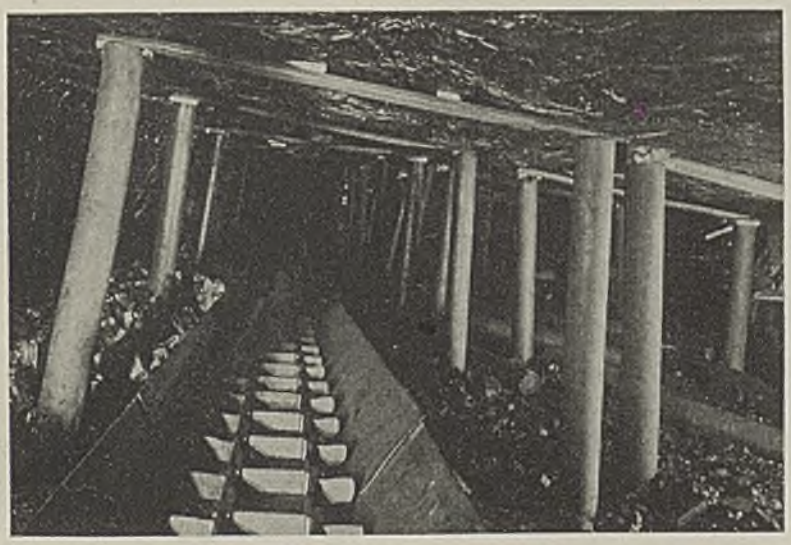


Fig. 3—Tube Props With Corrugated Steel Cap Pieces, or "Straps."

land, the number of steel props used increased 67 per cent in 1930; no fewer than 78 mines were using steel props and arches in Yorkshire at the close of that year. A total of 75,000 steel props were used in 32 mines in that district. There were 61,000 rolled steel-joist props, 13,000 tubular wood-filled props and 930 of other kinds. In South Wales, there were 120,000 steel props in use.

In Germany, the flexible prop has been extensively used. Of the Schwarz prop alone, 250,000 have been sold, also large quantities of Nellen props. During 1928, Mureaux props to the number of 4,500 were installed at La Houve Colliery, in the Moselle coal field of France.

It is asserted that steel props prevent the roof from lowering and fracturing; keep the faces open; make it unnecessary to set and withdraw wooden chocks, and, being of uniform strength, prevent the formation of cross breaks; they reduce the number of falls and of minor face accidents.

Today, rooms are driven so rapidly and pillars drawn so promptly that steel props can now be installed with advantage, not only in longwall, where they are withdrawn, but in rooms. Particularly in America is this feasible because of the high rate of advance. In 40 working days, and in some cases 20 or fewer days, a room is driven the entire 240 ft. or more from neck to ultimate face. The pillar will be drawn back as fast.

Consequently the use of steel props becomes less of an extravagance than it was when a room, with only one man to a working face, might be a year in driving, and when pillars were left to be drawn perhaps a year or a decade later and in a most dilatory way. If double shifting is practiced, as is sometimes the case, and with faces cut, shot and coal loaded twice or three times a shift, the props would be in place from one day to twenty or less, and steel would seem a far more attractive proposition, for more of it would be recovered.

In very dirty coal with drawslate, binders and impurities, withdrawal of props might be impossible. In this case, perhaps the use of wood is inevitable. Many are advocating, and machine loading is making imperative, the bringing of all coal, however impure, to the surface for recleaning (see B. M. Bird, before the American Mining Congress, 1932). In this event, the floor would be clean, and props would be easily and safely removed. When they are so removed, the coal is more completely recovered and can be obtained in larger sizes, which, of course, is a desirable condition where coal is needed for domestic use.

In English parlance, a "strap" is a cap piece. It may be of wood or of steel, a rail or a corrugated plate. It may be relatively short or it may extend over three or more posts. One end may be sunk in a hole in the face. In what follows it will be regarded as a corrugated *steel* plate of varied length, width and thickness. In Nova Scotia (No. 16 colliery) such straps are 5 ft. long, 5½ in. wide and ¼ in. thick. In Princess Colliery, they are 7 ft. long.

Accident rates from falls of roof and sides are many times more numerous per man-shift in the United States. One reason for the immunity on the Continent of Europe is the use of safety props and straps. In the United States, safety props that are erected temporarily and later removed are occasionally put at the end of a room road. In Great Britain, they are sprinkled freely over their long faces. As they are difficult to set, the miner in America resents having to erect them, and too often does not set them in a workmanlike manner. Here it seems is a possibility for improvement in methods. The safety prop should be of steel and not excessively heavy. It should have an easily adjustable screw or wedged head so that it can be adjusted to the roof in a few minutes.

Without question steel supports will revolutionize mining, especially where adverse roof conditions are found. In some cases a rigid support will be desirable; usually some slight yield will be preferable; and in other cases a still more flexible support will be necessary.

▼

Conveyor Mining Overcomes Adverse Conditions At Price-Pancoast Colliery

(*Concluded from page 6*)

are inserted between the regular chute sections.

Angle sections are made up in the company's shop from broken chutes. One end of each of the two pieces of chute which comprise a section is cut on an angle to give the desired turn, and the two pieces are lap-welded together. Lugs are riveted on each end for bolting the angle section to the regular chutes, and a stiffener of ½x4-in. flat steel is welded on each side. Sections having an angle of approximately 30 deg. are most used, one or more being installed, with chute sections between, to give the desired turn. While unusual, five 45-deg.. angle sections have been used in the past on one conveyor, the turns going both to the right and the left. Chains anchored to posts are applied to the angle sections to keep the conveyor on its track.

As all chamber pillars are recovered entirely with conveyors, an exact comparison with the quantity of rock handled in recovering pillars with mine cars has not been possible in late years. The reduction, however, has been substantial, with a corresponding decrease in operating cost. The enviable operating record of the Price-Pancoast colliery also is believed to be due in part to the adoption of conveyor mining and, in late years, forecasting. Up to the middle of December last year, the mine had operated every working day since February, and a few of what usually are counted holidays. Since 1925, the colliery has lost only 16 working days.

SAFETY BELOW!

+ Theme of Meeting of

Coal Mining Institute of America

ONLY one paper at the Forty-Sixth Annual Meeting of the Coal Mining Institute of America, which convened in Pittsburgh, Pa., Dec. 15 and 16, related exclusively to surface problems; the others were almost entirely studies of underground needs and conditions and covered steel roof supports, mine illumination, compensation insurance, protective apparel, methane in air currents, accident prevention in general and from falls of roof in particular. E. A. Holbrook, president of the institute, occupied the chair at all meetings.

Progress in Europe in the use of steel arches; cambered arches; steel posts, flexible and inflexible; steel straps and safety posts was reported by R. D. Hall, engineering editor, *Coal Age*, in an article entitled "Steel Roof Supports for Mines," which appears on pp. 9-11 of this issue.

At the afternoon session, C. W. Owings, associate mining engineer, U. S. Bureau of Mines, Pittsburgh, Pa., declared that coal absorbs 95 per cent of the light thrown on it. Only about 5 per cent of the light thrown on the working face in a coal mine is reflected for the use of the mine worker. Fresh limestone dust absorbs only about 30 per cent and reflects about 70 per cent of the light. So limestone dust enables the miner to receive approximately fourteen times as much light as he receives when the coal is not thus covered. Ten foot-candles suffice to illuminate an office desk; so about 150 foot-candles would be needed to define the coal face with equal distinctness. A broad field of light is of assistance, for it has been found that, while the eye cannot discern static objects over a range of 180 deg., it can note the movement of objects over that range, though some men have no perception whatever at an angle beyond 40 deg. on either side of the visual axis, or 80 deg. in all.

In plotting accident rates and the illumination intensities of lights on the same ordinates for given times in the day shift, Mr. Owings found that, with the carbide lamp, peaks of accident rate coincide at 10 a.m. and 2 p.m. with down peaks of illumination—that is, lamps are low then and accidents prevalent. At noon, the lamps usually are replenished, and accidents are at a minimum.

He declared, however, that the relation is in part accidental. There are other causes of accident than darkness affords, because, even with closed lights, where the decline in illumination is continuous and has no peaks, there are similar peaks of accident at 10 a.m. and 2 p.m., showing that illumination is not the sole factor.

However, it is observable with closed lights, Mr. Owings said, that the peaks of accidents are not so high as with open lights. In making these computations, all accidents underground had been taken into consideration. All that his research showed, he declared, is that illumination, as other factors, has a favorable effect on the accident rate, though some accidents are clearly due to the recharging of lamps. In all, he had studied 1,000 accidents, and found the accident frequency 205 in the open-light mine and 101 in the closed-light mine.

However, he declared, the closed light is often inadequate from improper use. Lampmen are too often chosen for their disabilities rather than for judgment and faithfulness. An injured man is made lampman because injuries prevent his performing more difficult labor. The high cost of introducing electric lamps and their decreasing ability to function should make the operator realize that he has an investment to protect, and, if that does not move him, a high cost of compensation to avoid by keeping his lamps in good condition. No man purchasing a high-priced automobile would hire an incompetent driver.

Electrolyte should be changed frequently. In one case the voltage was raised from 2.6 to 5.6 by a change of electrolyte. It should be remembered that the minor filament is not a working light, and should be used only in emergencies. It has been added solely for that purpose. Of the 1,000 accidents, 35 per cent appeared to be such that light might have entered into their causation. Supposing this light factor was the determinant, the direct cost of the accidents, which was 5.5c. per ton, would have been reduced 1.9c. had poor light been eliminated, and the hidden cost of 22c. would have been reduced by 7.7c. Surely, said Mr. Owings, this is a matter worthy of consideration.

J. T. Ryan, general manager, Mine Safety Appliances Co., Pittsburgh, Pa., discussing length of shift and illumination, said that only 10 per cent of the users of lamps have a shift length in excess of 8 hours. Such men could be given numbered lamps, which could be appropriately charged; low-amperage lamps or even extra lamps. In case distinction between men was not desirable, all the men might be furnished with low-amperage lamps.

In place of F. E. Bedale, safety engineer, Consolidation Coal Co., Fairmont,

Side Sight of Moving Objects
Poor Light, Many Casualties
Hire Only Good Lampmen
Change Electrolyte
Light on Long Shifts
Five-Year Accident Rating
Goggles for Short-Sighted
One Injury in Three to Head
Ropes Lifted by Hooks
Hands Need Gloves
Goggles in Shoveling
Red Tags Signal Insecurity
Over Million Tons Per Death
Calcium Chloride for Dust
More Drastic Legislation
Axes Sometimes Verboten

W. Va., who did not attend the meeting, R. N. Hosler, superintendent, coal-mine section, Pennsylvania Compensation Rating and Inspection Bureau, Harrisburg, Pa., described the methods and advantages of merit rating in Pennsylvania mines. The basis of experience is taken as five years. This seems to be a suitable length of time, as it carries over periods of rising and falling prices, and over increases in percentages of native and foreign labor with the large variation in the number of dependents incident thereto and the varying accident hazard of the two groups. With five-year experience, there will be no violent fluctuations in premium.

Ratings are more stringent than mining laws, which are, and always will be, based, in a degree, on compromise. Laws do not represent the best practice and are never kept abreast of the times. Rating, declared Mr. Hosler, has therefore stimulated the progress of safety. The promulgation of its standards has had an educational value.

"New Safety Ideas for Preventing Accidents" formed the groundwork for a question-box session conducted by W. R. Chedsey, professor of mining, school of mines, Pennsylvania State College, State College, Pa. He thought that one of the needs probably was for an unbreakable glass goggle that would rectify vision as well as protect the eye. He did not know whether such goggles were available. About 38 per cent of all injuries in Pennsylvania, said Mr. Ryan, were to head and shoulders, and 31 per cent of all the fatal accidents in that state were head injuries; these, he declared, were unanswerable arguments in favor of head protection.

Among the developments in safety at the mines of the Pennsylvania Coal & Coke Corporation, said J. T. Gatehouse, safety engineer, Johnstown, Pa., has been the requirement that a 4-ft. metal bar be used invariably to pry down boney. Some of the men have been supplied with wooden wedges for securing their props. He also described the detachable shunt which is detailed in this issue on p. 26 and which protects shotfirers from stray current.

A man recently cut his toe with an ax, said J. J. Rutledge, chief, Maryland Bureau of Mines, Baltimore, Md., but refused to buy safety shoes, saying that another man had cut his toe even more severely with the wire in his safety toe cap, a matter worthy of careful consideration. In Mr. Rutledge's State, the justice of the peace was an important factor in reducing accidents. A mine worker dreads being brought before the judge to explain, if he can, why he violated the law.

"Why we have cut our accident rate 40 per cent below that of last year" was the subject of the remarks of Fred R. Vinton, general superintendent of mines, Rochester & Pittsburgh Coal & Iron Co., Indiana, Pa. A safety print has been made for every mine, showing just how a room should be driven. There are only six rules in connection with this print and these are of simple character. The drawing shows where the dinner pail, caps, explosives and safety posts respectively must be placed. These prints are posted in the assistant foreman's office and in the check and lamp rooms.

Frank G. Dunbar
Institute's New President

In all cases, in reporting an accident an effort is made not to load the fault on the injured or his fellows but on the official in charge of the place. Records of accidents are kept as against the assistant foremen under whose supervision they occur. Each man knows his own record and so does everybody else.

At the mines of the Jamison Coal & Coke Co., said C. F. Keck, general superintendent, Pleasant Unity, Pa., job analysis has been stressed, and miners are trained in the best way to do their work. Mr. Keck keeps his figures on accidents in dollars and cents, which everyone understands. Frequency and severity rates are too difficult of comprehesion for the ordinary man and make no appeal to him.

Coal Mining Institute Officers for 1933

President: F. B. Dunbar, general manager, Mather Collieries, Mather, Pa.

First Vice-President: C. L. Lutton, safety director, H. C. Frick Coke Co., Scottdale, Pa.

Second Vice-President: G. W. Riggs, mine safety engineer, Mine Safety Appliances Co., Uniontown, Pa.

Third Vice-President: G. S. McCaa, state mine inspector, Pittsburgh, Pa.

Emphasis was laid by Morris Coulter, safety engineer, Clearfield Bituminous Coal Corporation, Indiana, Pa., on the need for inspection of old and abandoned places before cutting into them, because they may contain gas or water. It has been made a rule of his company that the man who is connecting shots shall have the firing battery in his possession, so that it will not be operated while he is exposed to the risk of a premature firing of the shot.

Because ropes and other metallic conductors are frequently charged, means are provided for lifting them without contact with the hands, said J. V. Berry, safety engineer, Bethlehem Mines Corporation, Johnstown, Pa. Hooks are provided and must be used in the coupling of links, even though coupling on the fly is forbidden. Many men are colorblind, said Mr. Rice, chief mining engineer, U. S. Bureau of Mines, and a safety lamp furnishes them with no indication of danger.

"Leather and rubber footwear now manufactured with toe-protection caps is as comfortable to wear as footwear without this valuable asset," wrote C. L. Lutton, safety engineer, H. C. Frick Coke Co., in a paper presented in his absence at the morning session of Dec. 16 by Professor Chedsey. "Therefore, it is difficult to comprehend the attitude of managements and workmen who refuse to take advantage of this protection, which involves no additional cost."

One coal company, said Mr. Lutton, 100-per cent equipped with safety footwear, cut its disabling toe-injury rate 60.33 per cent during the period 1930 to 1931 inclusive. Two companies had practically equal toe hazards. Company A had all its men fitted with safety footwear, whereas few of the Company B men had toe protection. In consequence the toe-injury rate of Company B was 465.09 per cent higher than that of Company A.

A coal company whose underground employees wear goggles continuously below ground reduced its eye-injury experience 95.32 per cent during the years 1929 to 1931 inclusive, with a 97.28 per cent decrease in eye-injury compensation and hospitalization costs. One company, designated as A, had all its men equipped with glass-lens spectacle-type goggles, whereas another, designated B, had a very small per cent thus protected. The eye injury rate of B during 1931 was 3,397.62 per cent higher than the rate of A.

A similar showing as regards headgear was noted by Mr. Lutton. A coal company with a large percentage of its men wearing protective hats made a 72.22 per cent reduction in its disabling head-injury rate in the first eleven months of 1932 as compared with the first eleven months of 1931.

"The value of gloves in preventing hand and finger injuries or lessening the

severity of such injuries to mine employees probably is so well known that its importance need hardly be stressed," declared Mr. Lutton. Of injuries experienced by surface and underground mine employees embracing all classes of severity, 31 per cent are hand and finger injuries. Such gloves should be adapted to the operation being performed and be maintained in a serviceable condition.

Mr. Lutton presented facts from which the accompanying table has been prepared.

Manufacturers should incorporate in safety footwear protection for the bones of the foot at the point of instep, said Mr. Lutton, but such protection must be such as not to retard activity or cause discomfort. Experimental work has been conducted to this end in rubber footwear, and it is believed that such wear will soon be on the market. Nonslipping soles also are desirable.

Use of goggles when shoveling is inconvenient, declared F. B. Dunbar, manager, Mather Collieries, Mather, Pa. Dust from shoveling coats goggles and renders the men blind. Nor is it practicable to use them in picking coal in tipples. He thought rating rules should be changed so that the shovel would be exempted from among hand tools the use of which demanded the wearing of goggles.

Mr. Hosler acknowledged that eye injuries were most numerous where men were using picks and next most numerous when they were using hammers. Shovel accidents, of which there had been four, came third. Perhaps the rating schedule had gone too far, for some eye accidents occurred where men were using their bare hands.

Results varying between 0.0 and 0.05 per cent from the percentages of methane in mine air as obtained by chemical analysis were recorded by G. G. McCaa, State mine inspector, Pittsburgh, Pa., in tests he made using the new M.S.A. methane indicator (see *Coal Age*, Vol. 37, p. 246), the readings of which are based on the electric resistance of a heated platinum wire in methane. Burning methane changes the resistance of the wire, which receives its current from a battery. But, in the course of time, batteries vary in voltage, so a variable rheostat is used to regulate voltage before making a test. Mr. McCaa said that the presence of water vapor in the air, which would militate against obtaining correct readings, was corrected by passing the air through a drying tube which absorbed the moisture.

Many new developments in coal cleaning by dry and wet processes, aspiration, dust collection, and drying were described by J. B. Morrow, preparation manager, Pittsburgh Coal Co., Pittsburgh, Pa.

F. W. Cunningham, state mine inspector, Somerset, Pa., opened the question box, on "How does supervision prevent accidents" with the declaration that efforts were being made more and more to reduce not only fatalities but also lost-time accidents and in fact accidents of all kinds. For every fatality, there were eight 60-day accidents.

Saying he had cut his accident rate in half, L. H. Schneer, division manager, Consolidation Coal Co., Somerset, Pa., gave a detailed analysis of his methods. His foremen are instructed to spend more time with the new men so as to get them started right. Discharge as a means of discipline is less favored than education. A large number of discharges is held to reflect on the foreman's ability. He also described the district courts (see *Coal Age*, Vol. 35, p. 606). Red tags are carried by engineers and other officials, and they are wired to machinery or plugs on the coal rib wherever there is an unsafe condition, such as a lack of guards or of clearance. The upper part of the tag is marked with a notation as to the dangerous condition, and the lower half is torn off and a similar notation affixed. This half is brought to headquarters and put in a live file after the proper authorities have seen it. The man whose duty it is to remedy the subnormal condition sees the red tag, corrects the condition, removes the tag, notes on the card the work he has done and turns the tag into headquarters, where it is inspected and pinned to the lower half of the ticket and placed in the dead file.

Four of the nineteen largest coal companies in Pennsylvania, said Richard Maize, acting deputy secretary, Pennsylvania Department of Mines, Uniontown, Pa., are producing more than 1,000,000 tons of coal to every fatal accident: the H. C. Frick Coke Co., Clearfield Bituminous Coal Corporation, Ford Collieries Co. and Buckeye Coal Co. In 1928 a fatal accident occurred for every 255,603 tons produced and in 1931 for every 470,118 tons. Mr. Maize's paper was largely historical.

Mr. Lauder remarked that the Pittsburgh Coal Co. was using calcium chloride on the roads wherever it had dry and dusty conditions. Rock-dusting lasts four years in back entries. Mr. Dunbar urged that the Coal Mining Institute of America go on record that all mines, even though containing less than ten men, be inspected; that all be required to use closed lights, permissible machinery and permissible explosives and that all mines be completely rock-dusted.

Rapid working and care to keep clay veins or cleats—which ever presented the greater problem—in the right relation to room advance and pillar drawing would make roof conditions less dangerous, declared J. W. Paul, senior mining engineer, U. S. Bureau of Mines, Washington, D. C. On the resumption of Professor Chedsey's question box, Mr. Paul said that props are better set when cap pieces and wedges are cut to shape. At some mines, use of axes was prohibited altogether. Exclusive use of bars for bringing down loose roof will save lives. Timbers should be removed by mechanized pulling devices.

At the banquet, Dec. 15, C. B. Huntress, executive secretary, National Coal Association, presented a six-point program for reduced overhead in the coal industry. Overhead in production should be reduced: (1) by decreasing the physical effort involved; (2) by a reduction in taxes, local, state and national; (3) more problematically, by a reduction in interest charges. The overhead in distribution should be lightened: (1) by market research to promote utilization of product; (2) by a decision to permit regional sales agencies, or, failing that, legislation revising the Clayton Act and permitting such agencies to function in the distribution of natural resources; and (3) by a reduction of railroad rates.

Statistics Compiled by Pennsylvania Department of Labor and Industry, 1926-1931 Inclusive

All coal mine accidents reported	190,499
All fatal accidents	5,134 or 2.70 per cent
Toe injuries	8,352 or 4.38 per cent 8 or 0.1 per cent of foregoing 8,352 injuries were fatal.
Eye injuries	11,882 or 6.24 per cent* 12 or 0.1 per cent of foregoing 11,882 injuries were fatal.
Head and face injuries	16,804 or 8.82 per cent 1,604 or 9.55 per cent of foregoing 16,804 injuries were fatal.
Toe, eye, head and face injuries	37,038 or 19.44 per cent 1,624 or 4.38 per cent of foregoing 37,038 injuries were fatal.

*846 or 9.62 per cent of the 8,798 eye injuries in the period 1926-1930 inclusive—1931 figures not being available—caused loss of one eye and 83, or 0.94 per cent, resulted in total blindness.

STABILIZATION PLANS

+ And Future of Mineral Industry

Feature Mining Congress Meeting

In the Spotlight

Should the United States adopt the British control system as a means of stabilizing the bituminous coal industry? Congressman Lewis, proponent of this method, aroused so much interest with his discussion of the British system that delegates to the American Mining Congress meeting asked for further light.

The mineral industry, in common with the rest of business, has felt the shock of the depression. But, as Scott Turner showed, coal has fared less badly than many other commodities in the mineral group.

Is the mineral industry entitled to tariff protection? Yes, says Herbert Wilson Smith, in an exposition of the tariff system and trade balances at the American Mining Congress meeting.

Research engineers in the metallurgical field have made great strides in perfecting new alloys to give longer life and lower production costs in the mining field. W. J. Priestly outlined the high spots in these developments in an address on "New Materials and Their Uses in Mining," abstracted in these pages.

STUDY of the workings of the British Coal Mines Act of 1930 was recommended in a resolution adopted by members of the American Mining Congress at their thirty-fifth annual meeting, held at the Hotel Mayflower, Washington, D. C., Dec. 15-17, 1932. This action followed an exposition of the Lewis bill, modeled on the British statute, made by Congressman David Lewis, of Maryland, author of the proposed law, and discussion of stabilization problems by the delegates at the convention.

The resolution, after reciting that many proposals for bituminous stabilization, including development of greater co-operative effort within the industry, modification of the Sherman law, and "drastic control of the industry by the imposition of penalties upon those who are not willing to give up constitutional rights for the general good of the industry," asserted that the principles embodied in the Lewis bill had "received much commendation and approval among coal operators, notwithstanding the fact that the operations under the [British] act are not fully understood." It was therefore recommended that the Congress make an investigation of the workings of the British law "in order to furnish a proper basis for intelligent action upon similar bills now under consideration" in this country.

The Lewis bill would set up 27 bituminous and 3 anthracite district councils of operators, a central council and a Coal Commission of five members. The central council would make standard district allocations of tonnage and the district councils would make allocations of tonnage to individual operations within their respective districts. District and individual quotas based upon these standards would be fixed from time to time in order to correlate productive activity with demand. District selling agencies would be authorized, and provisions are included for the establishment of minimum and maximum prices.

Mr. Lewis emphasized that primary control would reside with the operators. "The power of the federal government under the bill," he said, "is principally that of arbitration and supervision. Its function is more judicial than executive." Labor provisions of the bill, which deny the right to make nonmembership in a union a condition of employment, were passed over in the exposition.

Up to ten years ago, said Paul Weir, vice-president, Bell & Zoller Coal & Mining Co., car shortages and strikes had been effective agencies for production control, but these no longer served. Long opposed to the idea of government regulation, Mr. Weir confessed that he had come to the conclusion that some form of outside help was necessary to stabilize the bituminous industry.

Attempts of the anthracite operators to stabilize their branch of the industry, remarked E. W. Parker, director, Anthracite Bureau of Information, had been fought by government authorities, who outlawed the Temple Coal & Iron Co. combination and compelled the segregation of the authracite railroad and coal properties. Operation of the anti-trust laws, declared a spokesman for the lumber interests, was making it increasingly difficult for the small producer to survive. Something must be done to conserve natural resources for posterity. He was insistent that the district selling agency plan be definitely legalized so that the smaller units might pool their resources and eliminate waste.

A letter from R. E. Tally, United Verde Copper Co., expressed the belief that producers must cooperate in the regulation of production to demand and in cooperative selling through a revision of the anti-trust laws. Weaknesses of the European cartel system were commented upon by R. M. Roosevelt, vice-president, Eagle-Picher Lead Co., who presided over the stabilization session.

At the opening session, presided over by James F. Callbreath, secretary, Herbert Wilson Smith, Union Carbide Co., discussing the need for protection for the mineral industries, denied that the tariffs imposed by the United States had the adverse effects pictured by the free traders. Most of the shrinkage in imports in recent years, he said, represents price declines and currency depreciation. Since the mining industry of this country buys labor and supplies in a protected market, it should be privileged to sell in a protected market.

The purpose of the broadened modernization program of the Congress, said R. M. Shepherd, president, Allegheny River Mining Co., is to bring to the members studies of operating practices and policies throughout the field, not with any intention of setting up methods

Table I—Mineral Production and Unit Values in 1931

(Expressed in Percentages of Yearly Averages 1926-1930)

	Production	Prices
Metals		
Gold	106	100
Aluminum	92	93
Lead	61	62
Copper	60	58
Silver	53	54
Zinc	51	59
Pig iron	47	84
Fuels		
Natural gas	100	97
Petroleum	95	47
Anthracite	78	93
Bituminous coal	73	85
Non-Metals		
Sulphur	98	100
Crushed stone	79	90
Building stone	79	93
Sand and gravel	77	95
Portland cement	72	72
Lime	64	82
Slate	58	81
Gypsum	55	98

for the operation of the individual mine but purely in a recommendatory way. Stressing the importance of the labor factor, he pointed out that labor had a direct interest in the economic position of the industry, since it usually was the first to suffer in a decline and the first to benefit in an advance. He believed that it was possible to educate labor to recognize its responsibility. Ninety per cent of the misunderstandings which arise, he maintained, were due to ignorance and misinformation on the part of both management and labor.

While the first reaction of a coal operator who has developed an improved method which reduces production costs is frequently one of refusal to share the benefits of his enterprise with his fellow producers, such an attitude, insisted E. J. Newbaker, general manager, Berwind-White Coal Mining Co., is unsound because the biggest competition which coal faces is the competition of other fuels. Anything, therefore, that helps meet this competition benefits the entire coal industry and should be made available to all producers fighting in a common cause.

Although the mineral industry, in common with other industries, has declined sharply in the depression, this condition, declared Scott Turner, director, U. S. Bureau of Mines, "should be appraised as only temporary." Between 1860 and 1929, population was approximately quadrupled, agricultural production increased over six times, manufacturing about 22 times, and mineral output 60 times. "From this it would appear that, if our standard of living is to continue to improve, and I have no doubt that it will, society will demand more and more mineral production, for which it will and must pay an economic price."

Comparing 1931 with the yearly average for the preceding five years, Mr. Turner pointed out that the metals group declined 40 per cent in volume and 55 per cent in value; non-metallics, 24 per cent in volume and 39 per cent in value; fuels, 15 per cent in volume and 39 per cent in value. Figures for the more important minerals in each group, as given in Mr. Turner's paper, are shown in Table I.

During the depression, declared W. J. Priestly, vice-president, Electro-Metallurgical Co., the economic picture has so changed that management that hopes to compete successfully under the new conditions which have been established will be compelled to discard obsolete plants and processes. "Efficient production will call for resourceful engineering that utilizes new metals and materials which were not available when the original plants were constructed."

Metallurgical engineers, continued Mr. Priestly, have made great strides in developing new alloy steels for mining equipment. Some of these alloys add strength which makes it possible to reduce the weight of moving parts; others impart hardness and resistance to abrasion and corrosion. Great success has attended the process of coating or surfacing machine parts with hard-wear-resisting alloys such as Stellite, thereby increasing the life of swing hammers, segments of coal crushers, dipper teeth, buckets, drag chains, drills, augers, crusher jaws, sprockets, scrapers and skip guide shoes. Three per cent chromium steel is being tried out for chutes, plates and liners in jaw crushers and for frogs, switch points and locomotive tires. A number of other uses for alloy steel in mining equipment are summarized in Table II.

Tests show that steel cars have three times the life of wooden rolling stock, will carry 20 per cent greater load, and require 28 per cent less repairs. Consideration is now being given to the use of welded high-strength mild alloy steel for further lightening construction. Stainless steel is demonstrating its advantages in handling corrosive materials. Chrome-nickel-silicon alloy is giving longer life to locomotive piston rings. Tests on stainless steel ropes and cables show a life of 42 months, against 9½ to 29 months for ordinary steel.

Twenty-eight per cent chromium steel has been found satisfactory for pumps, pipes and fittings in handling acid mine water and for sand pumps. Used to replace bronze in the anthracite region, it showed no deterioration after a year's service, whereas bronze pumps had failed in three months. In another case, 28 per cent chrome-steel valve stems showed no appreciable wear after 2,200 hours; lead-bronze stems lasted about 150 hours. Twenty-five per cent chrome steel, said Mr. Priestly, has been found satisfactory for jig and shaker screens, chutes, conveyor flights, baffles, shovels, bolts, nuts and other parts commonly attacked by the corrosive action of acid mine waters. In the case of pipes and tubing it has been found that 4.0 to 6.0 per cent chrome steel gives a corrosive-resistant material; an alloy of 0.4 to 0.6 per cent chromium, 1.1 to 1.4 per cent manganese and 0.7 to 0.8 per cent silicon makes for increased strength.

The work of the Committee on Industrial Rehabilitation in stimulating interest in modernization was explained by Joseph Dilworth, managing director of the committee, who pointed out the close relation of this movement to increased activity in the capital-goods field.

Mining Congress Officers

J. B. Warriner, president, Lehigh Navigation Coal Co., was elected president of the American Mining Congress at its annual meeting last month.

D. D. Moffat, Utah Copper Co.; J. B. Putnam, Pickands, Mather & Co.; and C. H. Crane, St. Joseph Lead Co., were chosen vice-presidents.

Members of the board of directors chosen at this meeting were: L. S. Cates, Phelps Dodge Corporation; R. E. Tally, United Verde Copper Co.; Donald Gillis, Corrigan McKinney Co.; Donald A. Callahan, Callahan Zinc-Lead Co.; A. E. Bendelari, Eagle Picher Lead Co.; Paul Weir, Bell & Zoller Coal & Mining Co.; W. J. Jenkins, Consolidated Coal Co. of St. Louis; and C. J. Ramsburg, Koppers Co.

R. L. Ireland, Jr., vice-president, Hanna Coal Co., was elected chairman of the board of governors of the coal division of the Congress.

Table II—Steel Alloys for Mining Equipment

Equipment	Percentage			
	Carbon	Chromium	Nickel	Other Metals
Bolts, studs and pins, *highly stressed*	0.30 to 0.40	0.80 to 1.10	.....	0.18 [1]
	0.30 to 0.40	0.45 to 0.75	1.00 to 1.50	.....
Buckets, shovel	0.30 to 0.40	0.60 to 0.95	2.75 to 3.25	.....
	0.30 to 0.40	0.40 to 0.60	.....	[2]
	0.30 to 0.40	0.40 to 0.60	.....	[3]
Chains, driving	0.35 to 0.45	0.90 to 1.25	1.50 to 2.00	.....
	0.40 to 0.50	0.45 to 0.75	1.00 to 1.50	.....
Chisels	.....	1.35 to 1.45	.....	[4]
Clutch gearing	0.15 to 0.25	0.80 to 1.10	.....	0.18 [1]
Cylinders and barrels for pneumatic hammers	0.15 to 0.25	0.80 to 1.10	.....	0.18 [1]
	0.10 to 0.20	0.55 to 0.75	.....	.....
Dies, header	.....	0.70 to 0.80	.....	0.45 to 0.55 [5]
Drills, hollow	.....	.....	.....	[6]
Drills, rock	0.10 to 0.20	0.45 to 0.75	1.00 to 1.50	.....
	0.10 to 0.20	.....	1.50 to 2.00	0.20 to 0.30 [7]
Gears, *requiring resistance to wear and heavy shock*	0.40 to 0.50	.....	3.25 to 3.75	0.50 to 0.80 [8]
	0.35 to 0.45	0.45 to 0.75	1.00 to 1.50	.....
	0.35 to 0.45	0.90 to 1.25	1.50 to 2.00	.....
Mine-car axles	.....	0.50	.....	0.20 [7]
	0.30 to 0.40	0.80 to 1.10	.....	0.70 to 1.00 [8]
Pistons and piston rods	.....	0.15 to 0.25	.....	0.40 to 0.55 [5]
Shafts, armature	.....	0.50	.....	0.20 [7]
Shafts, steam shovel and other heavy-duty equipment	0.35 to 0.45	0.45 to 0.75	1.00 to 1.50	[7]
	0.35 to 0.45	0.80 to 1.10	.....	0.15 to 0.25
	0.15 to 0.25	0.80 to 1.10	.....	0.18 [1]
Valves, diesel engine	.....	17.00 to 19.00	8.00 to 25.00	.....

[1] Vanadium. [2] 1.10 to 1.40 per cent manganese and 0.70 to 0.80 per cent silicon. [3] 1.10 to 1.40 per cent manganese, 0.70 to 0.80 per cent silicon and 0.10 per cent vanadium. [4] 2.30 to 3.00 per cent tungsten and 0.15 to 0.20 per cent vanadium. [5] Silicon. [6] 0.20 to 0.30 per cent molybdenum and 0.15 to 0.25 per cent vanadium. [7] Molybdenum. [8] Manganese.

SAFETY, ECONOMY

+ In Coal Mine Operation

Stressed by West Virginia Institute

ECONOMY and safety in the operation of coal mines were again the leading topics at the twenty-fifth annual meeting of the West Virginia Coal Mining Institute, held at Charleston, W. Va., Dec. 6-7. Around these objectives, speakers prepared addresses on stabilization of labor cost at mines, improvement in gathering haulage, and the reaction of employees to accident-prevention programs. In addition, the relations between the coal industry and railroads were dealt with at the technical sessions, and the results of byproduct coking tests on certain West Virginia coals were presented by research workers.

The coal industry has not lagged behind other industries in the introduction of new machinery, declared George S. Brackett, Consolidation Coal Co., Fairmont, W. Va., but today there appears to be a need for methods that will lead to more efficient production in the ordinary mine without revolutionizing normal operation or increasing capital investment by the purchase of expensive equipment. Stabilization of mine labor cost, he contended, is the first step toward economy, and also offers the best opportunity for continuous future improvements.

Of the three general classifications of mine labor (cutting and loading, day labor serving the loaders and maintaining equipment, and the supervisory force), day labor generally shows the greatest fluctuations in cost. For purposes of examination and study, day labor may be classified as follows: betterment labor, maintenance labor, wiremen, gathering haulage men, main haulage men, section trackmen, main-line trackmen, bratticemen, pumpers and drainagemen, timbermen, rock and slate men, miscellaneous inside labor, hoist and tipple men, men handling supplies inside and outside, and miscellaneous outside labor.

To stabilize to permit forecasting and obtain economies, the mine must be maintained at some set standard. Afterward, it is necessary to make tests to determine the allotment of labor to each of the fifteen day-labor classifications. This was done at Consolidation mines several years ago, a definite quota of labor being assigned to each. For purposes of comparison and study of the different components of mine labor, the company adopted a "yardstick" of tons per man per day of eight hours, exemplified by Table I. For an individual mine, these figures would represent the average experience over a period of time, against which all future results could be measured. More important, however, the tabulation offers a definite starting point for improving the performance of the various classes of labor.

In the direct labor of cutting and loading coal, some industrial engineers have centered their attention on increasing the productivity of the loader by proper working and rest periods and an incentive wage structure. With the bonus system, the more the loader produces, the cheaper the cost to the company, but, in Mr. Brackett's opinion, there are three obstacles to the widespread introduction of this system in the coal industry: danger of increasing day-labor cost, thus offsetting the savings in loading; disruption of the fundamental flat rate per ton on which the industry is built; and intermittent supervision.

Table I—Ratio of Production to Mine Day Labor

Classification	Tons Per Man Per Day (Eight Hours)
Betterments—Such as sidetracks, overcasts, or major maintenance or replacement labor	400
Equipment Maintenance Labor—Repairmen, car repairmen and blacksmiths	325
Wiremen	750
Haulage Men—Gathering	125
Haulage Men—Main-Line	500
Section Trackmen—Working inside the main haulage sidetrack	150
Main-Line Trackmen	1,000
Bratticemen	1,500
Pumpers and Drainage Men	550
Timbermen	400
Rock or Slatemen	350
Miscellaneous Inside Labor—Track Cleaners, Rock-Dust Men, etc.	500
Hoist and Tipple Men	170
Labor Handling Supplies—Inside and Outside	8,000
Miscellaneous Outside Labor—Office, Stable, Watchmen, Slate Disposal, Substation, etc.	200
All Mine Day Labor (Excluding Supervisory)	21.48

Institute Leaders

M. L. Garvey, president, Fire Creek New River Coal Co., Charleston, W. Va., was elected president of the West Virginia Coal Mining Institute at the annual meeting in Charleston, Dec. 6-7. Other officers chosen were:

Vice-presidents: R. E. Salvati, general manager, Pond Creek Pocahontas Co., Bartley; R. J. Burmeister, general manager, Raleigh Coal & Coke Co., Raleigh; E. B. Agee, superintendent, Youngstown Mines Corporation, Dehue; George Caldwell, general superintendent, West Virginia-Pittsburgh Coal Co., Wellsburg; and J. D. Sisler, West Virginia Geological Survey, Morgantown.

Secretary-Treasurer: Charles E. Lawall, head, School of Mines, West Virginia University, Morgantown.

Executive Board: E. H. Shriver, superintendent of mines, Raleigh Coal & Coke Co., Raleigh; E. S. Wade, superintendent, Windsor Power House Coal Co., Windsor Heights; S. Austin Caperton, general superintendent, Slab Fork Coal Co., Slab Fork; and N. A. Elmslie, division superintendent, Bethlehem Mines Corporation, Barrackville.

In the discussion which followed Mr. Brackett's paper, N. A. Elmslie, division superintendent, Bethlehem Mines Corporation, Barrackville, stated that his company has been working for seven years on the standardization of mining cost, and is now able to forecast the monthly cost for a 3,500-ton mine to within $3 to $30.

Because of variations in tonnage, the dollars-and-cents standard is not always a measure of accomplishment, said C. W. Connor, American Rolling Mill Co., Nellis, W. Va. This company prefers definite tonnage quotas per man per day, per locomotive per day, etc. Each section has a fixed quota of men and supplies, on which is based a standard cost with which the actual cost is compared.

Basing his conclusions on a study of 42 mines in eight West Virginia coal fields by the School of Mines, D. L. McElroy, assistant director of mining extension, School of Mines, West Virginia University, Morgantown, discussed the major factors affecting

gathering haulage in coal mines. As evidence of the importance of gathering haulage in mine transportation, Mr. McElroy declared that the study showed that the labor cost of gathering was approximately 80 per cent of the total transportation labor cost, and that 62 per cent of the fatal and 68 per cent of the non-fatal transportation accidents occurred in gathering.

In contrast to main-line haulage, which is the transportation of coal in comparatively large quantities between relatively few points, gathering haulage consists of moving relatively small quantities of coal between a comparatively large number of points. Any concentration of working places will therefore effect a saving in the direct cost of haulage, as well as in ventilation, safety and supervision.

Turning rooms from both the entry and aircourse, though in effect only in mines where pillars were not drawn, increases haulage efficiency by doubling the number of working places per unit of entry. Another important fact brought out in the study was that in many cases, particularly where animals are used, the distance of travel on the butt entry to the parting was excessive. The study showed that the minimum distance of travel to the partings was 650 ft. for locomotives and 150 ft. for animals. Maximum distance was 2,658 ft. for locomotives and 1,000 ft. for animals. On the basis of the findings, locomotives should not travel more than 1,500 to 2,000 ft. to the partings, and animals not over 500 ft.

Four of the mines included in the survey employed contract labor in gathering. Three of these mines were among the four highest in tonnage produced per gathering locomotive per shift and among the fourteen highest in cars gathered per locomotive.

Dispatching is an important factor in efficient gathering haulage, the study indicates. Of the twelve mines producing 2,000 tons or more per day, ten employed full-time dispatchers. Eight of the thirty mines producing less than 2,000 tons also employed dispatchers. Mines employing dispatchers averaged 199 tons per gathering locomotive per shift and 109 tons per shift per animal. At mines where there were no dispatchers, locomotives averaged 155 tons per shift and animals 72 tons.

Employment of a dispatcher at the Nellis mine cut the power demand charge $144 per month, said Mr. Connor. A consulting electrical engineer was doubtful, in view of that fact, whether the installation of a demand meter would be justified. The meter was installed, however, and resulted in an additional saving of $40 per month.

"Is the employee really interested in the prevention of accidents beyond the possibility of injury to himself? Does he look upon the overworked safety signs as being in a class with the scarecrow in the corn field? Does he feel that the whole scheme is a smoke screen behind which the employer is working for personal gain, rather than for the preservation of life and limb? Has the intensive drive for the prevention of accidents in our industrial life changed the attitude of the employee?" These were questions propounded by G. H. Thomas, division superintendent, C.C.B. Smokeless Coal Co., Helen, W. Va., in discussing the reaction of the employee to accident-prevention measures.

Neither workmen nor officials are yet thoroughly sold on accident prevention beyond the possibility of personal injury, in Mr. Thomas' opinion. To accomplish the most, safety work must be organized as an agency to sell freedom from injuries, and the customer must be made to understand that profit to the company is not the objective of the organization.

Discussion following Mr. Thomas' paper revolved around the correct approach in selling safety to the workmen, and was joined in by Mr. Connor; R. E. Salvati, general manager, Pond Creek Pocahontas Co.; L. N. Thomas, vice-president, Carbon Fuel Co.; E. H. Shriver, superintendent of mines, Raleigh Coal & Coke Co.; A. R. Matthews, superintendent of mining, West Virginia division, Consolidation Coal Co.; and F. O. Harris, vice-president, Cannelton Coal & Coke Co. Sincerity on the part of the company was stressed, and the majority of the speakers emphasized the fact that a safety program should be based on mutual interest.

Two major changes in the Transportation Act were advocated in a paper by Stanley C. Higgins, secretary and traffic manager, New River Coal Operators' Association, read in his absence by A. O. Wilson, statistician, Kanawha Coal Operators' Association. Section 15-A of the act, requiring the Interstate Commerce Commission to fix rates, regardless of other conditions, so that the carriers will earn as nearly as possible the 5¾ per cent set as a fair return should be changed to allow the commission to consider the effect of such rates on the movement of traffic; the preservation of low-cost transportation service; and the yield of a fair return under efficient and economical management. Second, the provisions of the so-called recapture clause should be repealed to end the practice of taxing the industry and the consumer in excess of the 5¾ per cent fixed as a fair return to the carriers. The industry, Mr. Higgins recommended, should give serious thought to the question of proposing to federal and state authorities that railroads be given liberty for the prompt establishment of rates to meet the competition of substitute fuels.

Concluding the technical program, W. W. Hodge, professor of chemical engineering, presented the results of a study of analyses and byproduct coking tests of West Virginia coals, which was carried on with the assistance of Richard Newton, fellow in research. Complete analyses and carbonization tests were made on the following coals: Upper Freeport, Preston County; Pocahontas No. 3, Mercer County; Welch, McDowell County; Chilton, Logan County; No. 2 Gas, Kanawha County; and Sewell, Fayette County.

A note of optimism for the bituminous industry was sounded by C. B. Huntress, executive secretary, National Coal Association, at the dinner meeting which followed the technical sessions. Reviewing conditions in other industries, he arrived at the conclusion that coal was comparatively well off in both production and price. Greater effort in the offensive against competitive fuels is necessary, however. Coal need not be crowded off the stage by oil and gas; the answer to competition is "spend as much money on improved marketing methods as has been devoted to production."

How CAN coal-mine labor be stabilized to reduce cost and permit accurate forecasting?

George H. Brackett answers this question in this summary of the proceedings at the twenty-fifth annual meeting of the West Virginia Coal Mining Institute.

What are the major factors to be considered in gathering haulage?

An abstract of D. L. McElroy's discussion of this question, based on a study covering 42 mines in eight West Virginia coal fields, appears in these pages.

Is the employee really interested in safety work beyond the possibility of injury to himself?

G. H. Thomas takes this question up in a discussion of the reaction of the employee to accident-prevention measures.

Interest in the relations between the coal industry and the railroads has grown sharply.

The recommendations of Stanley C. Higgins for the improvement of these relations are reproduced herewith.

How is the bituminous industry faring and what direction should its major efforts take?

The conclusions of C. B. Huntress are presented here in abstract form.

PUBLIC UTILITY

+ Consumption of Fuel in 1929

By W. H. YOUNG

Mineral Economist, Coal Division
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COUNTY DATA on many types of economic activity have been available for some time,[1] but it is only recently that county breakdowns of fuel and energy consumption have been published. As a result of studies on such consumption in the public utility,[2] manufacturing,[3] and mining and quarrying industries,[4] county data covering the consumption of 51.1 per cent of the bituminous coal, 3.0 per cent of the anthra-90.0 per cent of coke and 46.1 per cent of fuel oil are now available for analysis. Taken together, these data give the most complete picture we have yet had of the fuel and energy market of the United States.

In 1929, electric public utility power plants consumed 8.2 per cent of the bituminous coal, 3.0 per cent of the anthracite, and 2.7 per cent of the fuel oil. The object of the analysis which follows is to show the competition between coal, oil, and natural gas, by indicating the kind of fuel used in each county. Electric public utilities are among the largest of all consumers of fuel, and as fuel is a major element in their costs, no class of consumers exercises greater care in its selection. The cost of fuel often amounts to 20 or 30 per cent of their total operating expenses, whereas in manufacturing it averages only 3 per cent. For this reason the practice of the electric utility power plants in the selection of fuel in a particular area is a good indicator of the kind of fuel best suited for generating power in that area.

Previous reports of the Geological Survey have shown fuel consumption in the form of state totals. But there are wide variations within the limits of a single state, even a state as small as Massachusetts. The present study carries the analysis one step further by presenting the picture by counties. Although directly the figures relate only to the fuels used by the electric utilities, indirectly they throw light on the entire market for fuels. In a given locality coal, oil, and natural gas may be available, and the choice between them depends on the price, on the heating value, on the type of equipment in which the fuel must be used, on the reliability of supply, and on other factors.

By showing what fuels were actually selected in each county, the study indicated the preferred kinds of fuel, at least under the market conditions of the period covered. As a result, the figures are of interest to fuel purchasing agents, to sales managers and distributors of coal and fuel oil, to natural gas companies, and to railroad traffic men in connection with rate and traffic problems.

This study also shows another type of competition, an inter-industry competition, between the several fuels. It indicates that over large parts of the United States the price of coal is under continual competitive pressure from oil, or gas, or water power, or perhaps all three. Even in a region where coal is the only fuel used in power generation, there is practically always active competition among several different fields, all seeking the available business.

Fig. 1 presents the picture of the consumption of coal by electric public utility power plants by counties in 1929. Total consumption of bituminous coal that year amounted to 42,765,223 net tons, and of anthracite, 2,172,007 net tons. Each dot on the map represents 10,000 net tons of coal. The most striking feature of the map is the high degree to which coal consumption is concentrated in particular counties. Consumption of coal by the power utilities centers in the highly industrialized counties north of the Ohio and Potomac rivers and east of the Mississippi and Missouri rivers. In fact, the great concentration is not completely portrayed by the map. For instance, the Chicago district in Illinois and Indiana absorbs 54 per cent of all coal burned by electric utilities in Illinois and 16 per cent of the total for Indiana. The Detroit area uses 63 per cent of all coal burned by utilities in Michigan. Practically all of the anthracite was consumed in eastern Pennsylvania, New Jersey and New York.

Though fuel oil has been one of the most formidable competitors of coal within recent years, electric public utility power plants have not been large users of fuel oil. In 1929, these plants consumed 10,124,216 bbl. of fuel oil, or the equivalent of 2,411,000 net tons of coal. Fig. 2 presents the picture of consumption of fuel oil by counties. One black dot represents 40,000 bbl. of fuel oil, which is roughly equivalent to the unit of 10,000 tons of coal used in Fig. 1. Competition of fuel oil in electric generation is largely confined to the Southwest, the Pacific Coast, and a narrow fringe of territory along the Gulf

Intensive market analysis has become a vital part of modern merchandising. Progressive management wants to measure sales potentialities by detailed data on the consuming power of each market area and to know the volume and the type of competition it will encounter in each area. In the present article, the author presents a graphic study of fuel-market possibilities in the public utility field. A similar analysis of fuel consumption in the manufacturing industries will be published in an early issue.

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[1] *Market Data Handbook of the United States*, U. S. Department of Commerce.

[2] *County Analysis of Fuel Consumption and Power Production by Electric Public Utility Power Plants in 1929*, U. S. Geological Survey and U. S. Bureau of Mines.

[3] *Consumption of Fuel and Electrical Energy in Manufacturing Industries*, U. S. Bureau of the Census.

[4] *Consumption of Fuel and Electrical Energy in Mining and Quarrying Industries*, U. S. Bureau of the Census.

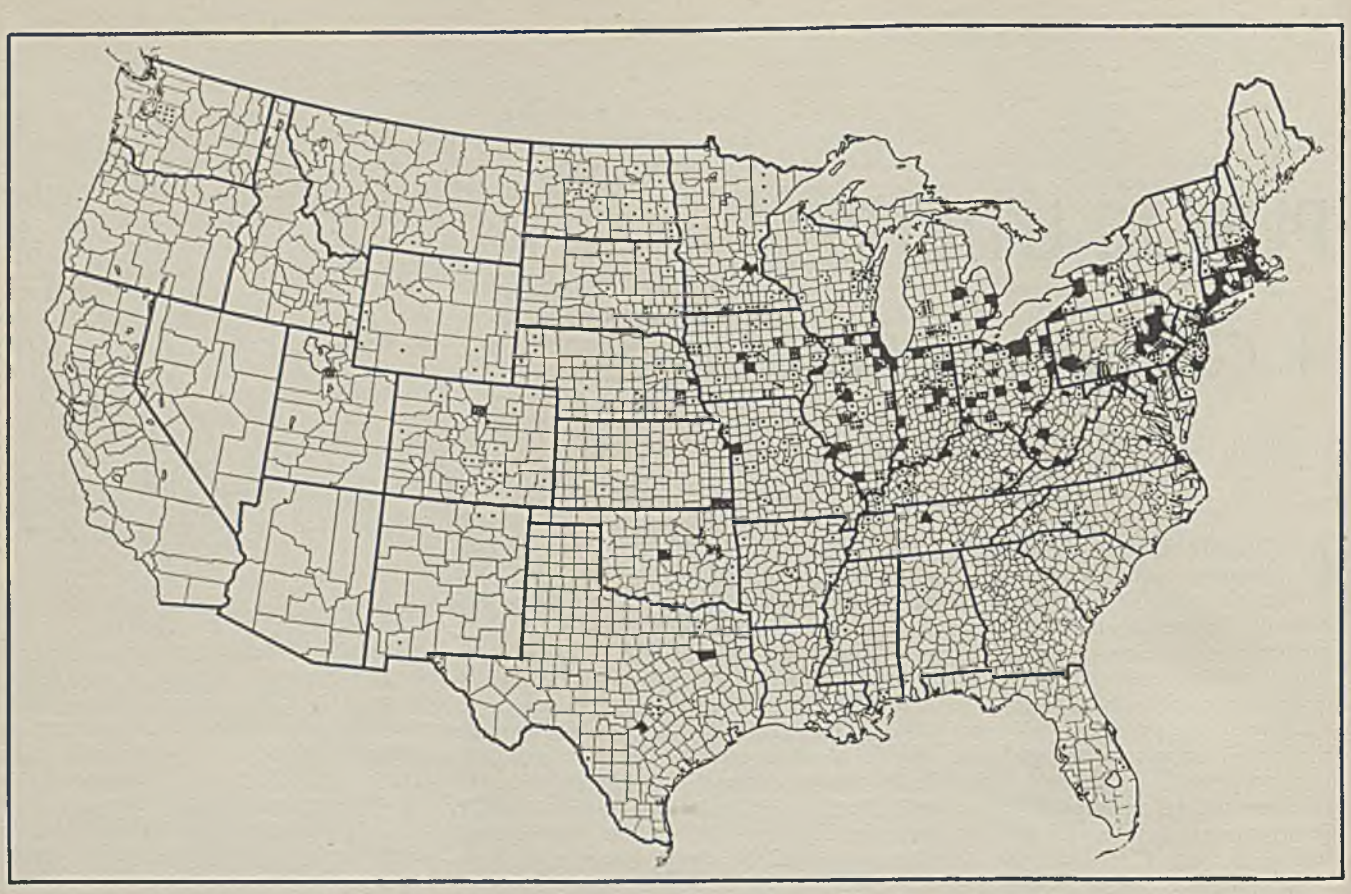


Fig. 1—Consumption of Coal by Electric Public Utility Power Plants in 1929. Each Dot Represents 10,000 Tons.

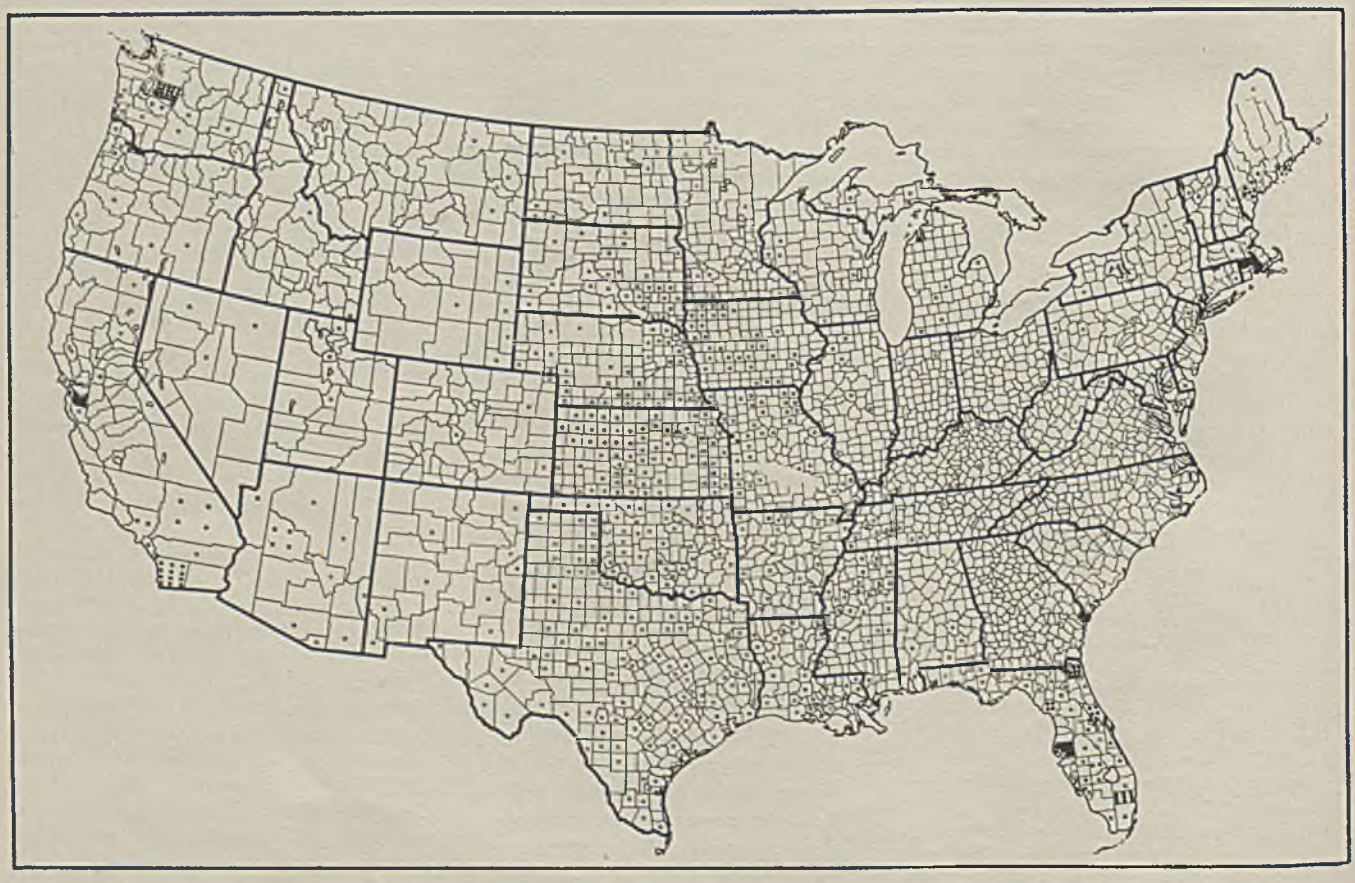


Fig. 2—Consumption of Fuel Oil by Electric Public Utility Power Plants in 1929. Each Dot Represents the Consumption of 40,000 Bbl., or the Equivalent of 10,000 Tons of Coal; Circles Represent Consumption of Less Than 20,000 Bbl.

Coast and the Atlantic seaboard. Practically every county consuming large quantities of fuel oil along the Atlantic seaboard or the Gulf Coast is located on tidewater.

Since the black dots on the map do not show the complete picture, the large number of counties consuming less than 20,000 bbl. of fuel oil were represented by a circle. Small quantities of fuel oil were consumed in many counties of the interior, especially in Iowa, Missouri, Kansas, Nebraska, Oklahoma and Texas. Though some of the fuel oil consumed in these states is used in steam plants, a large part is used in diesel or other internal-combustion engines. For instance, 78 per cent of the total fuel oil consumed by electric utility power plants in Iowa was used in diesel or other internal-combustion engines, 38 per cent in Missouri, 37 per cent in Kansas, 55 per cent in Nebraska, 69 per cent in Oklahoma, and 54 per cent in Texas. Thus, the indications are that the internal-combustion engine using oil is very widely favored for small plants. This is true of small plants even in coal-consuming states such as Illinois and Michigan, where many small plants use fuel oil in diesel engines. In these areas flexibility of operation rather than price of fuel doubtless explains the preference for the diesel-type engine.

Fig. 3 presents the picture for consumption of natural gas by electric public utility power plants by counties in 1931. Data for 1931 were used instead of 1929 because the recent completion of a number of long-distance pipe lines has made possible the use of natural gas in several new localities. With the exception of certain particular localities, natural gas has not been a major competitor of coal for power generation. In 1931, the electric utilities consumed 139,328,000 M cu.ft. of natural gas, or the equivalent of 5,443,000 net tons of bituminous coal. One dot on the map represents 250,000 M cu.ft. of gas, which again is roughly equivalent to the unit of 10,000 tons used in the coal map. Thus, it is seen from the map that the consumption of natural gas in power generation in 1931 was concentrated mainly in the Southwest and in California, though two counties in Ohio, one in Indiana, one in Tennessee, and one in Alabama consumed large quantities of natural gas. In the Southwest, the use of natural gas was very widely scattered in many counties.

A number of counties consuming less than 125,000 M cu.ft. of gas were represented on the map by a circle. Though the consumption of natural gas in these counties was not large, the circles do show where natural gas is available for use by electric public utility power plants.

For a number of years the various fuels have been faced with water power as a serious competitor in the generation of electricity. Though no map has been prepared showing the competition of water power, the published report[3] on which the present analysis is based throws much light on the problem. The county tables show the percentage of total kilowatt-hours produced by fuel and by water.

Over most of the Pacific Coast, in northern New England, and in the Niagara district, water power far outranks fuel power. It also furnishes a large proportion of the requirements of the southern Appalachians. The study indicates just where water power is produced. Everyone knows, for example, that Niagara is a great center of water power; in 1929, however, only 50 per cent of the total electricity produced at public utility plants by means of water power in New York came from Niagara County. It is not generally realized that water power is generated over most of the state. Out of 56 counties producing electricity in New York, 40 have some water power, and there are 34 counties in which the amount of water power generated by the utilities exceeds the fuel power.

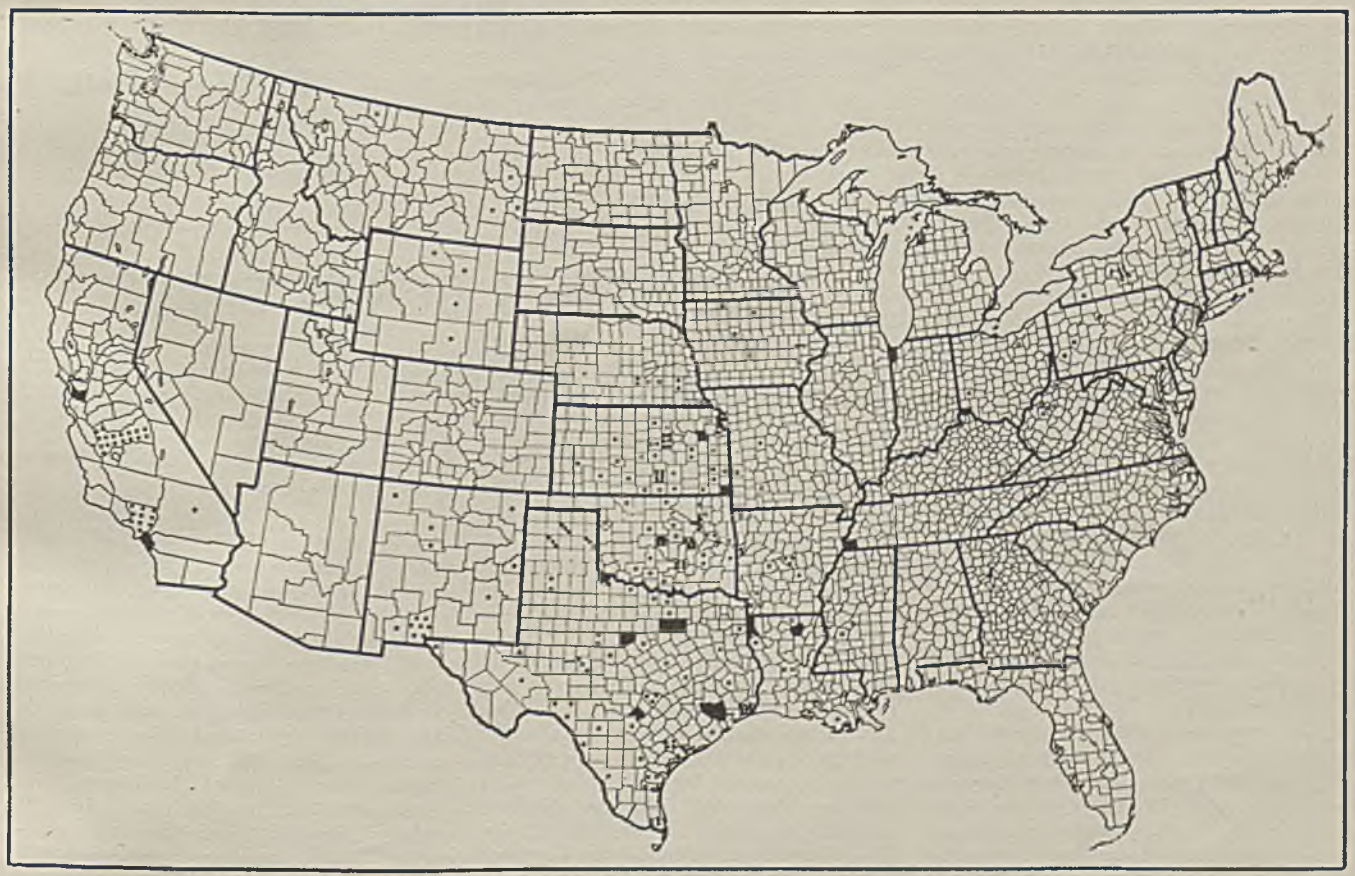


Fig. 3—Consumption of Natural Gas by Electric Public Utility Power Plants in 1931. Each Dot Represents the Consumption of 250,000 M Cu.Ft., or the Equivalent of 10,000 Tons of Coal; Circles Represent Consumption of Less Than 125,000 M Cu.Ft.

NOTES

. . . from Across the Sea

REFERENCE was made at the Mine Inspectors' Institute of America, in Wilkes-Barre, Pa., some months back, to the escape of gas in the Northern Anthracite Field from the surface above the Buried Valley—a thick body of sand and gravel found in places above the coal measures. It was said that pipes driven in the sand would deliver enough gas to light or warm a house. The city conservatory was for a long time heated by this method, and the gas escaping from the bed of the river often could be lighted, whereupon it would burn for long periods.

This phenomenon apparently is not peculiar to the American anthracite field. G. D. Budge, at a recent meeting of the South Wales Institute of Engineers, Cardiff, Wales, referred to the fact that, in the early history of the Rhondda Valley, in South Wales, methane came to the surface at many points alongside the brooks, and it was a favorite pastime for boys to ignite bubbles of gas floating down the streams.

In the American anthracite fields, the gas may not come direct from the strata entirely lying beneath the Buried Valley but from the edges of those seams that outcrop into it. The measures above the Baltimore bed at the Woodward colliery are so impervious that where the mine has caved, though it is under the Buried Valley, no inordinate quantity of water is observable underground. This seems to suggest a tightness in the strata that, on the one hand, might make the escape of methane difficult, and, on the other, might cause the methane which is escaping in volume to resist the passage of water from the surface to the beds beneath.

At that same meeting of the Mine Inspectors' Institute, R. M. Lambie, chief, Department of Mines, Charleston, W. Va., referred to the difference between European and American methods, the Europeans permitting work to be done in high percentages of methane, but being more particular as to the exclusion of machinery that might permit of the ignition of that gas.

Such great difficulties are encountered in properly ventilating its old mines, and such large inflows of gas occur in its newer ones, that Europe cannot well insist on low methane percentages. Thus at one mine in Czechoslovakia, according to J. T. Whetton, where the coal was liable to spontaneous combustion, 4 per cent of methane frequently was found in the return air. It is interesting to note that at one mine in England, where two seams are operated, one fan supplies the primary air for the entire mine. This fan has a 5½-in. water gage. In one of the seams is another fan with an 8½-in. water gage; this fan runs at 370 r.p.m. and delivers 86,000 cu.ft. per minute. In the other seam is another fan giving 89,000 cu.ft. per minute, and it has a water gage of 5½ in. Thus in one seam the aggregate water gage is 14 in., and in the other 11 in. With such conditions, safety must lie in the entire exclusion of sources of ignition, combined with the closest supervision.

Europe still evinces interest in the use of the interferometer for detecting methane in mine atmospheres. When light strikes a methanized atmosphere, or any non-normal atmosphere, it is deflected, but in so small a degree that perhaps use of this property always will have to be confined to instruments of precision like the interferometer. If only it could be caused to deflect light enough that with a 2-per cent concentration of methane one could illuminate an electric eye and set relays working to shut off the power on a machine, then perhaps Mr. Lambie's ideal of a machine that would not work in gas would be achieved.

Instead we have a machine that can be used only by a technical man and costs about $500. Nevertheless, it is said to rival the chemist and to have an accuracy of plus or minus 0.02 per cent. A portable machine is made by Carl Zeiss, of Germany, for mine use that is rugged and handy enough that it can be carried up and down ladderways. It is said to be an instrument that will operate without need for adjustment.

Phosphorus in the Parkgate fusains of Yorkshire may reach 0.662 per cent, remarked W. M. Hyslop and T. S. Burns in a paper on phosphorus determination in coal and coke ash, before the Midland Section of the Coke Oven Managers' Association, Sheffield, England. The authors of the paper gave the following partial analyses:

Ash in Fusain Per Cent	Phosphorus in Fusain Per Cent
5.1	0.093
7.8	0.023
13.7	0.662
14.8	0.161

In Durham coals the phosphorus generally is below 0.01 per cent, whereas, in Cumberland and South Wales coal, the percentage is often high. The fragile coals of south Yorkshire sometimes have a low phosphorus content, but the percentage usually is high in the stronger coals. In Cumberland, the percentage of phosphorus in coke may be below 0.01 per cent, but in South Wales 0.3 is permitted wherever the iron which is to be smelted has itself a low phosphorus content. Titanium in the ash of the bands of the Parkgate seam varies from 0.01 to 4.3 per cent.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

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

Recent Social Trends, by Wesley C. Mitchell and others. McGraw-Hill Book Co., New York City. Two Vols., 1,664 pp. Price, $10 per set.

Some months after the report of the President's Committee on Recent Economic Changes had been published, Mr. Hoover asked a group of scientists to consider the feasibility of a national survey of social trends; a few weeks later, in December, 1929, he appointed a committee under the chairmanship of Dr. Mitchell to undertake the suggested survey. Working with a group of specialists in their respective fields, the President's Research Committee on Social Trends entered into an intensive study of the problems of physical, biological and social heritage, including population trends, utilization of natural wealth, the influence of invention and discovery, trends in economic organization, shifting occupational patterns, education, family life, changing social attitudes, labor, religion, arts, medicine and health, public and private welfare work, and the social aspects of government. The results of the inquiry into these subjects, broken down into 29 subdivisions, and the findings of the committee based on these investigations make up the text of this two-volume report, which both complements and supplements the earlier report on "Recent Economic Changes." In addition,

thirteen of the subjects covered by the present report are to be treated in more detail in a series of separate monographs.

The first third of the present century has been filled with epoch-making events which have brought "national problems urgently demanding attention on many fronts." Indifference to the interrelation of the parts of the American social system has resulted in incredible skyscrapers and incredible slums, splendid organization side by side with deadly disorganization. "These unequal rates of change in economic life, in government, in education, in science and religion, make zones of danger and points of tension." Because industry in the narrow sense is inseparable from the social structure in the broad sense, these changing social trends inevitably introduce new problems which must be taken into account in long-range industrial planning. If, for example, we must revise our forecasts of population growth and scale down 1940 expectations from 140,000,000 to 132,000,000, with still sharper downward revisions for later years, producers who have been projecting future plans and hopes on earlier and more generous estimates must recast their figures.

This illustration of the close connection between the social problems discussed in this report and future business trends is multiplied in page after page of the work. The section on mineral and power resources, written by F. G. Tryon and Margaret H. Schoenfeld, treating one phase of the physical heritage where the rate of change is relatively slow, emphasizes the story, familiar to coal men, of the tremendous wastes which overdevelopment has saddled upon the mineral industry. Because technologic improvements in production and consumption have increased the output per worker 50 per cent in 30 years and reduced consumption per unit of product 33 per cent, the outlook for the immediate future is one of growing abundance of minerals available at declining prices. But as mining becomes more difficult, there is grave danger that the gains of technology will be wiped out. Even today, "in spite of the seemingly inexhaustible tonnage underground, many bituminous districts show clear signs of depletion." The anthracite district, these authors say, has already reached that stage of maturity in the production cycle where natural conditions grow steadily more difficult and increasing production costs handicap it in competition with other fuels.

"To maintain the balance of our economic mechanism," asserts the committee, "is a challenge to all the imagination, the scientific insight and the constructive ability which we and our children can muster." It is impossible to deal with the central problem of balance or with any of its ramifications without economic planning. Admittedly the difficulties inherent in such a movement are manifold, and yet, as the report points out, the country did mobilize its industrial resources during the War. "Is it beyond the range of man's capacity some day to take the enhancement of social welfare as seriously as our generation took the winning of the War?"

The major problem, as the committee sees it, is that of closer coordination and more effective integration of the swiftly changing elements in American social life. Constructive integration, it declares, cannot be expected from a policy of drift, but must be advanced by planning which will embrace the scientific, the educational, the economic and the governmental. "All these factors are inextricably intertwined in modern life, and it is impossible to make rapid progress without drawing them all together." Possibly, the committee suggests, the answer may be the creation of a national advisory council which will embrace all these agencies and interests.—S.A.H.

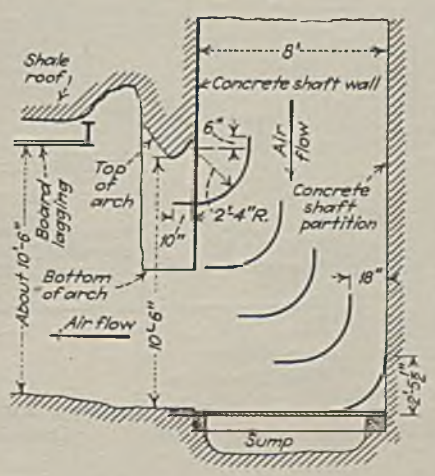
* * *

The Effects on Mine Ventilation of Shaft Bottom Vanes and Improvements in Aircourses, by Cloyde M. Smith. Illinois Coal Mining Investigations Cooperative Agreement, Bulletin 249; University of Illinois Engineering Experiment Station, Urbana, Ill. Price, 25c.

Viewing the large expense of cleaning of aircourses, operators have been wondering whether adequate returns would be received from such improvements and have often waited till conditions became so bad that betterments were needed if the required quantity of air were to be delivered at a reasonable water gage to the working faces. Mr. Smith has undertaken, and in this bulletin describes, the tests made in an Illinois mine to determine whether cleaning of airways and introduction of vanes at the foot of a shaft are justified by the expenditure.

He concludes that "where the mean cross-sectional area of aircourses in the high-velocity zone of a mine can be increased considerably—say, 50 per cent or more—and maintained at moderate expense without excessive use of obstructing timbers, substantial savings in ventilation costs can be effected." The major part of the savings come from reduced velocities of flow, which are needed if the quantity of air is to be the same under the two conditions, although a substantial share of them result from improved lines of flow.

Vanes Set in a Shaft Bottom to Aid Air in Rounding Angle



As a rule, larger savings can be realized at bends and splits and other like features than in straight headings, although in the mine examined most of the economies were effected in the great length of the high-velocity aircourse, which was cleaned and enlarged.

Vanes were put in the bottom of a shaft to change the flow of air from vertical to horizontal, as shown in the accompanying illustration. The specific resistance of the turn was reduced 50 per cent; Mr. Smith declares this is less than has been obtained in industrial applications. The saving in power consumption for the installation of these vanes was $238 annually, a net saving of $200 per year, depreciating the vanes at 20 per cent per annum. Formation of ice, however, reduces this saving, as the vanes during the coldest months have to be removed. In a dry or an exhaust shaft, vanes would not occasion this difficulty. All the vanes are of 90-deg. arc and 2 ft. 4 in. radius, and all but the one in the corner have 6-in. and 10-in. lips, as shown by the dimensions in the uppermost vane.

* * *

Jigging, Classification, Tabling and Flotation Tests of Coals Presenting Difficult Washing Problems, With Particular Reference to Coals From Pierce County, Washington, by B. M. Bird and S. M. Marshall, U. S. Bureau of Mines, Bulletin 337; 132 pp. Price, 35c.

This comprehensive bulletin, prepared from the results of tests made under the joint cooperation of the U. S. Bureau of Mines, University of Washington and Pacific Coal & Coke Co., deals with the product of an area of coal situated southeast of Carbonado, Wash., mostly northeast of the Carbon River. The purpose was to discover if the coal would form a good metallurgical product, but this report deals solely with the preliminary preparation tests and not with its carbonization.

In course of the work many changes were made in standard methods of cleaning. The thoroughness of the investigation reflects much credit on the authors of the bulletin. They found that the best results were obtained by using classifiers, and that of the systems tried on slack sizes—through a ⅜-in. Ton-Cap screen—a combination of classifiers, tables and froth flotation was the most efficient. They developed a new hindered settling classifier, a new system of riffling tables which increased efficiency and a new method of adjusting coal-washing tables based on the distribution of the products.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Safety for Locomotive Runner Dictates Changes In Control Equipment

AT THE Tams operation of the Gulf Smokeless Coal Co., Tams, W. Va., experiments have been carried on during the past year to develop an electrical control for gathering locomotives that would make operation safer for the motor runner. Briefly, this has been accomplished by the use of a mechanical controller and master control switch, shown in Fig. 2.

The Beckley seam, with an average height of 42 in., is mined at the Tams operation. Inside-frame locomotives with a 44-in. wheelbase and an over-all height of 32 in. above the top of the rail are used in gathering. Over-all length of the locomotives, bumper to bumper, is 13 ft. 7 in., and they are equipped with two poles requiring a clearance width of 6 ft. 6 in. Wheel gage is 44 in. Direct current for the operation of the locomotives is supplied at 250 volts from the company's power plant. The room-and-pillar system of mining is used, and rooms are driven 350 ft. deep, necessitating a reel capacity of 400 ft. of cable. Locomotives are equipped with mechanical brakes, and have an average speed of 6 m.p.h.

General changes in the design of the locomotives are shown in Figs. 1 and 2. Fig. 1 shows the standard controller and standard hand-operated cable reel and transfer switches with which the locomotives were equipped when shipped from the factory. The crowded condition of the cab is apparent from an inspection of Fig. 1. Fig. 2 shows the same locomotive after the changes were made to increase safety. Location of the motors and the width of the frame were not altered, but the frame was lengthened 4 in. by the insertion of filler blocks between the bumper and the operating cab.

The standard electric operating controller and reverse were removed from their place in the cab to locations along the frame (Fig. 2). In their place, a mechanical controller of the usual type was installed. As the mechanical controller was shorter than the equipment it replaced, which originally extended to the bottom of the cab, its installation resulted in a gain of 9 in. of cab room. Operating controller and reverse were connected to the mechanical controller by shafts with swivel joints. The four standard hand-operated cable-reel and transfer switches (Fig. 1) were replaced by one master control switch, hereinafter described in detail. The master control switch is connected by cable to the standard type cable-reel contactors and transfer switches inclosed in fiber cases firmly fastened to the frame at the front end of the locomotive (Fig. 2). Operating cables are gathered neatly into a tree, and armored cable is used between the master control switch and the operating controller.

The master control switch designed by the electrical department at Tams is shown

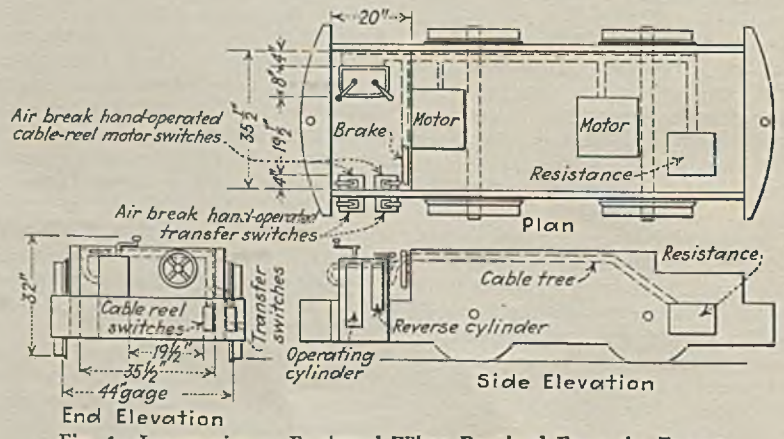


Fig. 1—Locomotive as Equipped When Received From the Factory

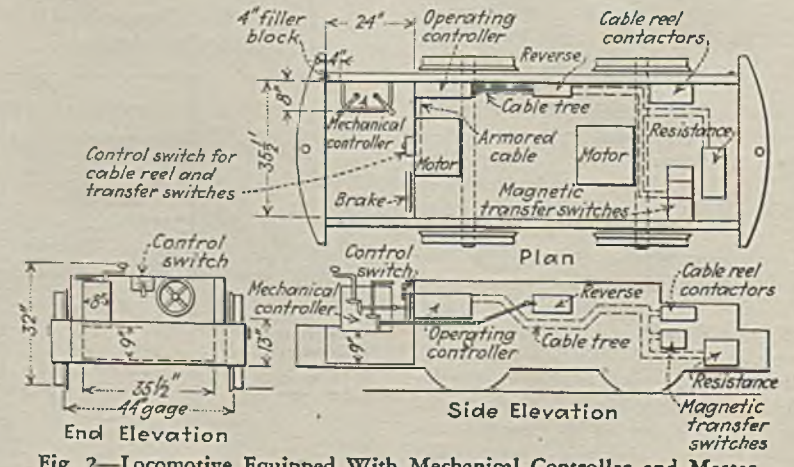


Fig. 2—Locomotive Equipped With Mechanical Controller and Master Control Switch

in Fig. 4, together with the corresponding wiring diagram. Operation of the master control switch is as follows (numbers refer to corresponding numbers in Fig. 4):

Barrel 1 with segments turns with lever 2, thus bringing the segments in contact with the various fingers and closing the corresponding circuits. With the lever 2 vertically down, all current is cut off the locomotive. By moving the lever to the left until the blade engages stop 3, current from the reel cable is applied through circuit 4 to close contactor 5, which supplies current to the main operating controller. With contactor 5 closed, lever 2 is then moved to the left until the blade engages stop 6. Current is then applied to the reel motor through circuit 7 by closing contactor 8, which puts the full reel resistance in the circuit and gives a weak cable tension for running into the room. With contactors 5 and 8 closed, the lever is moved to the left until the blade engages stop 9. Current is then applied to the reel motor through circuit 10, by closing

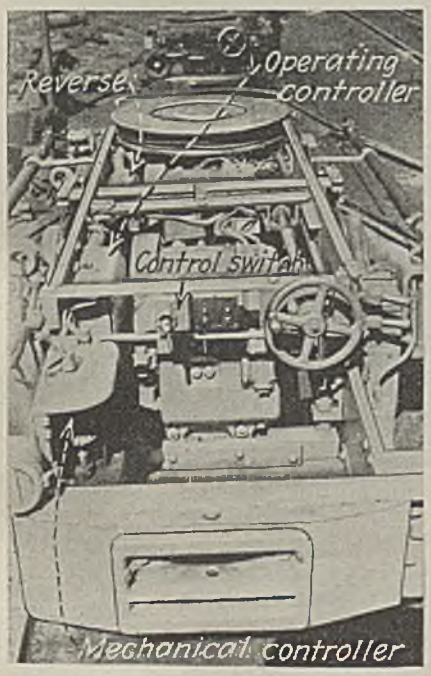


Fig. 3—View of Locomotive After Changes Were Made

contactor 11. This cuts out resistance bank 12 and provides full cable tension for running out of the room. Fiber stop block 13 prevents lever 2 from going farther to the left.

Returning the lever to stop 3 puts circuits 7 and 10 out of service and leaves circuit 4 in use, with current entering the locomotive through the cable. Returning lever 2 to the "off" position cuts off all current to the locomotive and entirely separates the cable-reel circuits from the circuits connected with poles 16 and 20.

By moving lever 2 to the right until the blade engages stop 15, current is applied through pole 16 to the main controller by closing contactor 18 in circuit 17. Moving the lever to stop 19 applies current through pole 20 to the controller by closing contactor 22 in circuit 21 and interrupting circuit 17 by opening contactor 18, thus disconnecting pole 16 from the main controller. Fiber stop block prevents the lever from going farther to the right.

Thus, by the action of lever 2, it is impossible to apply current to more than one operating part of the locomotive at a time, and the whole operation of the locomotive is controlled by one switch. In case trouble occurs, the lever can be quickly returned to the "off" position and all current cut off the locomotive. Positive lever action is guaranteed by reason of the fact that to remove it from any one of the stops it must be lifted out against the tension of spring 23.

Safety and comfort for the motor runner and a simplified operating control are the main objectives of this design. Safety is secured by (1) removing from the cab the standard controller and cable reel and transfer switches, substituting therefor the mechanical controller and master control switch, and (2) by increasing the motor runner's space. Removal of the controller and switches reduces the chances of burns and the master control switch allows the runner to quickly cut all current off his machine. The runner also is provided with 12 cu.ft. of cab space, an increase of one-third over the 9 cu.ft. formerly available. The increased space is especially advantageous in reducing the chances of the runner's striking his head against the roof in low coal and in relieving him of the necessity of extending his body out over the bumper. With the master control switch well up to the deck of the locomotive, and with only the lever projecting into the runner's space, there is little chance of it being hit or thrown by the movement of his body or any outside obstruction.

Perhaps the most advantageous feature of the new control system is the possibility of cutting all current off the locomotive when it is operating on the cable 200 or 300 ft. up in a room. If the controller hangs in the open position, the master control lever is merely moved to the "off" position.

The system herein described can be applied to any cable-reel locomotive, it is asserted, and the master control switch can be located as shown in Fig. 2, or at any other convenient place within reach of the runner. All parts required are standard in the trade, or can easily be turned out in the usual mine maintenance shops.

One locomotive with the new arrangement has been in use at the Tams operation for several months. Service has been excellent, and operation is strongly praised by the runner. Changes are being made in the remaining Tams locomotives, and later the machines at the other Gulf Smokeless mines will be revised. Standard foundry castings are being made for the master control switch, mechanical controller, operating controller and reverse. All parts are easily accessible.

Changes in the first locomotive were made during the regular day shift by the usual locomotive maintenance crew, with very little extra time. However, due to the experimental nature of the work, the first locomotive was of necessity torn down and rebuilt several times, with the result that the entire job took a month to complete at a cost of $250 for material and labor. It is estimated that each of the other locomotives can be changed over by

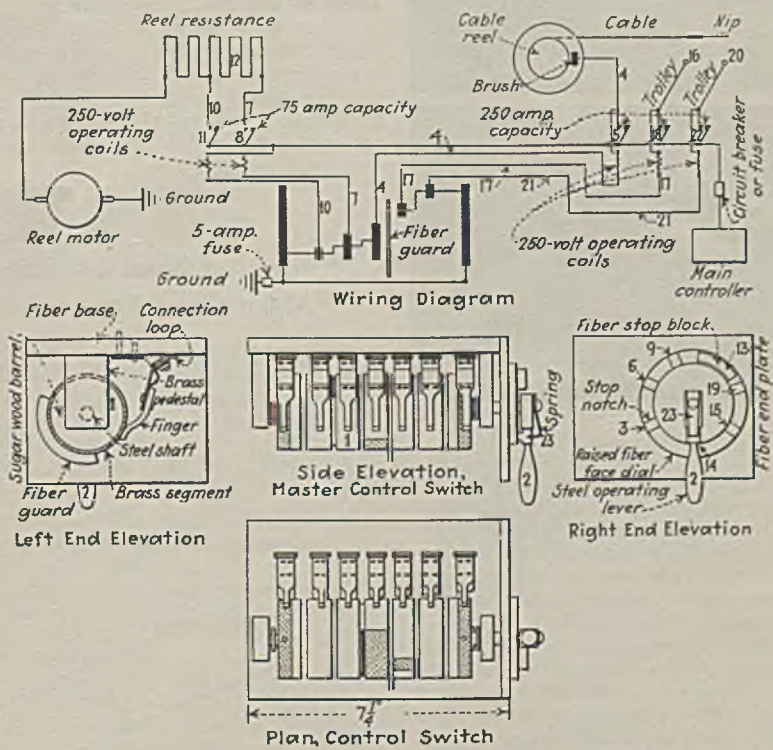


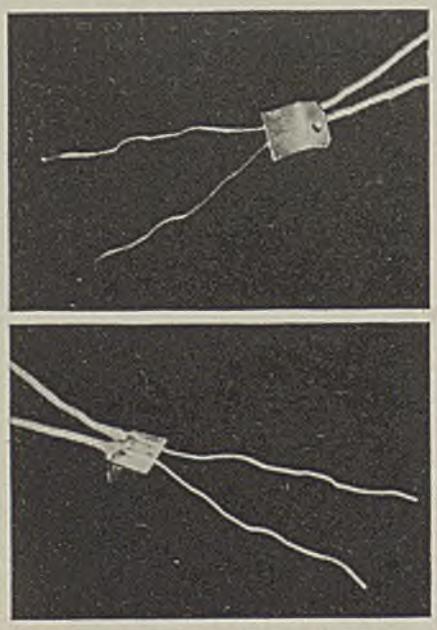
Fig. 4—Master Control Switch and Wiring Diagram

two men in six eight-hour shifts at a cost of $175 for labor and supplies.

F. Van der Volgen, electrical engineer for the Gulf Smokeless Coal Co., who supplied the material for this article, was responsible for all the changes detailed above and the equipment was designed, installed and tested under his supervision. Supplementary inspections and tests were made by Frank Wilson, Beckley, W. Va., district mine inspector, West Virginia Department of Mines. The revisions were made with the cooperation and encouragement of W. P. Tams, Jr., president, and W. F. Tams, general manager, Gulf Smokeless Coal Co. Both have always followed the policy of operating up-to-date mines in which maximum safety to employees is stressed.

Improved Short for Blasting

J. T. Gatehouse, general inspector, Pennsylvania Coal & Coke Corporation, Cresson, Pa., has announced an improvement in the system for shorting detonator wires in electric blasting described in the November, 1932, issue of *Coal Age*, p. 416. The improvement consists of a change in the design of the metal short. The former flat strip of metal has been replaced by the



Angle Short in Position on Detonator Wires

angle short shown in the illustration, which is lightly soldered to the detonator wires. As was the case with the old, the new short is made with a small hole to facilitate its removal in accordance with the plan detailed below.

A cord 1 ft. long with a hook on one end is tied to the firing cable 5 ft. back of the connections, and the hook is inserted in the hole in the metal short. After the attachments are made, the shotfirer goes back to his station and by pulling lightly on the cable tears the short from the detonator wires. The shot can then be fired. With this system, the detonator leads are always shorted until the shotfirer is out of the way, and the 5-ft. loop removes all possibility of breaking the connections while tearing off the short.

When using the former flat metal short, pulling on the cable exerted a direct pull on the detonator wires, with the result that the bare ends occasionally were pulled together, shorting the circuit and requiring the shotfirer to return to the face. With the angle short, much less force is required to tear the short off the wires, thus reducing the chances of a short circuit. Over 1,000 detonators equipped with the angle short have been fired in the No. 42 mine of the Pennsylvania Coal & Coke Corporation, declares Mr. Gatehouse, without any shotfirer having to return to the face.

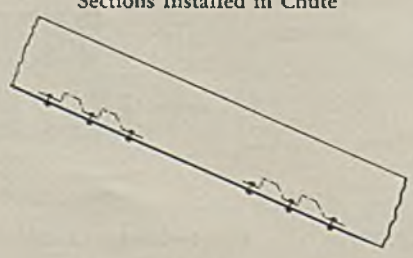
What's Ahead?

Ideas will command a premium in 1933. Coal-mining companies and coal-mining men face the problem of making dollars, and even cents, stretch much farther than in the past. Money- and time-saving short cuts to more efficient operation, to which these pages are devoted, will therefore take on added value in coming months. Your ideas belong in this record of solutions to the every-day problems which practical operating men constantly are called upon to meet, and *Coal Age* will welcome the opportunity to consider them. Only essential facts are necessary; the editors will do the rest. Acceptable ideas are paid for at the rate of $5 or more each.

Sections Cut From Lip Screen Make Chute Retarders

Slowing up the flow of coal in a shaker chute without disturbing the pitch of the chute is a problem at many mining plants. The accompanying illustration indicates a method which was applied successfully by the Puritan Coal & Coke Co., Puritan Mines, W. Va.

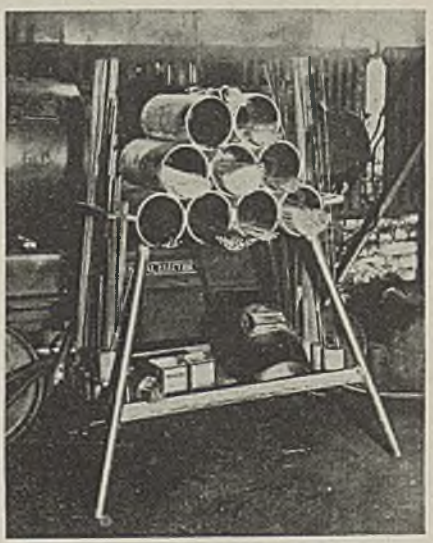
Sections Installed in Chute



Sections, each consisting of two or more steps, were cut from lip screens that had been discarded from service. These sections were riveted to the bottom of the chute and the number of sections and spacing were determined by experiment. The determination depends, of course, upon several factors such as pitch and length of chute, shaking speed, and size of coal.

Rack for Welding Rods Aids Efficiency

Good shopkeeping, like good housekeeping, requires a place for everything. If the welder's efficiency is to be kept at a high level, it is essential that welding rods of all sizes and grades be kept in an accessible place. This point was found to be particularly important in the shops of



All Types of Welding Rods Instantly Available

the Bell & Zoller Coal & Mining Co., Zeigler, Ill., where both gas and electric-arc welding are employed daily. To solve this problem, the company's electrical department, headed by Ernest Prudent, developed the rack shown in the accompanying illustration. It is made of 5-in. conduit pipe mounted on 1½-in. legs, and is designed to accommodate several kinds of rods.

Washing Dust From Top Layer Improves Car Appearance

In many instances general appearance of the railroad car may be a factor even before the car leaves the plant. The loads may be plainly visible from a main highway or from passenger trains. Coal that would otherwise present a beautiful appearance may be dulled to "just coal" by a coating of dust settling on it at the preparation-plant loading chute or when standing close by. If the coal has not been given a dustless treatment with water-solvent chemicals, the bright appearance can be

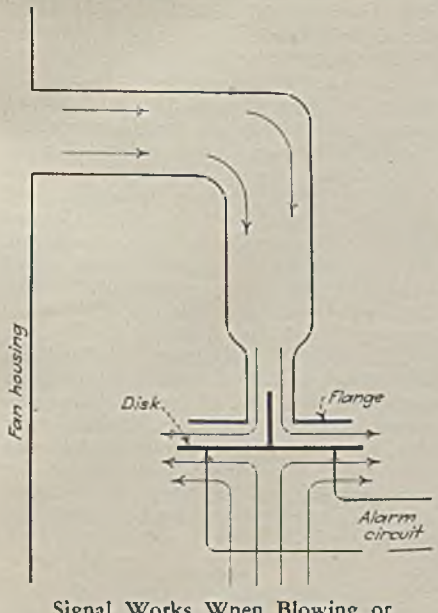
Dusting Off a Car of Lump

restored by a brief spraying of the top of the coal with a hose.

The accompanying photograph illustrates a practice of this kind. It takes but a few minutes of labor to wash the dust off the top layer. Little water is required to make a vast improvement in the general appearance of the car.

"Hole and Disk" Alarm Device For Fan Installations

On an exhaust fan it is a simple matter to construct a device that will operate an alarm in case the fan ceases to maintain the proper suction. A common method is to employ a disk on the end of downward pointed pipe connected into the fan housing. With a blowing fan a similar device



Signal Works Wnen Blowing or Exhausting

can be used, but it is the popular belief that in this case it must be installed inside of the fan housing, an objectionable location. This, however, is not true, as it is possible to install the device on the outside and even to make one disk and one set of contacts serve for either exhaust or blowing operation.

This is based on a mechanical principle seldom put to use. It is best illustrated by taking a 1½x1½-in. piece of fairly stiff paper, laying it on the end of a wooden spool, sticking a pin through the center of the paper and down into the hole of the spool, then trying to blow air through the spool to dislodge the paper. The harder one blows the tighter the paper clings to the spool. If the spool is pointed downward the paper will not fall until the blowing ceases.

The accompanying sketch illustrates the principal parts of a blowing fan alarm which, if properly proportioned in the design and weight of its parts, will serve equally well if the fan is reversed. The lower end of the pipe connection must have a flange with a smooth outer surface. The disk should be made of thin metal to reduce weight, should be of somewhat greater diameter than the flange, and should carry a pin in the center to prevent the disk from sliding sidewise off the flange.

If the disk is lifted by hand up against the flange while air is escaping from the pipe, it will stay up close to the flange as long as there is a positive pressure in the fan housing. Failure of the pressure allows the disk to fall onto the contacts, thus completing the alarm circuit. With proper design, the disk likewise will hold up against the flange with reversed air pressure, dropping onto the contacts when the suction fails.

Arrows on the sketch show air flow with a blowing fan. The escape of a small quantity of air around the periphery of the disk causes an injector action which sets up an upward current of air. This current strikes the bottom of the disk and turns outward, giving a lifting action which more than balances gravity plus the force of the fan pressure acting upon the relatively small area of the escape pipe in which the disk pin plays.

If the disk itself is to act as the electrical conductor for completing the alarm circuit, it should be of a non-corrosive metal. Stainless steel will serve the purpose under ordinary conditions. The device should be housed to protect it from rain and wind, but this housing should not be so small as to interfere with the circulation of air along the top and bottom faces of the disk.

Loading Machine Clutch Removed By Spot Welding

Uneven wear on the slot faces frequently is the cause of trouble with Joy loading machine clutches, the Bell & Zoller Coal & Mining Co., Zeigler, Ill., has found. Repairs are made in the company's shop by grinding these faces to the proper dimensions with a portable grinder. In order to grind the slots throughout their entire length, the clutch center (Fig. 2) must be removed from the assembly (Fig. 1), as the center fits tight against the bevel gear, thus preventing grinding in place.

The problem of removing the clutch centers quickly and easily was solved by the electrical department, headed by Ernest

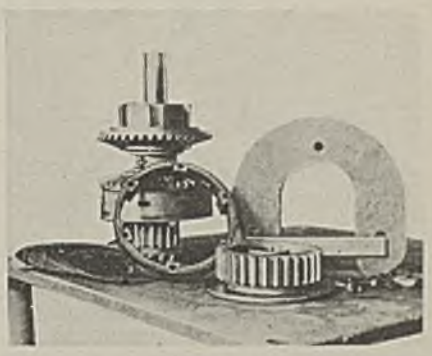


Fig. 1—Clutch Center in Assembly

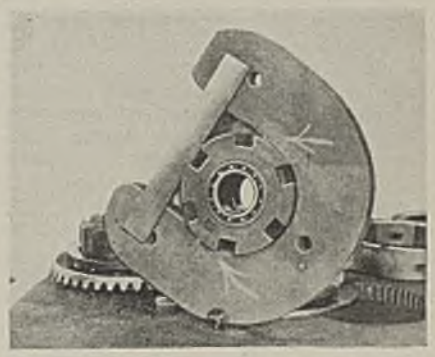
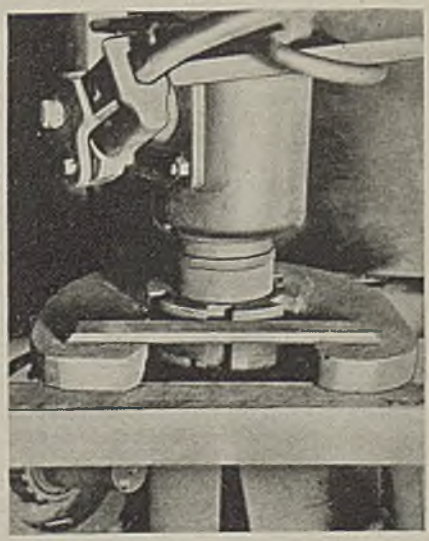


Fig. 2—Plate Spot Welded to Center. Arrows Point to Welds

Prudent. A 1-in. plate, shown in Fig. 2, cut out and machined so that it will just slip over the center, is spot-welded to the center in two places, each bead being about 1½ in. long. The assembly is then placed in a hydraulic press (Fig. 3), where a pressure of 10 to 15 tons presses out the center.

Several centers have been removed in this manner at the Bell & Zoller shop. The single-bead welds have been found sufficiently strong to stand up under the required pressure, and the center is readily cut free with a cold chisel and dressed down with a grinder.

Fig. 3—Removing the Center in Hydraulic Press



WORD from the FIELD

Alabama Fuel & Iron Co. Plan Eases Miners' Burden

The problem of assisting employees during times of depression has been solved by the Alabama Fuel & Iron Co. through the adoption of a comprehensive program of housing and camp improvement and food growing carried out jointly by the company and its employees. This program, outlined in the July *Coal Age,* p. 282, was adopted at the instance of Charles F. DeBardeleben, president, early in 1932. As the work progressed, the company purchased 8,000 gal. of paint and furnished all supplies for repairing and repainting all the company houses at Acmar, Margaret and Overton, according to the Anniston (Ala.) *Times,* which recently published a special article on the results of the program. This work was done by the occupants of the houses, who were paid at the regular rates, thus augmenting their earnings at the mines.

A second major part of the plan was food raising. The company engaged a horticulturist and agriculturist, established canning and food-preserving stations, and required each of its 1,650 employees to cultivate a plot of ground. Mules and plows were furnished, and 1,000 acres was cultivated during the summer. Seeds and plants were furnished at cost. As a result, 100,125 qt. of vegetables and preserves were canned, and 25,000 bu. of corn, 10,000 bu. of sweet potatoes, 2,000 bu. of peas, and large quantities of beans, onions, okra and other vegetables were grown. The company also purchased and distributed 1,000 hogs and 300 cows to its employees to augment their meat and milk supplies.

Much of the success of the program was due to the efforts of F. R. Bell, general manager, assisted by superintendents C. H. Sheperd, Acmar; R. H. Sansing, Margaret; and Hewitt Smith, Overton.

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations were reported as follows:

C.C.B. Smokeless Coal Co., Princewick (W. Va.) mine; contract closed with the Fairmont Mining Machinery Co. for shaker screen and loading boom equipment; capacity, 150 tons per hour.

Cherry Tree Coal Co., Emeigh, Pa.; contract closed with the Fairmont Mining Machinery Co. for all-steel tipple and cleaning plant equipped with shaker screens and Peale-Davis pneumo-gravity separators; capacity, tipple, 250 tons per hour; cleaning plant, 160 tons per hour; to be completed May 1.

New River Co., Macdonald, W. Va.; contract closed with the Pittsburgh Coal Washer Co. for screening and conveying equipment, together with steel structure and

storage bin for preparing nut, stoker and slack; capacity, 300 tons per hour; to be completed April 1

Philadelphia & Reading Coal & Iron Co., Locust Summit breaker; company has purchased from the Hydrotator Co. rights on an unlimited tonnage of No. 4 buckwheat. Two Hydrotators covered by the agreement have a total capacity of 90 gross tons per hour.

Susquehanna Collieries Co., Pennsylvania breaker, Strong, Pa.; contract closed with the Hydrotator Co. for the purchase of one Hydrotator and auxiliary equipment, as well as the rights on a production of 22 gross tons per hour.

Stevens Coal Co., Cameron colliery, Shamokin, Pa.; contract closed with the Wilmot Engineering Co. for two Menzies hydroseparators for preparing rice and barley; capacity, each machine, 20 gross tons per hour.

Anthracite Gas Machine

Selling for $10,000 to $22,000, depending upon the size, the Anthracite Institute placed its new anthracite gas machine on the market in December. Capacity of the small size is 565 lb. of No. 2 buckwheat per hour; capacities of the next two sizes are 1,000 and 1,500 lb. per hour, respectively. One machine installed in a Baltimore (Md.) rolling mill consuming 30,000 tons of coal annually will, it is asserted, save the user about $90,000 per year.

Soft Coal Off 20% in 1932; Anthracite Down 17%

Production of bituminous coal dropped to 305,667,000 net tons in 1932, according to preliminary estimates by the U. S. Bureau of Mines. This is a decrease of 76,422,396 tons, or 20 per cent, from the 1931 output of 382,089,396, tons. Anthracite production fell to 49,350,000 net tons in 1932, a drop of 10,295,652 tons, or 17.3 per cent, from the 1931 total of 59,645,652 tons.

Bituminous coal production in December, 1932, rose to 31,110,000 net tons. This compares with 30,632,000 tons in November, and 30,260,000 tons in December, 1931. Anthracite production also increased in December to 5,089,000 net tons, against 4,271,000 tons in November, and 4,671,000 tons in December, 1931.

Economic Planning Arouses Executive Interest

Existence of a high degree of interest in the possibilities of economic planning for industry is revealed in response to the proposals made by Charles E. Stuart, president, Stuart, James & Cooke, Inc., in an address on "Planned Economy," delivered before the New York Board of Trade a few weeks ago. That many executives are taking steps to acquaint their stockholders with the possibilities of economic planning was indicated by the suggestion of H. L. Badham, Jr., president, Bessemer Coal, Iron & Land Co., that the address be distributed to stockholders in coal companies to assist, among other things, in creating sentiment for modification of the Sherman law. Mr. Badham stated that he planned to embody the substance of the Stuart speech in his own annual address to his stockholders.

In view of the interest in the subject, Mr. Stuart has arranged to supply single copies of his address free to executives, and will supply copies in quantity at cost —5c. each. Applications should be addressed to 17 Battery Place, New York City.

Adopt Modification Program

Adoption in principle of a committee report to the effect that natural-resource industries should seek legislative relief for their difficulties, and that a measure along the general lines of the Capper-Volstead act, exempting agriculture from the provisions of the Sherman act to permit cooperative marketing, would be advisable was the chief order of business at the second meeting of representatives of the various industries, held in New York, Dec. 16, with Charles O'Neill, vice-president, Peale, Peacock & Kerr, presiding. The measure proposed in the report was sponsored by the National Coal Association at the Dec. 1 meeting (*Coal Age,* Vol. 37, p. 450).

The special committee appointed at that time was instructed to prepare a legislative proposal along the lines proposed for consideration at meeting early this month. The committee chairman also was empowered to increase the membership, and added J. D. Francis, vice-president, Island Creek Coal Co., to the roster.

Import Tax Reimposed

Pending a court decision, the import tax of 10c. per 100 lb. on coal from Germany and Great Britain was reimposed by the Treasury Department Dec. 30, following a ruling by Attorney General Mitchell. The tax, which was imposed in the Revenue Act of 1932,

was removed from British and German coal in November as a result of an earlier exemption granted on Canadian coal. It was held that as Canadian coal had to pay no tax, due to the fact that the United States shipped her more coal than she received, Great Britain and Germany also were entitled to exemption under most-favored-nation treaties.

Attorney General Mitchell's action in offering assistance to the importers in case they should turn to the courts, was the object of spirited attack by General Brice P. Disque, executive director, Anthracite Institute, in a statement issued Jan. 4. General Disque declared that the coal industry would fight importers through to the Supreme Court in order to conserve domestic business.

Dedusting Rights Acquired

Rights to build and install the Birtley aspirator and the Waring dust filter in the United States have been purchased by the Koppers-Rheolaveur Co., Pittsburgh, Pa., from the Birtley Co., Ltd., and the Goodlass-Wall & Lead Industries, Ltd., England. Selection of this equipment for American distribution followed a three-months' investigation of dedusting at collieries in England and on the Continent. The equipment is designed to remove dust smaller than $\frac{1}{4}$ or $\frac{1}{2}$ in. from damp coal or coal varying from damp to dry without blinding and with comparatively slight variations in efficiency.

Association Activities

Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., was reelected president of the Alabama Mining Institute at a meeting of the board of governors in December. A. B. Aldridge, president, Southeastern Fuel Co., and James L. Davidson were again chosen vice-president and secretary-treasurer, respectively.

All officers of the Winding Gulf Operators' Association were reelected at the annual meeting last month, as follows: president, A. W. Laing, vice-president, Morrison Coal Co., Charleston, W. Va.; vice-president, L. T. Putman, general superintendent, Raleigh-Wyoming Mining Co., Beckley; secretary-treasurer, P. C. Graney, general manager, C. C. B. Smokeless Coal Co., Mt. Hope.

W. Gaston Caperton, Charleston, W. Va., president, Slab Fork Coal Co., was elected president of the Smokeless Coal Operators' Association of West Virginia at the annual meeting held in New York in December. R. H. Knode, Admiralty Coal Co., and Capt. E. C. Page, Crozer Coal & Coke Co., were chosen vice-presidents; H. R. Hawthorne, Pocahontas Fuel Co., was chosen treasurer.

Wesley Harris, Bicknell Coal Co., was elected president of the Indiana Coal Mining Institute at its second annual meeting, at Terre Haute, last month. James White, Peabody Coal Co.; P. L. Donie, Little Betty Mining Co.; and B. H. Schull, Binkley Mining Co., were elected vice-presidents, and Harvey Cartwright, commissioner, Indiana Coal Operators' Association, was chosen secretary.

Illinois Wage Agreement Extended to 1935; Oklahoma Deadlock Continues

EXPIRATION of the Illinois wage agreement was unexpectedly extended from March 31, 1933, to March 31, 1935, through adoption of a resolution at a joint meeting of representatives of the Illinois Coal Operators' Association and the United Mine Workers of America Dec. 22, at Chicago. The action was taken to put Illinois on a parity with Indiana in regard to the expiration date, and permits Illinois operators to proceed with the negotiation of long-term contracts unhampered by the fear of a stoppage this year.

The Progressive Miners of America is expected to agree to a similar extension in the various districts in which it is dominant. Insurgent wage scales, however, have been subject to considerable modification in certain districts, according to developments in the Belleville district in December. A strike at three mines manned by insurgents revealed that some miners are working for a pick rate of 39c. per ton, compared with the 68c. established in the regular union agreement. At some mines, it is charged, the rate has been cut to 35c. a ton, and miners receiving this price were the ones who struck.

Several minor and one major clash occurred between members of the rival unions in December and early January. The most serious engagement took place on Jan. 3 at the No. 7 mine, Peabody Coal Co., Kincaid, Ill., where deputy sheriffs and working members of the United Mine Workers fought a pitched battle with insurgent pickets. One working miner was killed, a woman was fatally injured by a stray bullet and several men were injured. National Guardsmen moved into the district on Jan. 4.

Conditions in the McAlester-Wilburton district of Oklahoma were unchanged in December, with the Milby & Dow Coal & Mining Co., and the Craig Valley, Pittsburg-McAlester, Samples and Delokla coal companies steadfastly refusing to recognize the United Mine Workers in spite of constant picketing and pressure by state authorities. Henryetta operators continued to operate open-shop, despite union threats to call a strike in the coming months to force them into the union fold.

Continued dissension in locals of the United Mine Workers, complicated by the interference of the rival Amalgamated Mine Workers, continued to plague Nova Scotia. One hundred and six miners at the Colonial colliery, Bras D'or Coal Co., on Dec. 12 requested protection from attacks by men protesting against "unfair distribution of work." Three collieries of the Cumberland Railway & Coal Co., Ltd., Springhill, were closed down Dec. 20 as a result of the company's refual to discharge a miner suspended by the United Mine Workers, but work was resumed the following day, pending a settlement of the dispute. Two mines of the Dominion Coal Co., Ltd., Reserve, were closed Dec. 20 in a controversy over unemployment relief.

A new contract to replace the old agreement expiring Jan. 31 was presented to the 12,000 Nova Scotia miners on Jan. 2 for their consideration. With the exception of reductions in the day rates of 59 men, the terms of the agreement were the same as the old, which has been in effect since February, 1932.

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 *Colliery Engineer*, with which *Mines and Minerals* previously had been consolidated, was absorbed by COAL AGE.

When, in 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During twenty-one years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Lesher, John M. Carmody and Sydney A. Hale. The editorial staff of COAL AGE consists of: Sydney A. Hale, R. Dawson Hall, Louis C. McCarthy, Ivan A. Given, J. H. Edwards, and A. F. Brosky.

Explosions Kill 91 Miners

Fourteen miners were killed in an explosion at the Jones mine of the Albuquerque & Cerillos Coal Co., Madrid, N. M., Dec. 7. Fifty other men at work at the time of the explosion escaped. Ignition of gas was tentatively assigned as the cause of the disaster.

Twenty-three men were killed in a dust explosion in the Zero mine of the Harlan Fuel Co., Yancey, Ky., Dec. 9. Nearly 300 men were at work at the time of the blast, which was caused by two windy shots in a thin pillar. Investigation showed, according to John F. Daniel, chief, Kentucky Department of Mines, that the shots blew through with sufficient force to throw the dust in the air, where it was ignited.

Fifty-four men were killed in an explosion in the Moweaqua (Ill.) cooperative mine, Dec. 24. Recovery of the bodies was completed on Dec. 29. Cause of the explosion had not been determined at the end of the month.

Buys Briquetting Equipment

The Consolidation Coal Co. has awarded the Fairmont Mining Machinery Co. a contract to install briquetting machinery, bucket elevators and storage bins at its Cincinnati (Ohio) yard. The briquets will be made of finely crushed coal with a cement binder. They will be produced in the form of 4-in. cubes for domestic consumption. Capacity of the plant is 20 tons per day.

"Davis Coal News" Out

Davis Coal & Coke Co., Baltimore, Md., issued in December the first number of the *Davis Coal News*, a monthly publication devoted to improved coal burning. Distribution is limited to engineers and executives interested in economy and reliability in steam generation. The new publication, declared Arthur B. Stewart, president of the company, is dedicated to the task of spanning the long-existing gap between coal production and coal utilization.

Personal Notes

GEORGE S. PATTERSON, Huntington, W. Va., general manager of the Sycamore Coal Co., Cinderella, W. Va., has been elected president, succeeding his brother, the late S. W. Patterson. CHARLES A. HAMILL, mining engineer and assistant to the general manager, was elected secretary and general manager of the company.

EDWARD B. LEISENRING, president, Westmoreland Coal Co., Philadelphia, Pa., has been elected a director of the United Gas Improvement Co.

FORREST RICHARDSON, Omaha, Neb., was elected president of the Sheridan Coal Co., Rock Springs, Wyo., in December, succeeding the late G. W. Megeath. Mr. Richardson's connection with the Sheridan Coal Co. and the Megeath interests goes back to 1890.

THOMAS G. FEAR, general manager of operations for the Consolidation Coal Co., Fairmont, W. Va., resigned his position in December to accept a post as assistant to the president, H. C. Frick Coke Co., Scottdale, Pa. D. A. REED, manager, Elkhorn division, Kentucky, for several years, succeeds Mr. Fear.

COL. EDWARD O'TOOLE, for 26 years general superintendent of the Gary (W. Va.) operations of the United States Coal & Coke Co., resigned in December to give closer attention to the affairs of the American Coal Cleaning Corporation, headed by his son, EDWARD O'TOOLE, JR. For a time, the Gary operations will be in charge of W. C. STRATTON, engineer.

CARL STRIPE, formerly with the Combustion Engineering Corporation, has been appointed assistant to the vice-president of the Davis Coal & Coke Co., and will head the company's engineering activities, with headquarters in New York.

J. A. FORD, Huntington, W. Va., for a number of years connected with the Buffalo Eagle Coal Co., has been made superintendent of the Avis Eagle Coal Co., Lyburn, W. Va.

Obituary

FRANK S. KNOX, chief engineer, Sunday Creek Coal Co., died Dec. 21 at his home in Columbus, Ohio, of angina pectoris. Mr. Knox, who was 54, was graduated from Ohio State University in 1901, and before going with Sunday Creek two years ago was connected with the Pittsburgh Coal Co. and the Consolidation Coal Co.

STEPHEN ARKWRIGHT, 69, president, Arkwright Coal Co., died at his home in Morgantown, W. Va., Dec. 25, of a heart attack. Mr. Arkwright was a native of Lancashire, England, and came to the United States in 1884, settling at Roscoe, Pa. After working as a mine inspector for the H. C. Frick Coke Co. until 1919, he joined the Valley Camp Coal Co. organization and moved to Fairmont, W. Va. In 1926, he purchased the Mona mine at Morgantown.

F. H. KOHLBRAKER, 75, for 30 years prior to 1927 superintendent of the Nanticoke division of the Susquehanna Collieries Co., died at his home in Nanticoke, Dec. 9. Mr. Kohlbraker started his mining career as a slate picker 65 years ago.

CHARLES L. CLOSE, 58, supervisor of safety, sanitation and welfare for the United States Steel Corporation since 1911, died of apoplexy at Cincinnati, Ohio, Dec. 26, where he was visiting relatives. Prior to going with the Steel Corporation, Mr. Close was with the National Tube Co.

Industrial Notes

JOHN W. MACMORRIS, for nine years factory manager for S.K.F. Industries, Hartford, Conn., has been made factory manager for the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

RALPH KELLY, formerly southwestern district manager, has been appointed central district manager for the Westinghouse Electric & Mfg. Co., with headquarters at Pittsburgh, Pa.

GEORGE C. MCMULLEN, a member of the Timken Roller Bearing Co. organization for fifteen years, has joined the Tyson Roller Bearing Corporation, Massillon, Ohio, as manager of industrial sales.

Coming Meetings

Anthracite Club of New York; third annual banquet, Jan. 19, Hotel Astor, New York City.

American Society of Heating and Ventilating Engineers; annual meeting, Jan. 23-25, Cincinnati, Ohio.

Eastern Ohio Coal Operators' Association; annual meeting, Feb. 13, Cleveland, Ohio.

American Institute of Mining and Metallurgical Engineers; annual meeting, Feb. 20-24, Engineering Societies Building, New York City.

Business Cooperation Discussed

Broader cooperation in business and the legislation needed to make it possible was the theme of the Dec. 14 dinner in a series given by Charles E. Stuart, president, Stuart, James & Cooke, Inc., New York. The following representatives of industry and the legal profession participated:

Judge C. B. Ames, president, American Petroleum Institute; Gen. Brice P. Disque, executive director, Anthracite Institute; Dr. W. H. Easton, New York; James A. Emery, counsel, National Manufacturers' Association; William L. Glenn, attorney, New York; Charles R. Hook, president, American Rolling Mill Co.; Robert P. Lamont, president, American Iron & Steel Institute; W. A. Marshall, president, W. A. Marshall & Co., Inc.; Col. Fitzhugh Lee Minnigerode, New York; Eugene L. Norton, president, Freeport Texas Co.; George M. Shriver, vice-president, Baltimore & Ohio R. R.; John L. Steinbugler, president, William C. Atwater & Co., Inc.; C. B. Sudborough, general traffic manager, Pennsylvania R. R.; Mark W. Potter, New York; and M. D. Griffith, general manager, New York Board of Trade.

Mine Fatalities Down

Coal mine accidents caused the deaths of 74 bituminous and 21 anthracite miners in November, 1932, according to information furnished the U. S. Bureau of Mines by state mine inspectors. This compares with 80 bituminous and 22 anthracite fatalities in October, and 89 bituminous and 14 anthracite deaths in November, 1931. The death rate at bituminous mines dropped from 2.45 in October to 2.42 in November, while the anthracite rate rose from 4.20 to 4.92. Comparative figures are as follows:

BITUMINOUS MINES

	Nov., 1932	Oct., 1932	Nov., 1931
Production, 1,000 tons	30,632	32,677	30,426
Fatalities	74	80	89
Death rate per 1,000,000 tons	2.42	2.45	2.93

ANTHRACITE MINES

Production, 1,000 tons	4,371	5,234	4,149
Fatalities	21	22	14
Death rate per 1,000,000 tons	4.92	4.20	3.37

Comparative fatality rates for the first eleven months of 1932 and 1931 are given in the following table:

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

Cause	Bituminous: Number Killed	Bituminous: Killed per 1,000,000 Tons	Anthracite: Number Killed	Anthracite: Killed per 1,000,000 Tons	Total: Number Killed	Total: Killed per 1,000,000 Tons
January-November, 1931						
All causes	982	2.794	355	6.458	1,337	3.289
Falls of roof and coal	574	1.633	193	3.511	767	1.887
Haulage	186	.529	41	.746	227	.558
Gas or dust explosions:						
Local explosions	16	.046	16	.291	32	.079
Major explosions	46	.131	5	.091	51	.125
Explosives	12	.034	22	.400	34	.084
Electricity	55	.156	2	.036	57	.140
Surface and miscellaneous	93	.265	76	1.383	169	.416
January-November, 1932						
All causes	750	2.732	206	4.654	956	2.999
Falls of roof and coal	410	1.493	117	2.643	527	1.653
Haulage	129	.470	28	.633	157	.492
Gas or dust explosions:						
Local explosions	12	.044	7	.158	19	.060
Major explosions	54	.197	...	.....	54	.169
Explosives	17	.062	11	.248	28	.088
Electricity	38	.138	5	.113	43	.135
Surface and miscellaneous	90	.328	38	.859	128	.402

* All figures are preliminary and subject to revision.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Elevator Bucket

Link-Belt Co., Indianapolis, Ind., has developed an elevator bucket for heavy-duty work, designated as Style "AAP." It is available in all the popular sizes, such as 8x5, 10x6, 12x7, 14x7, 16x8 and 18x8 in. It is asserted that the new bucket, while weighing and costing a little more, will result in notable economies by reason of its longer life, in turn due to the improved distribution of metal to insure maximum resistance to wear. The metal used is "Promal," said to be stronger and more durable than malleable iron. Ribs down the front and a heavy flat bead around the ends are said to offer added resistance to twisting strains in service.

"AAP" Elevator Bucket

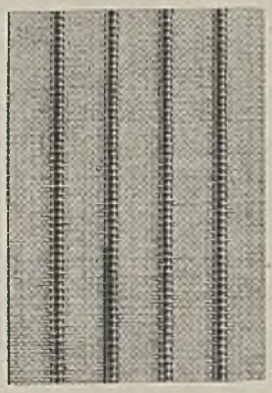
Screening and Washing

Abbé Engineering Co., New York City, offers for use in jigs and wash boxes the "Denta" washing grate, which it declares will double the capacity of equipment in which it is installed. The grate is made of slotted steel bars rigidly fastened to supporting members, and the apertures are so designed that resistance to water flow is reduced to a minimum and a rapid flow of heavy products to the discharge is obtained. Other features pointed out by the company include: elimination of grate breakage, choking and cleaning; maximum of active surface; and uniform washing results.

"Denta" Washing Grate

A full line of "Rima" wound-wedge-wire slot sieves for dewatering and screening also is offered by the company in a variety of profiles for different classes of service. Stepped forms also are available where clogging is a factor. Large open area and maximum carrying capacity per wire and over the entire screen surface are emphasized. Absolute rigidity and patent spacing lugs to prevent side movement of the wires and thus insure accuracy of the screening also are pointed out by the company. "Rima" sieves are available in all metals and all shapes with slots from 1/500 in. up.

Stepped "Rima" Wedge Wire Sieve



"Streno" Screening Cloth

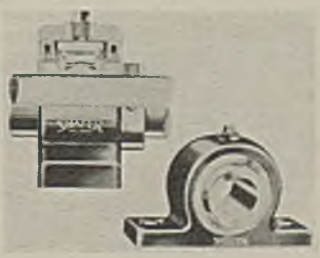
"Vibo" light-weight screening cloths of tempered spring or rustless steel are a further Abbé product for use on all types of vibrating screens. Openings range from $\frac{1}{8}$ in. to 60 mesh, with other meshes in preparation. Increased life of cloth, spring action, stiffness of screen area, vibrating action and capacity are claimed. Three wire gages are available for each mesh: "Vibo Ordinary," Vibo L" (light weight), and "Vibo EL" (extra light weight). Different gage wires are used for the warp and weft to secure greater vibratory action, and all the wires over the entire area are said to act as springs.

In meshes from 18 to 120, the company offers "Streno" screening cloths. These are made of phosphor-bronze and steel, with wire reinforcements. The special reinforcing wires, it is said, greatly increase the life of the cloth, maintain rigidity, and prevent mesh enlargement. Spacing of the reinforcing wires varies with the mesh.

Roller Bearings

A new line of single-row, self-aligning, radial roller bearings is offered by the Shafer Bearing Corporation, Chicago, for use where the duty is light. A single-row Shafer concave bearing (full-roller type) is used, with the rollers operating between a straight outer race and a convex inner race, thus, it is asserted, assuring liberal radial load capacity and ample provision for the limited thrust featuring moderate load applications. Full self-alignment is obtained in the bearing itself, the company points out, thus compensating automatically for inaccuracies in machining or shaft deflection under load. Retainers are omitted, allowing for 50 per cent more long rollers, said to provide exceptional capacity for absorbing shocks. Hardened and ground thrust plates are provided. Shafer light-duty bearings are available in ready-to-install pillow blocks, flange units, hanger boxes and take-up units for shafts from $\frac{7}{8}$ to $2\frac{7}{8}$ in. The bearing also can be obtained separately.

Shafer Light-Duty Pillow Block



Diaphragm Valve

American Hard Rubber Co., New York City, offers the Ace hard- or soft-rubber-lined Hills-McCanna Co. diaphragm valve in sizes from 1 to 4 in., inclusive. The hard-rubber-lined valve is recommended by the company for corrosive liquids, and the soft-rubber-lined type for use where abrasion is a factor. According to the company, there is no stuffing box to leak and the diaphragm is perfectly supported in all positions. Working mechanism, it is stated, is entirely segregated from the liquid handled. Consequently, it is always in proper condition.

Exploded View of Valve

Electrical Controls

General Electric Co., Schenectady, N. Y., has announced a new line of full-voltage magnetic switches built to conform to the standards of the Underwriters' Laboratory for use in Class 1, Group D hazardous locations. These switches are said to be weatherproof and suitable for use in corrosive atmospheres. The new devices consist of standard magnetic switches with special operating coils and contact for operation

Full-Voltage Switches

submerged in oil, and oil-immersed overload relays. Tanks are in themselves explosion-proof, the oil being used, it is stated, only to protect the switches and relays from corrosive fumes. The relay can be reset by a button which extends through the top tank cover. For use in connection with these switches, a pushbutton station, also meeting underwriters' specifications, has been developed for remote control.

A new line of capacitors for power-factor correction also is offered by the General Electric Co.; they are said to be cheaper and smaller in size, rating for rating. The new capacitors are treated and filled with Pyranol, a new dielectric material said to possess unusual insulating and dielectric properties which permit the construction of unusually small models for given ratings. Pyranol, it is asserted, is both non-inflammable and non-explosive. The new box-type models for indoor service can be connected directly to the motor terminals or to the line side of a motor switch. For large rack-type capacitors for both indoor and outdoor service, the new small units allow the installation of a line of racks and individual units, which are provided with individual fuses, to secure any desired kilovolt-ampere rating over a wide range, thus, it is said, simplifying the application of small blocks of corrective capacity where space is limited.

A new line of manually and electrically operated air circuit

A.C. Air Circuit Breaker, 6,000 Amp., 600 Volts

breakers is a further development of the General Electric Co. These breakers (designated AL-2) are designed for the control and protection of apparatus and feeders in all fields of activity. They are rated up to 750 volts, 10,000 amp., and are made in single-, double-, triple- and four-pole models. Multi-pole breakers consist of two or more self-contained single-pole units mechanically interconnected for group operation. The new breakers are trip-free, the company declares, and can be equipped with instantaneous or time overcurrent or under-voltage trips, shunt trips and auxiliary switches. The over-current mechanism is constructed for direct tripping action on all ratings. Contacts are so arranged that the circuit is never broken or closed by the main contacts.

Blasting Device

The Delphia blasting device, designed to prevent misfires and premature explosions in blasting, is now being offered in this country by representatives of Delphia A.G., Berlin, Germany. As shown in the illustrations, the device consists of a wooden spool bored out at one end to hold the blasting cap. Where fuse is used, the recess for the cap has the same diameter throughout and is bored to fit firmly around the cap, which is not crimped onto the fuse. The fuse is

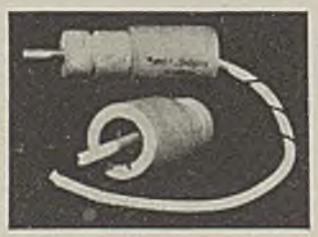


Fig. 1—Delphia Blasting Device for Firing With Fuse

threaded through the spool and is held in place by a wire (Fig. 1). If electric detonators are used, the recess is tapered (Fig. 2) and the holding wire is omitted. In using the device, it is inserted into the end of the last stick of explosive (high explosive or black powder) and the paper wrapping is tied around it.

One of the major features emphasized by the manufacturer is the provision for removing the device in case a misfire should occur in its use. To accomplish this, an auger consisting of a steel bar with a bit on the end has been developed to remove the stemming. When the charge is reached, a screw point on the auger bit engages the slotted plate (Fig. 2) and the blasting device is withdrawn. Contact with the cap is prevented by the intervening shoulder.

In addition to the positive prevention of misfires or premature explosions resulting from the displacement of the cap or fuse in charging, the manufacturer stresses the following advantages: elimination of extra drillholes in dealing

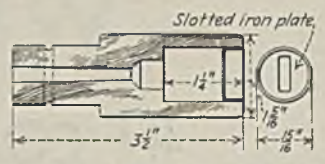


Fig. 2—Device for Use With Electric Detonators

with misfires; opportunity for firm tamping right down to the charge, inasmuch as the cap is protected by the wooden spool; more efficient blasting as a result of firmer tamping; elimination of cap crimping. The device, it is declared, can be waterproofed by filling the slot recess with a suitable material. Howard E. Perry, president, Chisos Mining Co., Portland, Me., is handling the introduction of the device.

Tracing Paper

Drafting supplies division, National Consumers Paper Corporation, New York City, offers the new "Cassvell" vellum tracing paper for use instead of the more expensive tracing cloth. Cassvell vellum, it is asserted, is without the disagreeable odor characteristic of mineral-oil-treated vellum, will not discolor, become brittle or transfer oil to other papers, and possesses better erasing qualities. In addition, it is not necessary to use pounce to make the paper take ink.

New Ball Bearings

Norma - Hoffmann Bearings Corporation, Stamford, Conn., has added the Type "CD" Duplex, double-angular-contact ball bearing to its line of "precision" ball bearings. This unit, it is said, has been developed to meet the need for a bearing adapted not only to radial loads but also to high thrust loads in either direction. At the same time, the width is no greater than that of a standard single-row bearing. The "CD" outer ring is made in two parts, and both inner and outer raceways are ground to a special curvature suitable for carrying heavy end thrust. A one-piece ball retainer of extruded bronze rides, or is carried, upon the ground flanges of the inner ring. These bearings are available in the light, medium and heavy metric series in sizes from 10- to 100-mm. bore. They should be used only where the thrust load exceeds the radial load, and the duplex outer ring should be clamped tight in the housing.

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