COAL AGE

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Devoted to the Operating, Technical and Business Problems of the Coal Mining Industry

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Editor

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ONE STEP AT A TIME

SELF-COMMISERATION long has been a popular pastime in the coal industry—particularly among those who have trusted to luck, fate and misfortune to settle the problems of tomorrow. But, fortunately, this easy way of dodging the future is losing its standing with men genuinely concerned over the larger aspects of the industry. More and more these leaders are abandoning faith in blind hope and are seeking practical ways and means of putting their business upon a permanently, steadily profitable basis.

IF THE disastrous experiences of 1927 had one virtue it was the teaching in a fashion none could ignore that calamity no longer can be relied upon to pull the industry out of the trough of unprofitableness. The rejuvenation of the railroads, following their return to private management eight years ago, removed transportation disability as a prop for high prices. The sad course of spot quotations on bituminous coal in 1927 made it painfully plain that the industry no longer could depend upon strikes to produce profits. Opportunism and opportunity have ceased to be synonymous in coal.

HOW then may the industry best build for the future? The answers offered run the gamut from reliance upon the ruthless operation of the stark law of the economic jungle to the smothering arm of government regulation. Large-scale consolidations, some of which are now in the actual process of being worked out, suggest the solution to many. District sales organizations which would control distribution without necessarily effecting a direct change in the financial structure or ownership of existing producing units also attract more attention.

OBVIOUSLY, even if such proposals can be adopted, their accomplishment will not be the achievement of a moment. In the meantime, however, there are possibilities of early help which merit consideration. A closer co-ordination, based upon clearer understanding between buyer and seller, is one such possibility. First tentative steps in this direction already have been taken by individuals and organized groups, but the movement is still embryonic. Even more immediate relief is open in a readjustment of steam-coal prices—if the larger producers will take their courage in their hands.

IN THE days when slack was a byproduct bargain-counter prices had some defense. Today the smaller sizes have a definite market. But, to quote the president of one of the largest producers in the country, "unless coal men change their idea of the value of slack, we will presently see some of them, not content with losing money on only a third of their product, begin to crush their entire production so that they can be sure of losing money on all of it by selling the entire tonnage as slack." Why should the prosperity of industry generally rest in part upon purchases of fuel at less than the cost of production? The answer, of course, is that it shouldn't. Giving that answer practical effect will advance the coal industry far along the road to prosperity.

Photo by Hine

A Human Equation in the Day's Pay

POWER-FACTOR CONTROL

Ends D.C. POWER TROUBLES

By J. H. Edwards
Associate Editor
Coal Age

"WE ARE now hitting 2,500 tons and averaging 2,000 tons per day from the Shamrock mine with little or no annoyance by failures of d.c. power. Before Melton applied his automatic power-factor regulator to the motor-generator set we were always in trouble, though output averaged but 1,500 and never exceeded 2,000 tons."

This declaration by John Harlan, of Providence, Ky., division superintendent of the West Kentucky Coal Co., shows one of the practical advantages of proper control of a factor which, generally speaking, has interested only the technically trained electrical engineer. Power factor has been thought of in terms of a bonus or penalty on the power bill rather than in terms of maximum production from equipment.

"One of the d.c. reclosing feeder breakers opened as many as 65 times a day because, if it were adjusted high enough to stay closed, the unit, a 300-kw. motor generator, would stop due to overload on the synchronous motor," added Mr. Harlan. "Although we operated with a field current of 12 amp., which was as high as we could leave it in hot weather because of overheating the motor, the set would stop five to fifteen times on days of heavy mine load. Since the regulator was installed we have added to the mine load one 15-ton locomotive, two 6-ton locomotives and two mining machines. Even with this additional equipment the motor generator now handles the load without stopping and with but few interruptions from opening of the d.c. breakers."

THE automatic regulator in use at the Shamrock mine of the West Kentucky Coal Co., at Providence, Ky., is one devised by Sherman Melton of Sturgis, Ky., electrical and mechanical engineer. Its field of application includes all synchronous motor-generator sets for supplying direct current from an a.c. power source. As indicated by the wiring diagram on page 76 the regulation is accomplished by using a compound exciter. Its armature is permanently connected to the field of the synchronous motor through the regular rheostat. The shunt field is connected through a rheostat to the 250-volt bus, and the series field, which is connected compound, is energized from a shunt on the negative 250-volt bus.

The illustration of the 300-kw. motor-generator set at the Shamrock mine, appearing on page 76, shows the exciter which was added. It is a standard 5½-kw. 250-volt d.c. generator. The motor-generator set is supported by 3-in. angles bolted to the base and to the bearing pedestal. A flexible coupling joins the shafts.

Peak-load difficulties on this motor generator, the only one supplying the Shamrock mine, caused Mr. Melton to develope his regulator. Interruptions of d.c. power had become so frequent that something had to be done. The obvious solution was to install another generating unit. But as the load was averaging considerably less than full rating of the machine the expenditure seemed unwarranted.

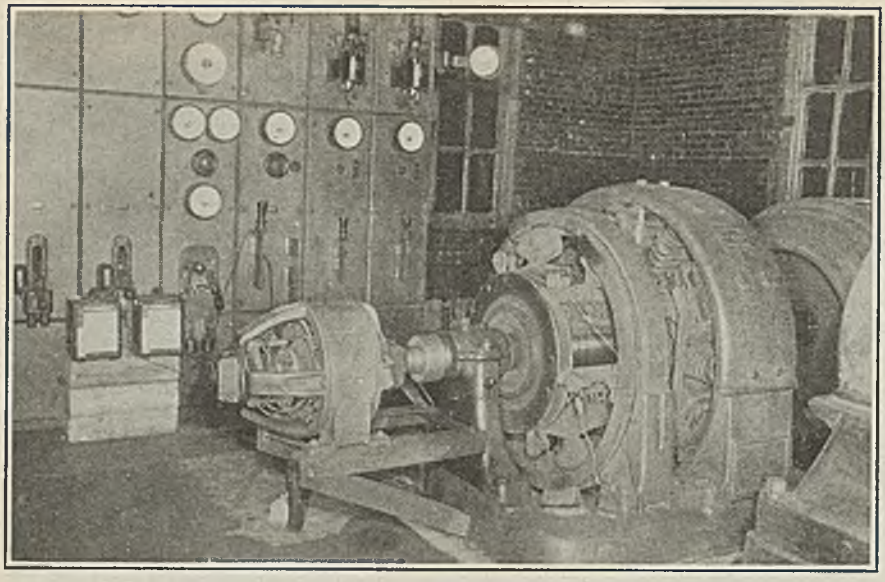
IF THE POWER FACTOR could only be controlled without appreciable time lag with relation to the load fluctuations the unit could easily handle the troublesome peaks. Finally an additional motor generator was obtained and moved into the substation. But before installation was begun the new power-factor regulator was applied to the old unit. The results were entirely satisfactory; consequently the additional unit was moved out and utilized at another mine. Shamrock mine is still operating with the one 300-kw. unit in spite

A Fable From Volt-Ohmia

ONCE UPON A TIME there was a team of horses, one named Volts and the other called Amperes, trying to start a heavy load. At times when one horse started first, then relaxed when the other jumped forward, the double tree moved back and forth violently—the animals exerted much force but accomplished no work. They were said to be out of phase; Volts was ahead of Amperes, or vice versa—the power factor was zero. But when they started together—or in phase, as it was called—the load was moved without loss of energy; the power factor was 100 per cent. From this it was seen that the more nearly the horses worked together the closer to 100 per cent was the power factor.

Moral: Study theory of alternating current and get a practical understanding of power factor.

Aesop, Jr.



Graphic Meters Connected to Motor Generator During Test

of the production and connected-load increases described by Mr. Harlan.

On Jan. 5 I witnessed a 12-hour operating test of the regulator. A portable graphic power-factor meter and a d.c. wattmeter of the same type were temporarity connected to the motor-generator circuits. Charts of both meters were kept in synchronism and driven at 3 in. per hour. Simultaneous readings of the graphic instruments and of the switchboard instruments revealed no differences in calibrations; therefore it is assumed that the graphs obtained are correct for all practical purposes. The meter elements were allowed to work freely. No oil was used in the damping wells and the pens were balanced to the slightest pressure possible to obtain good inking.

SECTIONS of the charts from 9:45 a.m. to 2:15 p.m. are reproduced on page 77. In the morning, with regulator connected and the mine load varying from zero to nearly 100 per cent overload, the power factor averaged 98 lead, and the widest variation was from 90 lead to 98 lag. The response to load changes was instantaneous.

At 10:45 a.m. the regulator was cut out of use to demonstrate the old conditions. The synchronous field current was adjusted to 13 amp., the amount necessary to reduce the likelihood of the motor generator stopping at peak loads. From this time until 1 p.m. the power factor averaged approximately 70 lead and much of the time was below 70, giving values beyond the scale of the meter.

From 11:17 a.m. to 11:47 a.m., the lunch period, when the load was light, the power factor was below 70 lead practically all of the time. The switchboard power-factor meter indicated from 40 to 50 lead during this half hour. When the load would drop close to zero the 2,300-volt synchronous motor took approx-

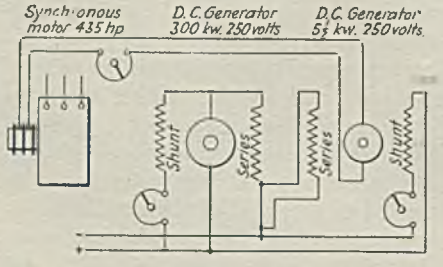


Diagram of Regulator Connections

imately 195 kva., as indicated by an ammeter showing a line current of 49 amp. The wattless current was then an expense to the coal company due to heating of the motor windings and the power line to the metering point.

At 1 p.m. the regulator was cut back into service, and the power factor then was held automatically at close to 99 lead during the next few hours of wide and rapid fluctuations in load. The instantaneous action of the regulator is apparent.

By proper setting of the exciter shunt-field rheostat and of the synchronous motor-field rheostat the power factor can be adjusted to hold automatically at any desired point in a practical range on either side of unity. It was adjusted to about 98 lead in order to compensate for the relatively small induction motor load at the mine.

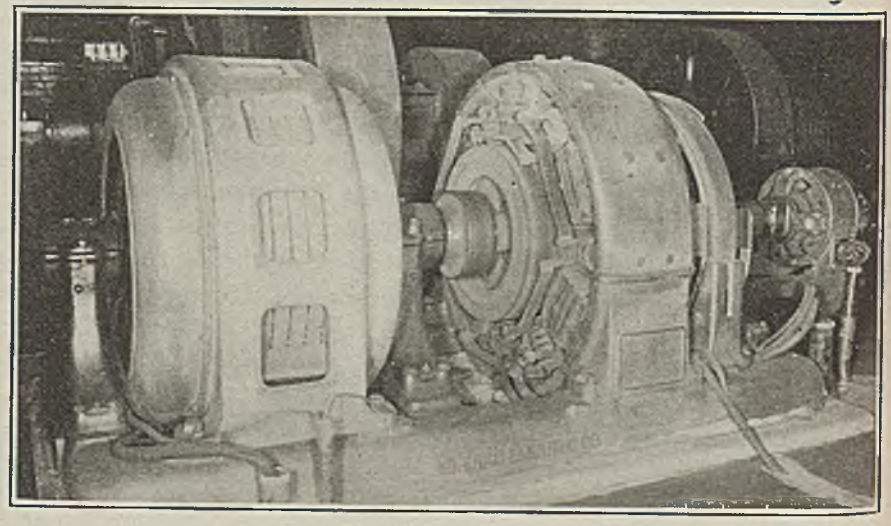
During the test with the graphic meters a number of simultaneous readings were taken of the following indicating instruments: power-factor meter, wattmeter, and ammeter in the synchronous motor field. These readings have been plotted and are reproduced on page 77.

With the regulator not in use and the synchronous field current adjusted to the lowest practical value the power-factor characteristic is one highly undesirable from the user's standpoint, but with the regulator working the power-factor characteristic is almost ideal even from 0 to 100 per cent overload. With the regulator working the field current was automatically varied from 7 amp. to 14 amp.

THE efficiency of the regulator is demonstrated by the following comparison. A new substation opened several months ago has one 200-kw. full-automatic motor-generator unit. It is installed at a borehole about a mile from the tipple of a certain mine.

The set was observed to be operat-

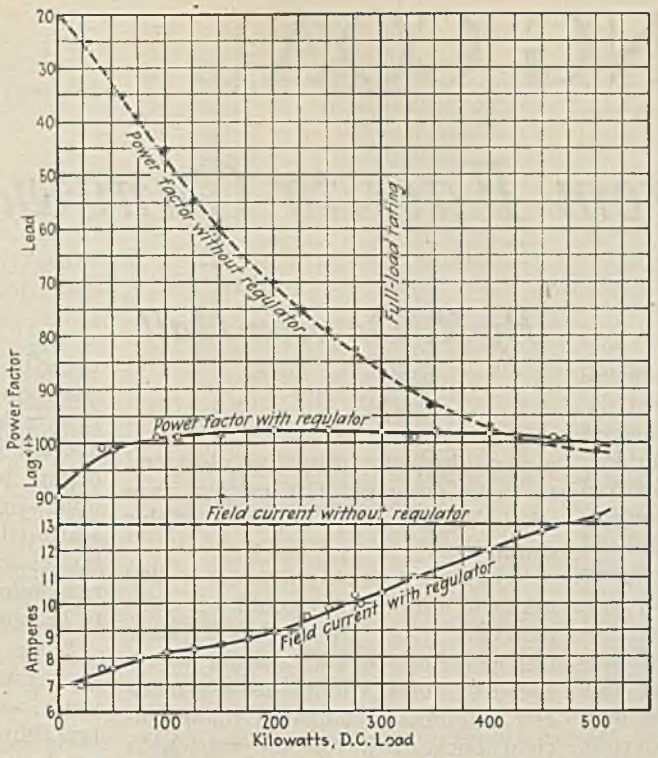
Motor Generator From Switchboard Side



ing most of the time at less than 25 per cent rated load and the pointer of the power-factor meter rested against the peg at 50 per cent lead most of the time. The motor field was operating at 10 amp. The d.c. breaker was opened purposely to bring the load to zero. The ammeter in the 2,300-volt line then indicated 45 amp. wattless current.

As a result of these observations I asked the electrician why he set the field current at such a high value. He said: "If we don't, the set will stop when the big locomotive gets on the d.c. line."

Here was a case where for about 20 hours per day the set was taking a heavy wattless current and was operating with a field of 10 amp. instead of 6.5 to 7, in order to handle the short-time peaks of the day load. The substation was too far away from the tipple to send a man to adjust the rheostat night and morning. It was a glaring example of letting power factor "run wild."



From Readings of Switchboard Meters During Test

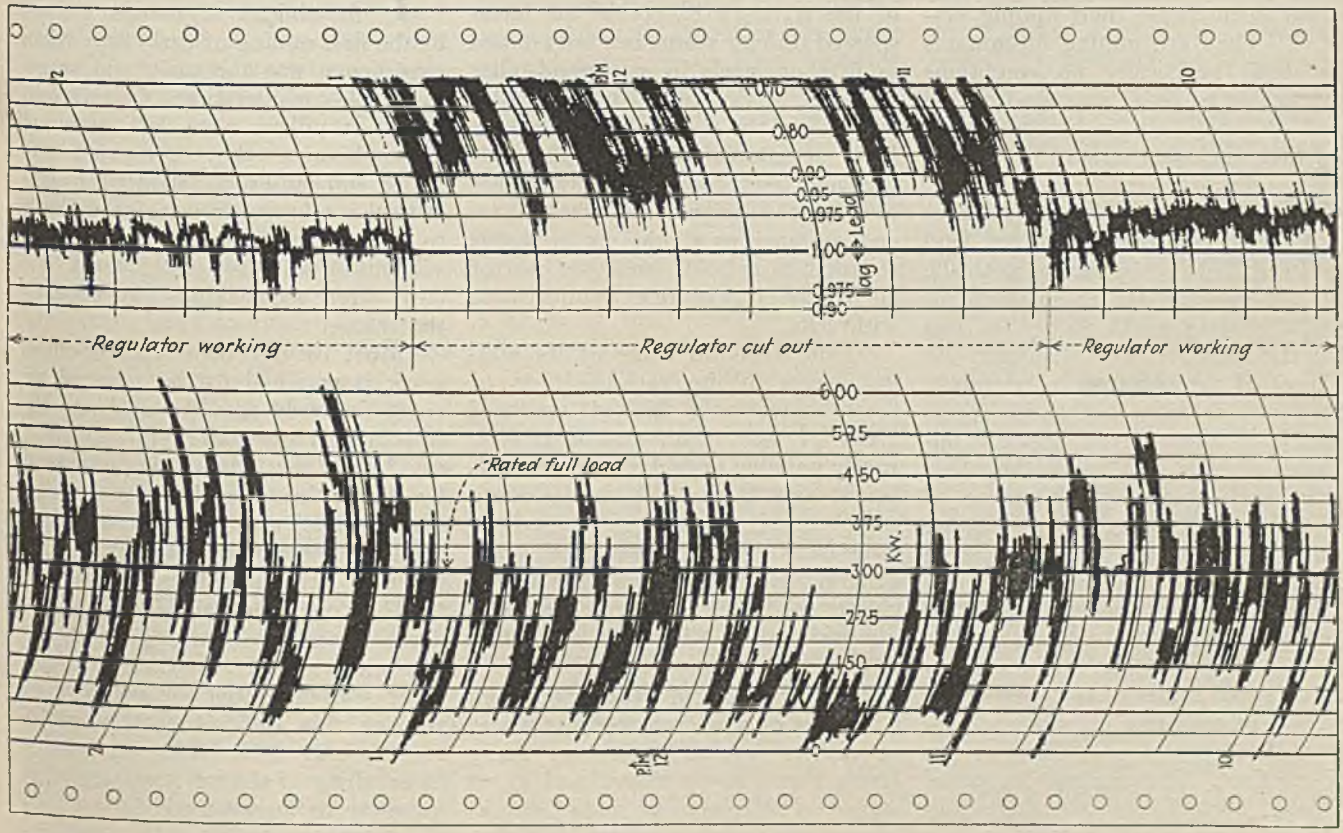
It is significant that at the Shamrock mine where the regulator is applied the power contract does not demand operation at a specified power factor. Such a demand usually is the principal incentive for installing equipment which will improve power factor. The regulator was installed for a more practical purpose and yet it would result in the maximum bonus if such were allowed by the power company for operation of the electrical equipment at a specified power factor.

The 5½-kw. generator installed on the 300-kw. unit as an exciter, is rated 22 amp., 250 volts. The maximum output required is 14 amp. at 200 volts, and this only during the short periods of peak loads. The average current is about 10.5 amp. if the generator is averaging full load. This indicates a possibility that a 3-kw. exciter would have been large enough.

A feature of the automatic power-factor regulator used at Shamrock mine is that the regulation depends upon power output rather than upon d.c. load only. This is true because any variation in the voltage of the main generator tends to raise the exciter voltage as does also the current output.

Mr. Melton has applied for patents covering the regulator.

Sections of the Synchronized Graphic Charts



SHAKING COAL

From Face to Gangway

By R. Dawson Hall

Engineering Editor
Coal Age

A TRIP to British and Continental European mines induced A. B. Jessup, general manager, Jeddo-Highland Coal Co., Jeddo, Pa., to try out shaking chutes in low-coal seams, some of which his company has in common with most anthracite producers. Though the experiment was not made till long after that trip, Mr. Jessup confessedly was influenced by what he had seen in Germany and Austria. Wherever this development of shaking chutes may be placed in terms of world progress, Mr. Jessup is to be credited as the first to apply it on a large scale in the mines of the United States.

In a recent interview he said: "We are not able at our anthracite mines to duplicate comprehensive European mining systems, although with advantage we can adopt or adapt some of their mechanical coal-handling devices for use at the face on a limited scale and in suitable localities.

"Why should we, in fact, be expected to duplicate their mining systems? They are mining bituminous coal with practically no conditions comparable to those surrounding the hard Pennsylvania anthracite seams and their inclosing strata.

"THIS hard anthracite requires heavy blasting, does not lend itself readily to undercutting methods, and the cuttings are in smaller, unprofitable sizes worth $6 per ton less than the sizes over ¾-in. diameter. As to most of the areas yet to be mined, the dozen or more anthracite seams have been distorted by geologic upheavals and lie one above the other under such varied conditions as to prevent comprehensive systems of mining from being used over large areas.

"If bituminous systems could be used we would need to go no farther afield for patterns than the most modern soft-coal mines of our own country, where elaborate layouts and systems of advanced engineering types are in effect. The extreme cheapness of labor abroad, multiple shifts and apparently better discipline also tend to make their kind of mining as a whole inapplicable to the mines of this country.

"On their low output per man-day mines of this country could not commercially exist. In respect to mine transportation by cars we are as far ahead of foreign mines as is a modern automobile compared to an ancient buckboard. In the matter of face conveyors and shaking chutes, however, they early took the lead in invention and use, but we are more rapidly coming to the fore in this line.

"OUR own Jeddo mines are located in the Eastern Middle field of the Pennsylvania anthracite region, where the coal has been intensively mined since the early days of the industry, and a great majority of the territory except in the interspersed thinner seams has been mined in lifts or levels by room-and-pillar methods, leaving most of the remaining coal in the form of room pillars. It is of interest to note that while this one field comprises, say, 9 per cent of the original anthracite area and contains, as a rule, six to twelve seams, it now holds but 2 per cent of all future recoverable Pennsylvania anthracite.

"This advanced stage of its mining leaves in the various levels of most mines only limited scattered areas of solid coal, and it now is rarely possible to find acreage of sufficient extent in which to lay out a comprehensive system of longwall or long faces even if it were not made generally impracticable by the strong character of the roof, steep and varying inclinations of strata and intermittent operation of collieries.

"The winning of anthracite from a number of scattered working places in six to twelve seams on many levels concurrently mined and in all stages of development makes operations in the later days of a mine a most complex engineering and practical task. To maintain output in an average mine after winning of pillars begins requires ingenuity second to none in removing the necessarily scattered and limited areas of overlying seams so as to permit corresponding areas in the seams below to be mined out in turn.

"Our company's mines have operated intensively for more than 70 years, and the coal areas in all but a few thin seams have been mined over on the room-and-pillar system. Our work is so circumscribed, as in many other old anthracite operations (particularly because rooms in the thickest seams were mined first regardless of their position in relation to the thinner ones still left unmined), that we can hardly dignify with the title of 'systems' our methods of recovering what solid coal is left.

"THEY ARE currently made to fit difficult situations created by the first mining of early days when expediency was the main and seemingly sole consideration. Certain coal areas or pillars were left unmined either because they presented too many difficulties to attract or suit critical workmen or were so difficult to extract that the operator could not, without prohibitive loss, meet the cost. Here the shaking-chute came to the rescue.

"Most of our own shaking-chute work is confined to the removal of small scattered areas of coal, mostly in pillars on less than running pitches, say 3 to 12 deg., the mining of which by the ordinary methods with mine car or smaller buggy has not been found commercially practicable because of local difficulties.

"Here our simple shaking chute has made reasonable earnings for the workmen, lightened their manual labor and permitted the operator to recover this difficult coal often at some profit. The lifting of bottom or brushing of the top necessary with mine-car or buggy methods is elimi-

nated by the shaking chute, thus making for speed and efficiency with economy to the miner and operator alike.

"IN thin seams, where cars or small buggies are run to the working faces, the cutting and disposition of millions of tons of top and bottom slate in the anthracite region each year constitutes an economic waste which challenges the best thought of engineers to overcome it by mechanical means, of which the shaking chute so far seems the most promising of any yet devised.

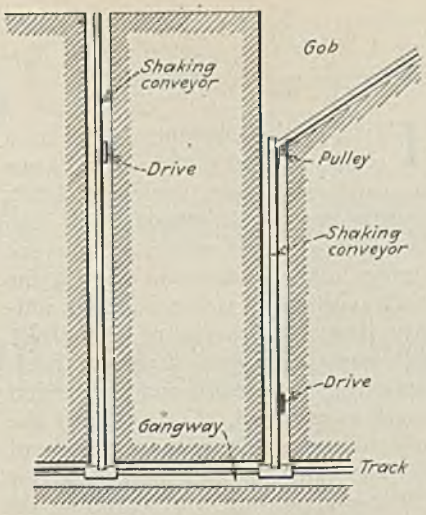
"You will be interested to know that we have 74 shaking chutes in use and find them most helpful in those working places that are advancing on only a slight rise, say 3 to 12 deg., and which otherwise we might not be able to work at all without loss, even if workmen could be induced to mine them out.

"These shaking chutes load about 40,000 of our large 150-cu.ft. mine cars a year, each car holding about 4 tons of run-of-mine. Though we utilize only a small percentage of the capacity of any chute during a working day the investment is justified, as the results for all concerned are more satisfactory and economical than those obtained with the next best method tried.

"We aim at the utmost simplicity of design in shaking chutes and drives and use scrap material to a large extent for hangers and crossbars. Our chutes are almost always suspended, but may be carried in whole or part upon gumwood rollers. Unless a curved track is used, however, the straight-line motion is not so effective as when the chute is hung from props.

"The angle between the hanger and the axis of the chute at the end of the stroke bears an important relation to its effective operation; the point of suspension should be so set as to give a slight lifting of the chute at the end of the downward stroke. The length of the hanger also affects the proper arc of motion, which, as in case of the stroke, seems most effective when it approximates manual shoveling.

"The uniform rotary speed of the motor is transformed by a short connecting rod to the familiar reciprocating motion of an engine crosshead, alike in forward and backward strokes, modified only by the travel of the chute in an arc. Alternating slow forward and fast backward motions are necessary when the grade in the direction of transportation becomes uphill, level or even only slightly descending.



Shaking Coal at Jeddo

"SUCH jerky motion complicates the drive with springs, slotted rocker arms, extra gears and parts and although feasible is not desirable, being heavier, more involved and quite expensive with high upkeep due to the shock of the quick return. The simplest drive for this purpose seems to be a compressed-air cylinder having a differential piston.

"One in satisfactory use is a small pump cylinder having a large exposed area on one side of the piston and a smaller net area on the other, usually accomplished by enlarging the piston rod to an abnormally large diameter. The noise made by an air drive is an objectionable feature with bad roof, although the regulation of the speed and the fast and slow motion make it worthy of consideration in special cases.

"It is possible that for nearly level or uphill work the greater expense of a chain or belt conveyor would be offset by its more positive action.

"Electricity seems most flexible as power for drives but sometimes cannot be used on account of gaseous conditions or other fire hazards. Since the drive is almost always set just off the haulage road it is rare that the ventilation is so poor at such a point as to prevent the safe use of electricity. Compressed-air pipes, on the other hand, in addition to pro viding power for jackhammers, make a most admirable expedient for temporary use as emergency water lines to get the jump on a mine fire.

"On the whole we are highly pleased with the results of our type of shaking chutes, and it is gratifying that our most critical miners are equally pleased. Thousands of tons of otherwise commercially unprofitable coal the presence of which was interfering with the orderly process of complete mining, was removed expeditiously at a cost above the average, it is true, but with compensating advantages of getting it out of the way of other mining."

C. A. Garner, Mr. Jessup's assistant, declared that the simplicity and lightness of the equipment he was making at the company plant and using at his mines appealed to him.

"The engine and the foundation of I-beams weigh altogether only 290 lb. No concreting is needed to prevent movement. A 5-hp. motor running at 1,150 r.p.m. with a double-reduction gear which gives the chute 60 double strokes per minute will drive a chute 450 ft. long without difficulty. The trough consists merely of No. 14 steel plate, 26 in. wide, bent into an arc having a chord of 20½ in., corresponding to a radius of about 11 in. and a depth of 6¾ in. Each unit of trough is 4 ft. long.

"THE trough sections are not riveted directly to one another because, in that event, with constant movement the holes become elongated. Angle-iron flanges are welded or riveted on each end of the chute units, and the angle on one end of one chute is butted against the near angle on the adjacent chute. These angles are bolted to each other. Thus connected the holes do not elongate and there is no lost motion. A little play at each unit would readily absorb the whole movement, for there may be 110 sections in a given trough length.

"At points 8 ft. apart posts are stood on either side of the proposed line of trough. These are set plumb regardless of the inclination of the seam and hitched at the top and bottom by cutting into roof and floor. The rows of props are 3 ft. apart in the clear. Four-foot cross hangers made of 1½- or 2-in. scrap pipe are laid between the props and bolted into place. They are located so as to be 14 in. above the top of the chute. Each end of the pipe is flattened back 6 in. from the end and drilled for ½-in. lag bolts, these latter being 3 in. long.

"The chute line is suspended by hooks made of ¾-in. round iron, the iron being 18 in. long before it is shaped. The ends are bent around a mandrel of 2½-in. radius. Holes are drilled in the ends of the flanges on the chutes, each being made large

enough to allow the hook to work freely.

"One end of the hook is inserted in the chute and the other is hung on the cross-pipe. When completed the hook should measure 14 in. between bends.

"IN ONE PLACE the shaker is made to empty into a sort of hopper chute. This is set on a 12-in. pitch. A gate is provided at the bottom from which the coal can be discharged into a car. By this means a carload of coal can be held in reserve within the hopper while a change of cars is being made.

"Different forms of drive are provided. In one place a 7x7-in. pump is being used, driven by compressed air. It has advantages because with it the number of strokes per minute can be controlled more closely than with electric drive, which is of constant speed. With air the speed may be increased or decreased at will within a wide range.

"The electric drive has an 18-tooth motor pinion, gearing with a 90-tooth pinion on the countershaft. A counter pinion on that shaft having eighteen teeth meshes with a drive gear of 69 teeth. The driving arm is 2 ft. 6 in. long and constructed of a piece of $\frac{3}{4}$ x 2-in. steel.

"The chutes are used not only in thin but in thick coal also. The use of light steel in 4-ft. lengths is an advantage to us in our work. If either the conveyor trough or the engine is heavy, both setting-up and equipment costs mount. It is difficult to get the men at the face to handle the troughs if they are cumbrous, especially if the coal is thin.

"Our troughs are used for low duty. Each trough accommodates only a few men. We could not well afford expensive equipment under such conditions. If we were wanting large duty or much uphill service we might have to look to more elaborate equipment, but these light shaking chutes meet our needs.

"The chutes," as I have said, "work downhill, though they have been used to raise the coal up an adverse grade of 0.5 per cent. Perhaps they would work on a 2-per cent adverse grade, but I think that a gradient of that kind could not be exceeded."

THIS use of shaking chutes on a rising gradient may seem, one may add in passing, somewhat likely to prove unsuccessful, seeing that both the advance and return stroke are similar and, as shown in Fig. 2, the speed with an air drive is almost uniform from end to end of the stroke with such dimensions of parts, stroke, connecting-rod length and suspension length as are used. Consequently the only difference is that toward the end of the forward stroke the action is a lifting one and at the beginning of the return stroke a depressing one. The trough, therefore, at the end of a stroke where the air drive is provided is moved as a man does a shovel when casting earth.

In both cases the material is taken forward gently and gradually raised—so gradually indeed that it cannot slide backward. When the end of the stroke is reached, the shovel or trough, as the case may be, is rising relatively rapidly when the reversal of direction takes place. This reversal the carrier has to obey, but the carried material, being loose, will ignore it. When the trough or shovel descends it subjects the material on it to less frictional stress than it experienced when carrier and carried material were being raised.

Figs. 2 and 3 are merely illustrations of possible conditions and are not based on the actual practice at any plant. Fig. 2 shows the movement of a point on the chute from *A* to *B* due to the motion of a wristpin from *C* to *D* and Fig. 3 of a crankpin also moving, but on a circular course, from *C* to *D*. It will be seen that in the first, which illustrates an air drive, the progress is almost uniform from end to end of the stroke.

The chute starts with a jolt from a normal speed backward to a normal speed forward. The coal is likely, therefore, to fail to follow it in its forward motion, but at the end of the stroke, on the other hand, as stated, the chute is rising rapidly and traveling at the normal speed when suddenly it stops and goes back, falling rapidly and traveling also at a normal speed. This gives the coal a jolt forward. Thus with air the best part of the forward stroke is the last.

With the electric equipment, on the contrary, the best part is the first. The chute comes to the rearward position at a decreasing speed which gradually becomes zero, and after coming to a stop it gradually increases speed. The coal, therefore, goes forward with it readily.

THE END of the forward stroke, however, is badly executed. The chute should be traveling fast, but unfortunately is again approaching zero speed. When at last the direction of motion is reversed and the chute tends to slip from under the coal, the latter has no velocity and therefore no energy to drive it forward. The chute goes back so slowly and falls so little that the coal follows it in its backward path. Thus, as has been said, with the simple electric drive, the first part of the forward stroke is the best and with the air drive the last part. It is unfortunate that the best parts of both cannot be combined.

The sudden reversal of the air drive, of course, is not so instantaneous as assumed. Reversal always takes time. The assumption made, therefore, is not wholly true. The air drive is better at the beginning of the forward stroke and worse at the end than the diagram shows. Still it must be remembered that gravity assists in the beginning of the backward stroke and increases the acceleration. There is no appreciable gravitational effect to aid in making the beginning of the forward stroke speedy, which is indeed well.

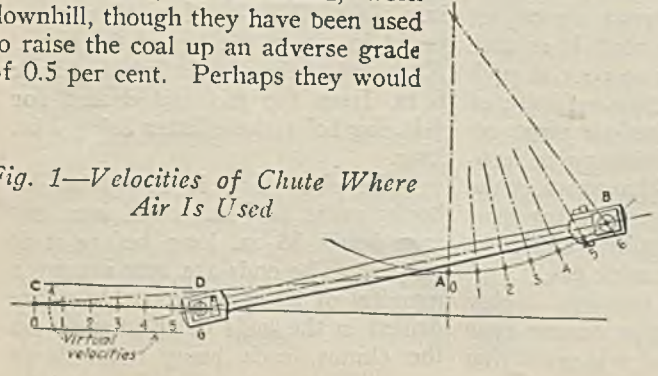


Fig. 1—Velocities of Chute Where Air Is Used

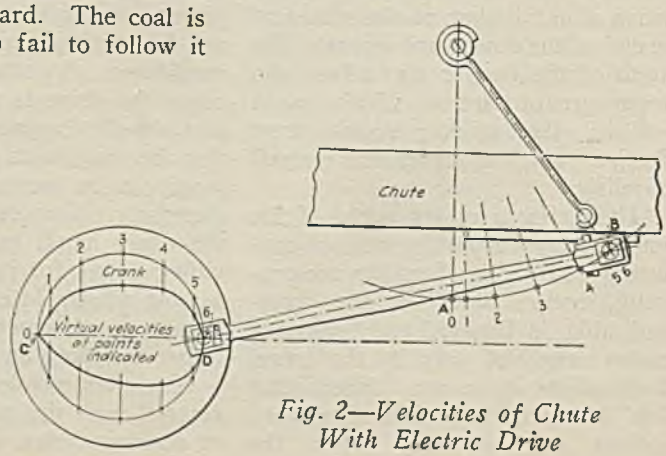


Fig. 2—Velocities of Chute With Electric Drive

LONGFACE

In Kentucky Mine

SHOWS DECIDED ADVANTAGES

By A. F. Brosky
Associate Editor
Coal Age

HAVING successfully worked out one block of coal on an 80-ft. face, the Hardy Burlingham Mining Co., operating in the Hazard field of Kentucky, has attacked an adjacent block by means of a 160-ft. face, with results equally as good so far as the control of roof is concerned. This company has proved to its own satisfaction that under 300 ft. of cover the roof strata immediately over the coal being mined, though bad, can be far more successfully held over a longface than over the face of a room.

It has discovered that longface mining has speeded up the time element in recovery to the extent that top slate which falls or has to be taken down in room-and-pillar mining, stays up when the roof supports are tightly set and placed on relatively close centers. But it has also found the cost of timbering a longface high, though practically all the timbers are recovered and used over and over again.

A lumpier coal is obtained which can be more effectively cleaned at the face. Greater safety is established. In the light of experience gained in this longface mining the company feels confident that eventually it will develop a system better suited to its conditions than the true room-and-pillar method. Whether the system finally adopted will be by face mining at the end of a block or slabbing from the side only future experience will determine.

CONDITIONS in the mine where these trials are in progress are by no means the best. The coal (Hazard No. 7 seam) is about 54 in. thick, is free of partings and is not defined by any marked cleavage. The cover ranges from 250 to 300 ft. Immediately over the coal in places is a slate 1 to 4 in. thick which falls with the coal. Over this slate shell is a rather massive, heavy shale about 3 ft. thick which is so broken by pots and slips that it tends to come down following the removal of the coal unless it is stoutly supported.

Above the 3-ft. shale is a sandstone bed of such irregular deposition that in places it makes contact with the coal while elsewhere it may rise 40 ft. or more above the seam.

As a means of combating these roof conditions, in room-and-pillar mining rooms 80 ft. long are driven simultaneously from each side toward the longitudinal center-line of a block measuring 160 x 275 ft. As a further measure toward quick recovery the rooms are driven evenly in sets of four each. Despite this speeding up of room driving the handling of roof slate remains a problem which thus far has been solved only by longface mining.

The longface layout is adapted from the room-and-pillar projections, the face being established on one end of the 160 x 275-ft. block, as shown in the accompanying sketch. The coal is undercut by a shortwall machine, is loaded by hand and shovel into an Eickhoff conveyor set along the face and is transported to a trip of mine cars by a take-off or entry conveyor of the same type as that along the face.

THE ROOF is supported by posts on 4-ft. centers in rows, three in number, spaced 2½ ft. apart. In the middle row cribs are set at intervals of 20 ft. As a cut is made no deeper than 6 ft., the shortwall machine requiring about that much clearance, and as the conveyor is about 2 ft. wide with a path or avenue about 1 ft. wide maintained on each side of the

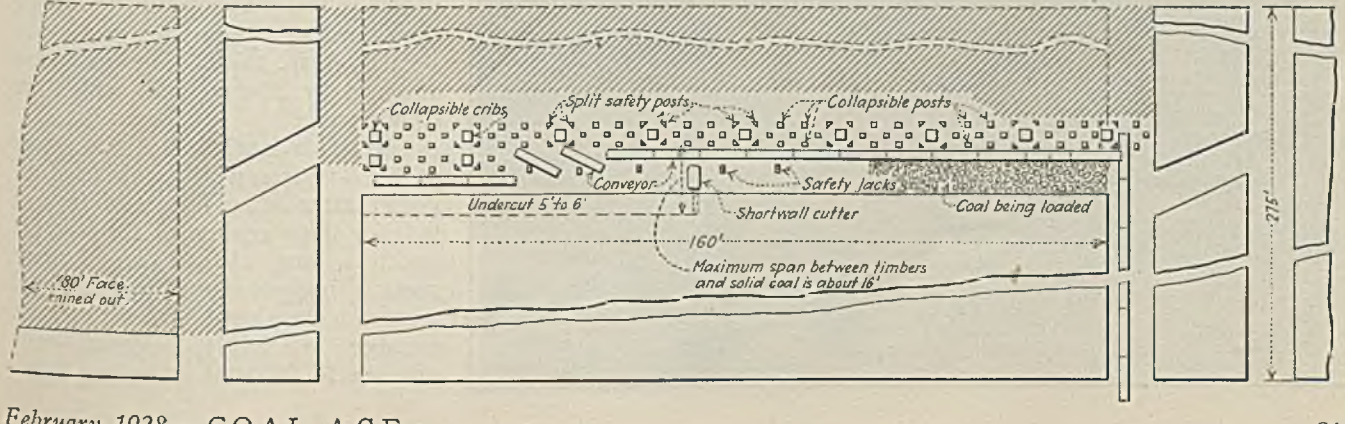


Fig. 1—Schematic Layout of Face

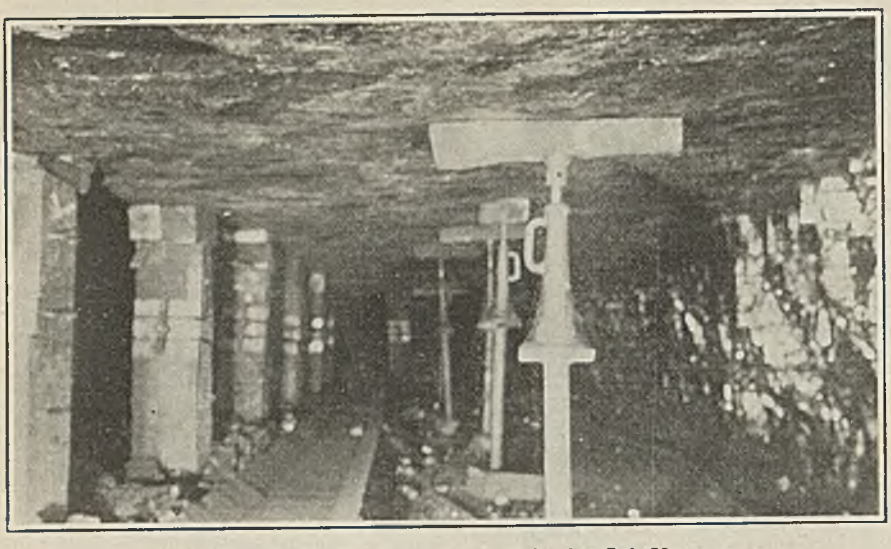


Fig. 2—No Timbers Are Left in the Gob Here

conveyor, the distance between solid coal and the nearest row of posts is as much as 16 ft. This span could be reduced to about 13 ft. merely by the employment of a longwall cutter, which requires a clearance of only 3 ft.

But this 16-ft. span is not wholly unsupported (see Fig. 2) as safety jacks are set between the conveyor and the face at points where the roof shows signs of weakness. These jacks are of the contractor type, originally acquired for the lifting of a building. They are set on 2-in. double-strength steel pipe and will sustain a load of 10 tons. As they are in the path of the shortwall machine it is necessary to reset each of them during the cutting operation.

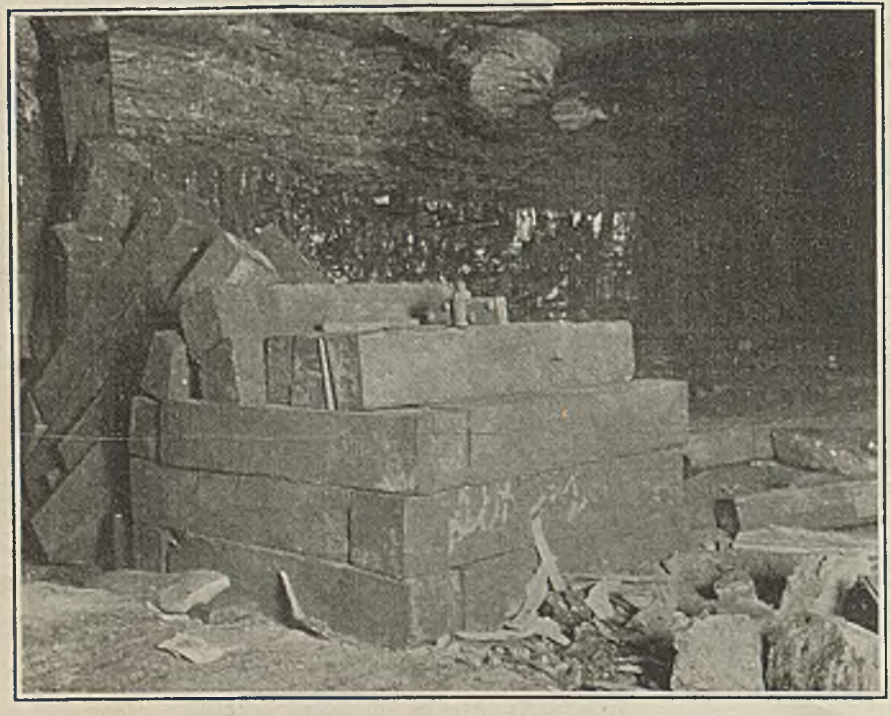
Both the posts and the cribs comprising the primary means of supporting the roof are of the collapsible type, as illustrated in the accompanying photographs. These were made in the mine shops. The post is 1 ft. square and is of oak or some other equally serviceable wood. It consists of three sections, the middle member being a wedge, to which the upper and lower members conform or fit.

ALL THREE MEMBERS are held together, when pressure is exerted on them, by a steel lug attached to a $1\frac{1}{8}$-in. nutted bolt which passes through the wedge member. The batter or slope of the slip surfaces is $1\frac{1}{2}$ in 12. Slopes of various degrees have been tried but the one chosen, which has proved most satisfactory, is approximately equivalent to the angle of repose of steel on steel, with which material the sloped surfaces of the post members are armored.

Fig. 3—The Crib Assembled

Fig. 4—Removing Key Blocks

Fig. 5—The Collapse



The head of the bolt is kept from being pulled through the wedge member by a steel bearing plate and the lug bears on three other steel plates, one of which is fastened to the lug side of each post member. The plate used for this purpose and for facing the sloped surfaces of the post members is $\frac{3}{16}$ in. thick. The plates are fastened by 20-dwt. nails which are countersunk.

The lug is fabricated of two pieces of $\frac{5}{8}$ x 3-in. iron which are riveted together after being forged to form a hub for the reception of the bolt. It is 10 in. long. When one of these posts is first put into service the steel armor on the sloped surfaces of each member is lightly smeared with graphite to facilitate collapsing when

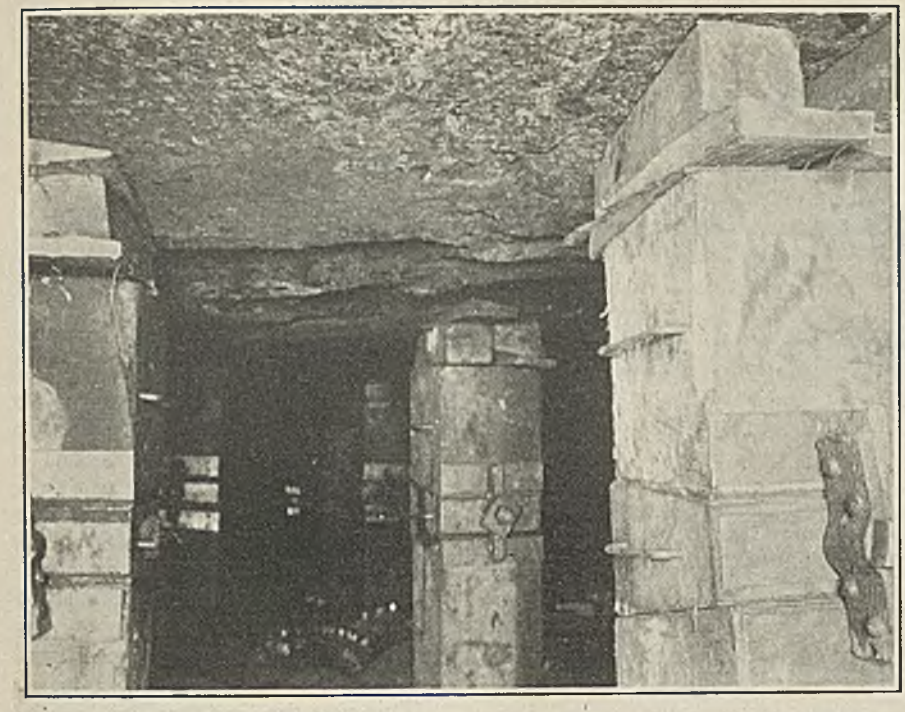


Fig. 6—Collapsible Jacks

the lug is turned from the position in which it holds the members together. A grip rod is placed on each of the members for greater ease in handling them.

THE COLLAPSIBLE CRIB is developed on the same principle as that already described for the post. In each side of the crib are inserted three key blocks, the middle one of which is of wedge section while the other two are battered to fit the wedge. They are held together in the same manner as the members of the collapsible post.

How the crib is assembled is clearly shown in Fig. 3. Here it will be noticed that on the side of the crib diverging to the left the key blocks are shorter than and therefore in the clear of the key blocks on the side diverging to the right. The key blocks on the remaining two sides are similarly arranged.

To topple the crib, the lugs holding the shorted key blocks (on two opposite sides) are rapped to a horizontal position; then these key blocks are knocked into the crib and lifted out as indicated in Fig. 4. Finally, one set of the longer key blocks is cleared of the lug hold and knocked inward, causing the remainder of the crib to topple without the removal of the last or fourth set of key blocks. The common blocks are of 6 x 6-in. section and the crib when assembled measures 36 in. square.

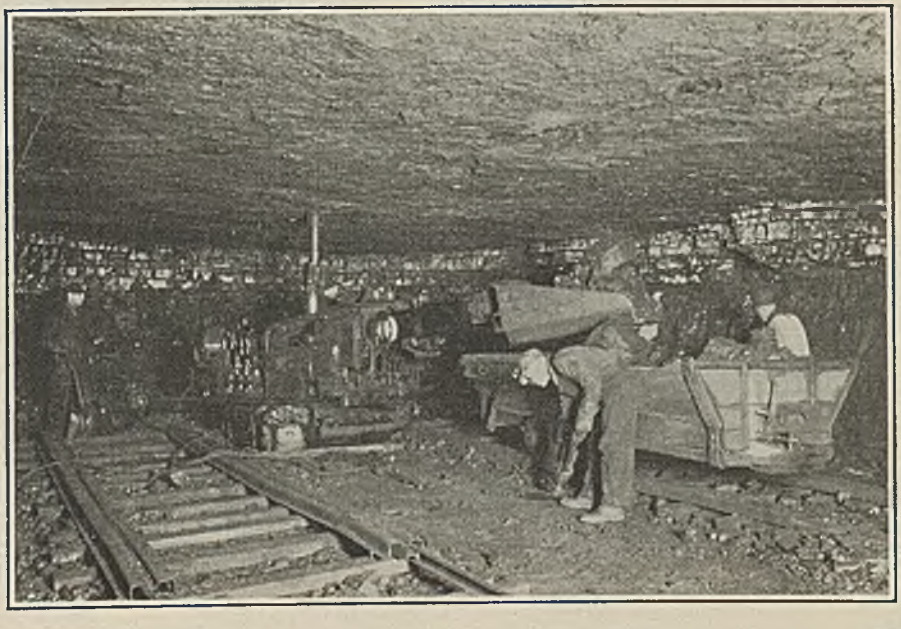
The field of application for this crib is wide by reason of its obvious great merit. It is easily built up. Two men will collapse it, move the blocks a moderate distance and build another crib in about 12 minutes. Once erected, the crib will not topple unless deliberately made to do so. As the blocks are laid skin to skin, in closed construction, the crib will withstand two and one-half times as great a load as will an open crib built of blocks of the same dimensions. This feature is highly desirable where semi-rigid support of roof is desired. Lastly, the crib is easily and safely made to collapse. In the Hardburly mine a split safety post is placed a short distance from each corner of the crib as a means of steadying the roof when it becomes time to demolish the crib and remove the timber of which it is composed.

ONE cut yielding approximately 175 tons of coal is gotten from the longface each working day. The crew consists of 20 men, of whom 5 are employed at night advancing the posts and cribs and shooting the coal. The division of labor on the day shift is as follows: Seven loaders; 2 cutters; 2 drillers; 2 timbermen and 2 car trimmers.

All operations incident to the winning of a cut are carried on more or less simultaneously during the day shift. Loading commences at the far end of the face and is executed progressively toward the discharge end. Cutting, drilling, moving the conveyor, and advancing the roof supports follow in logical sequence. The cutters and drillers move the conveyor. At present two advance rows of posts, including one row containing cribs, are set (making five rows in all) before the two rows nearest the gob are removed. Under ordinary conditions this procedure is hardly necessary and later it may be found feasible in this mine, as is customary elsewhere, to establish the advance rows of supports from material reclaimed from the rear rows.

After being cut the coal drops down practically as one body. The drillholes are placed horizontally about 18 in. from the top of the bench. They are comparatively lightly charged. In consequence the loaders are required occasionally to pick down coal. The result is that the percentage of large lump coal is abnormally high, so much so that shovels are not used during a large part of the loading period.

Fig. 7—Double Track Eliminates Delays



AUTOMATIC CONTROL

Aids Mine Pumping Service

By O. E. Kenworthy

Lehigh Valley Coal Co.
Wilkes-Barre, Pa.

THE EFFECTIVENESS of the centrifugal pump for mine service is being borne home to engineers with ever increasing forcibility. Despite the comparatively low efficiency of this machine when its operating characteristics are compared with those of other types of pumps its adaptability to ready control places the odds in its favor. This machine received little consideration at the hands of expert pumpmen until within recent years when it began to prove itself deserving of recognition because of this adaptability. This latter quality became apparent only after a prominent manufacturer of centrifugal pumps had placed on the market a device for use in priming known as a vacuum breaker.

"And thereby hangs a tale." Automatic pumping was much desired but its realization depended upon just such a device. Since its introduction automatic pumping has been highly developed but opinions are still divided as to the constancy of operation.

I wish particularly to parry that thrust of dissenting opinion which claims that automatic pumping is not fully effective. To do this I will relate a series of experiences encountered in devising a suitable scheme of automatic pump control.

A PUMPING plant was conceived, in 1923, consisting of three 1,500-r.p.m. centrifugal units having an operating head of 475 ft. requiring the use of three 300-hp. motors. The power system from which the station was to draw its energy had a rather large inductive load and it was necessary, therefore, to give due consideration to the ultimate power factor when this station was thrown on the line. Several schemes were worked out but the final one adopted and installed was that of driving these pumps with synchronous motors using magnetic clutches. The accompanying schematic control diagram shown below indicates the method adopted.

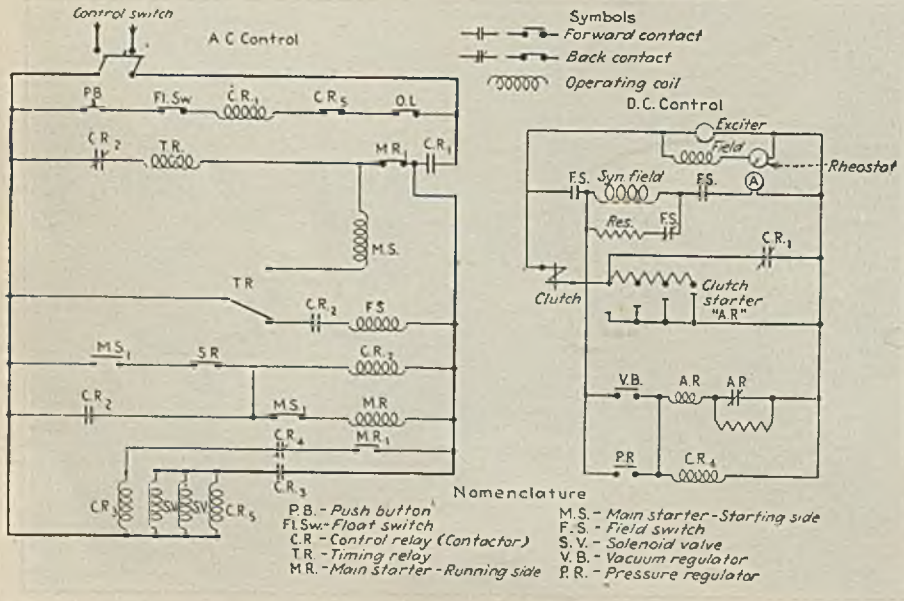
This station has worked successfully since its installation with the exception of several minor mishaps and one serious case of trouble. However, the low maintenance cost together with a minimum number of repair parts kept on hand has largely offset any ill feeling engendered because of this one major difficulty.

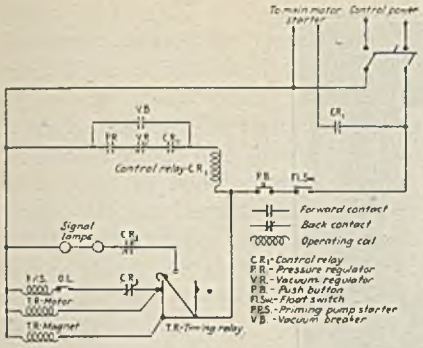
This was the first step, yet in spite of the success attained by it when another station on the same size was about to be installed its operation was further studied in order that a better control scheme might be devised. Several things were determined. First, that the power factor correction obtained, although having its proper effect, could easily have been secured through the use of other equipment such as static condensers, thus obviating the serious problem of operating to a nicety the magnetic clutches. Second, the use of separate and distinct controls, priming devices and piping was necessary in order to assure at all times operation of one unit without interference from another.

The second plant although of the same capacity as the first was installed with two units, and to satisfy the first conclusion, squirrel-cage motors, each of 300-hp. capacity and 2,300 volts, were used. To comply with the second conclusion each unit was given its own priming pump, together with the necessary piping so that the auxiliary machines could be used with either main pump.

THIS only required the installation of a hand-operated four-way valve. The control apparatus was installed in the pump room while the main motor starters were placed on the surface with a three-conductor cable leading down to each main motor. Another three-conductor cable for operation of the priming pump and a four-conductor control cable were laid from the surface to

Diagram of Synchronous Motor Connections





Induction Motor Connections

the pump room for the secondary circuits.

This constituted the second step. The first control scheme for this plant included a timing relay for each unit together with three small contactors. The operation of these contactors was not dependable and upon several occasions they stuck fast, allowing the unit to run after the sump was empty and the float switch had operated. The whole scheme was discarded after about a month's operation and a new plan adopted. This latter plan worked satisfactorily. It consists of a timing relay for each unit and a master contactor rated at 80 amp. (although the largest control current is only 8 amp.) having two forward and two back contacts.

THE large-size contactor was necessary in order to get away from heating and sticking of the fingers. The small diagram shows this simple control scheme.

With the push button and control switch closed ready for operation the water rising in the sump closes the float switch. This completes the circuit to the priming pump starter, which accordingly operates. With the rise of water through the suction pipe, pump and vacuum breaker this latter device operates, closing the vacuum breaker switch. A circuit is thus established which causes the control relay (CR_1 in Fig. 2) to close its forward and open its back contacts. The former completes the circuit to the main motor starter while the latter opens that to the priming pump starter. When these operations have been completed the unit is in operation and will continue to function providing the pressure regulator closes. The vacuum breaker then drains itself, simultaneously opening its switch.

Several other features are connected into this circuit. One of the forward contacts of the control relay is used as a holding contact as shown. If the pressure in the pump casing should fall because of loss of water by the introduction of air into the pump the pressure regulator will operate and open the control relay.

THE timing relay is so connected that it continues to operate until its time cycle has elapsed, whereupon it opens its own motor circuit and closes the one to the signal lights. When the control relay is opened by the operation of either the pressure or the vacuum regulator, after the timing relay has completed its time, the back contact completes the circuit to the signal lights and a warning is given. Incidentally one of these lamps is located on the surface.

This scheme was used for nearly a year with not a single failure of operation. However, all of the credit is not due to the control circuit. Many trifling difficulties may occur if the proper installation is not made. To guard against any possible sticking of the vacuum breaker switch as a result of heating a stationary carbon contact was made. The sticking of this device would render useless the operation of either the pressure or vacuum regulators, the two devices which are the main protection of the pump itself.

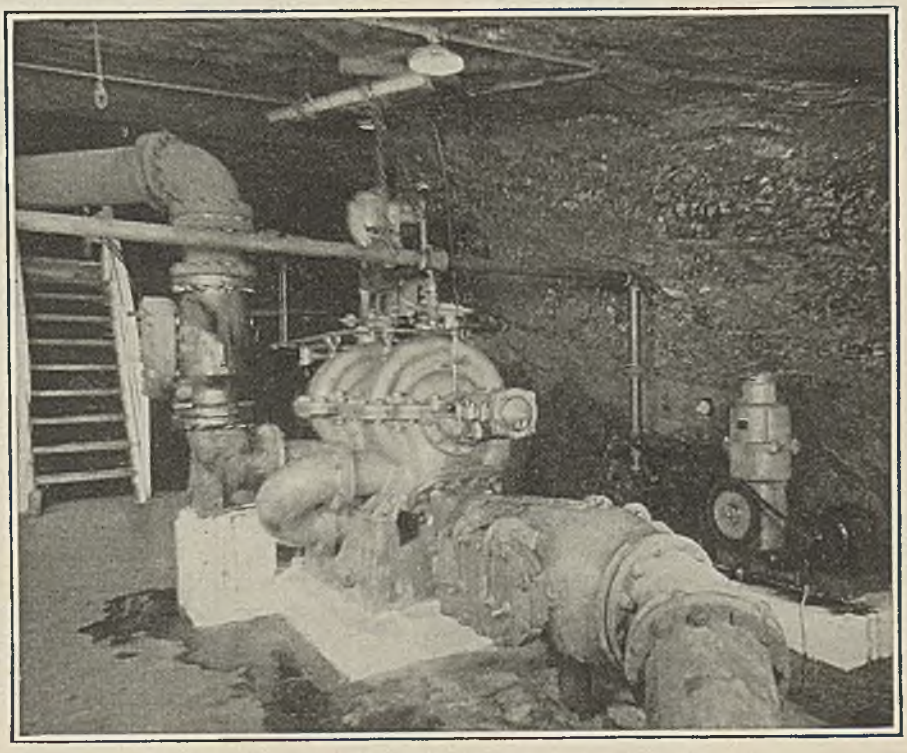
To offset the possibility of false priming, which might occur, one priming valve only was finally used, this being installed on the first stage. To avoid a false alarm being given due to the drain check valves on the vacuum breaker staying open and allowing an air leak and the consequent running of the priming pump until the timing relay should function, two such valves were used in series with a short piece of vertical pipe to seal them. This really stopped an annoying condition.

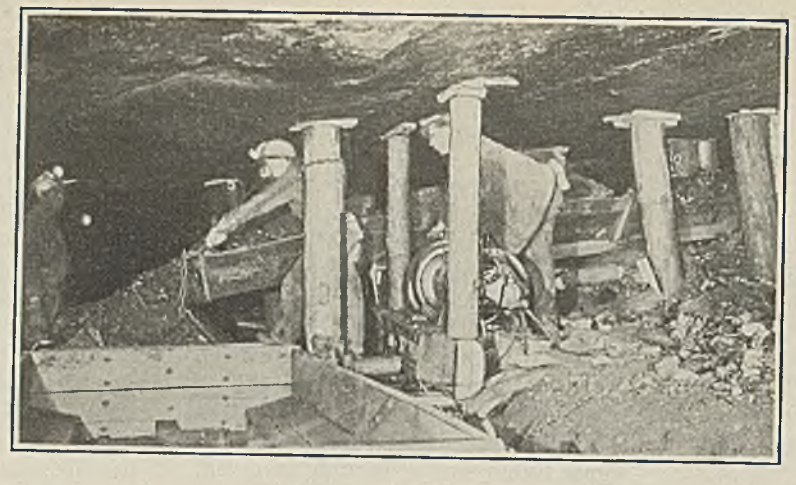
Again, the pressure regulator is rendered useless if it is installed on any but the first stage. The characteristics of a centrifugal pump will cause it to maintain a pressure in the other stages long enough to allow the wearing rings in the first stage to seize. It is obvious, therefore, that if the pressure regulator is installed on any but the first stage its maximum protective value cannot be obtained.

AS PREVIOUSLY stated, this plant has been in operation for nearly a year. The service is severe because of the small sump provided. This imposes an operating condition wherein the pump runs for one hour and is idle for three. The large pumping capacity of this plant seems unnecessary but it is installed in a mine that experiences unusual water troubles. All of the surface water reaches the pumps in about 10 hr. after a storm and sufficient pumping capacity must be ready to handle it.

This plant has demonstrated the feasibility and effectiveness of automatic pumping. Occasional inspection is all the care that the installation receives.

View in the Pump Room





Changes to LONGWALL *and Is Satisfied*

By J. H. Edwards
Associate Editor, Coal Age

AT SEVERAL ALABAMA mines the entire output is won by the conveyor-longwall method. Two types of conveyors have been signally successful in this work, the shaking conveyor and a drag conveyor using a single chain without flights.

The Montevallo mine, the first in this country to make extensive use of shaking conveyors and still operating successfully with that type of equipment, was described in the Dec. 31, 1925, issue of *Coal Age*. A representative longwall operation with the other type of conveyor is the Dixie mine, of the Moffat Coal Co., at Moffat, in Bibb County.

Although the coal bed lies on a pitch of 15 to 18 deg. and the type of conveyor there used will operate only on a down pitch of approximately 10 deg. or greater, the operation is of general interest because of the working plan and management methods that have been adopted.

The seam, which is known as the Woodstock, has an average thickness of about 42 in. Near the center is a 0-to-2-in. soft shale parting and at the top 4 to 15 in. of drawslate. Refuse from the two sources is thrown back over the conveyor and forms a gob which, until it is compressed by the settling of the roof, is about 18 in. deep.

The mine was opened in 1922 by a slope driven from the outcrop. For many years the room-and-pillar panel system was used, the rooms being driven 50 ft. wide with a packwall in the center. Because, at the rate paid by neighboring mines, a sufficient number of experienced miners could be obtained only with difficulty and because the coal thinned in places to 18 in., the mining method was changed to longwall-conveyor beginning about June 1, 1926.

"Longwall" in this case means faces from 240 to 385 ft. in length, worked advancing. No timbers are recovered and no attempt is made, either by setting extra break rows or by shooting timbers, to produce regular roof breaks. At times much methane is liberated at the faces. Little, if any, is released by roof falls, no matter how heavy they may be.

According to J. D. Moffat, president and manager of the company—which also operates a 3,000-ton mine at Sparta, Ill.—the first ten or eleven months of longwall operation at the Alabama mine was rather discouraging.

CLOSE SUPERVISION has been necessary in putting the mine on longwall; so Mr. Moffat, who formerly lived in St. Louis, now maintains his home and headquarters at the Moffat mine. Table I, which gives the mine production by months beginning with the introduction of longwall, shows the rapid increase in production coincident with a change in the method by which the mine was managed. This will be described later.

THE conveyor used is a trough of 8-ft. pans which are made at the mine by bending at one operation in a wooden press a sheet of No. 11 ($\frac{1}{8}$-in.) steel purchased cut to size—that is, 3 x 8 ft. To the bottom of the pan are bolted two full-measure two-by-fours set on edge and with a $7\frac{1}{2}$-in. clearance between them. At one end the two-by-fours lack $3\frac{1}{2}$ in. of extending to the end of the pan.

The pans are assembled by lapping one end of the steel trough into the next one and butting the two-by-fours. No bolts or fasteners are used to join the pans. The chain is a standard Jeffrey No. 82 without

MINE PRODUCTION AFTER CHANGE TO LONGWALL

	Tons		Tons
June, 1926..	9,800	Jan., 1927...	12,500
July, 1926...	8,900	Feb., 1927...	13,100
Aug., 1926..	6,300	March, 1927.	14,500
Sept., 1926..	8,300	April, 1927..	11,700
Oct., 1926...	10,600	May, 1927...	18,700
Nov., 1926...	8,600	June, 1927...	22,500
Dec., 1926...	12,500	July, 1927...	25,200
		Aug., 1927...	27,200
		Sept., 1927..	25,526
		Oct., 1927...	26,900
		Nov., 1927...	27,698

flights, and is $3\frac{5}{8}$ in. wide over all. The upper run of the chain drags in the bottom of the steel trough, and the return run, which is confined between the two-by-fours, rubs on the mine bottom and on the wooden pieces used in leveling the conveyor trough. It has been found that on a 275-ft. wall, 12 deg. in favor of the load is about the minimum pitch on which the conveyor will move the coal successfully.

The drive consists of a $7\frac{1}{2}$-hp. 275-volt open-type direct-current motor connected through a 45-to-1 Foote speed reducer. The total cost of a 275-ft. conveyor complete with drive is approximately $1,400. The pans complete, including labor, cost $8 each, and the chain 72c. per ft. The cost, therefore, of chain and pan is $19.16 per section, or $2.48 per ft. This is exclusive of the tail and drive sections. Adding to the $1,400 the cost of an undercutter brings the cost of the cutting and conveying equipment for a 275-ft. longwall working face to $5,800.

This Is How Pans Are Made

THE method of advancing the walls is shown in the accompanying sketch. Two headings with a 25-ft. pillar between them are driven on a 3-deg. rise 150 ft. or more in advance of the wall. One heading serves as a haulway and the other as an aircourse and ropeway. Rock-packed cribs, 5 x 5 ft. and "spaced tight," are built on the low side of the haulage heading as it is advanced. A similar solid row of cribs is built on the other side of the haulage heading as the longwall advances.

A third row of cribs is placed at the upper end of the wall to protect the temporary 10-ft. airway and passage through which the timber is brought to the upper end of the wall. Fifty-foot pillars are left between the aircourse heading and the adjacent longwall on the down-pitch side.

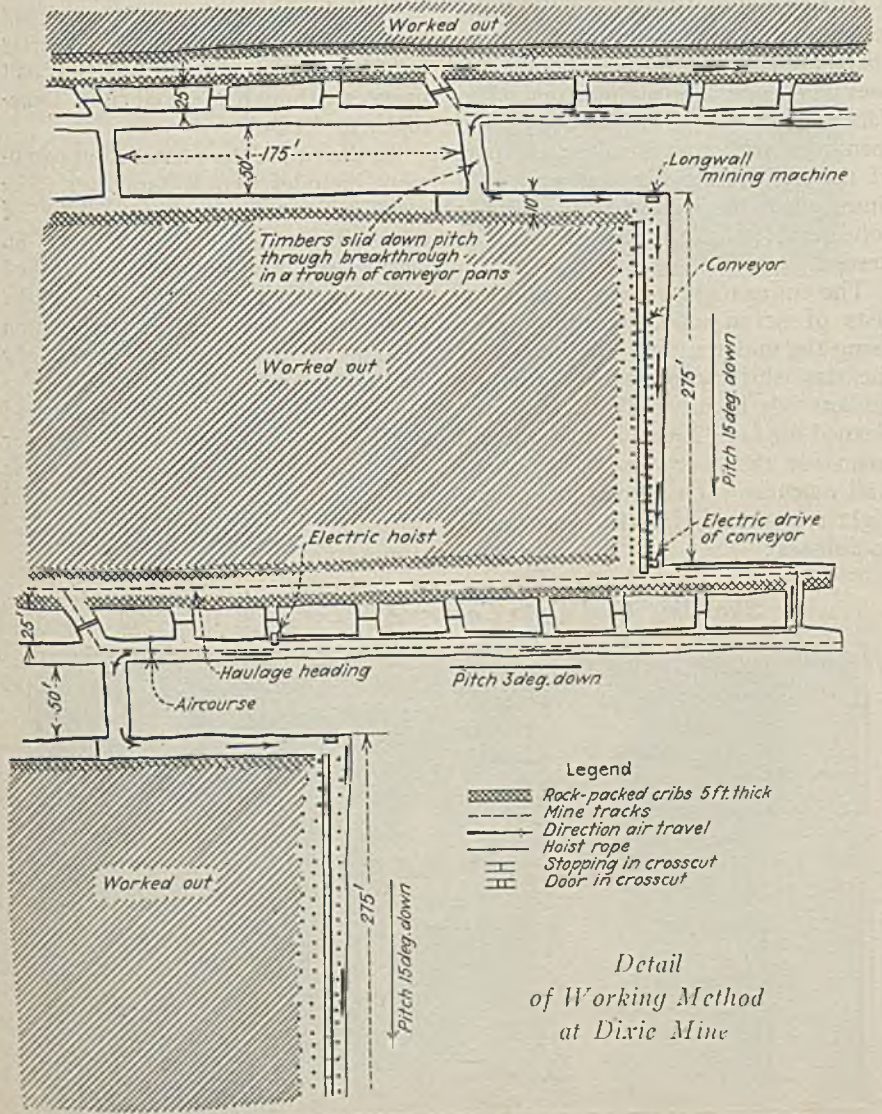
Ordinarily the timbers are distributed from the upper end of the wall. Every 150 to 200 ft. crosscuts are made through the 50-ft. barrier pillar and through these crosscuts the timber is slidden down to the temporary airway in a trough made by putting together four or five conveyor pans. When timbers are to be distributed from the lower end of the wall, the conveyor is reversed. A timber boat of sheet steel is then placed in it and hooked to the conveyor chain.

"Our success lies in the employment of a timber inspector," said J. D. Moffat, in describing the change in the management methods by which production was greatly increased and greater certainty in operation attained.

The inspector works on the night shift, when the coal is undercut and the conveyor moved. He notes carefully whether the timbers have been set at standard spacing and with the pitch, so as not to slew over and plow up the bottom. He also examines the roof to note the status of breaks, which tend to feather out to the face.

Every morning the inspector furnishes a written report to the manager, who is insistent on having every bad or doubtful condition included. The report must be complete and impartial and must exhibit plainly whether the bosses are following instructions and using good judgment.

The manager and superintendent meet every night and morning with the mine foreman to plan and report action in compliance with the inspector's written reports. The manager insists that the recommendations be followed. He believes in having an inspector in whom he has full confidence and in following that inspector's recommendations. Commenting on this characteristic, a man who has had some dealings with the company remarked: "Mr. Moffat evidently believes in having capable supervisors, for he pays them well."



Detail of Working Method at Dixie Mine

AN INTERESTING feature of this conveyor longwall work is that no strenuous effort is made to clean up all the walls daily. Six walls and equipment are maintained, but on an average only 4.5 walls are loaded out each day, these producing 1,100 tons. When a wall is to be shut down for some time, the pans are greased on the inside to prevent rusting; thus are prevented troubles

due to friction and the consequent overloading of the drive.

By having so many walls that it is not necessary to clean them up every day it is possible to get the normal tonnage, despite the unfavorable roof conditions that may develop from day to day and despite the uncertainty in labor supply. Often when the roof starts to cave the men desert the wall or are ordered off. In that event they may be transferred to another wall which has perhaps been lying idle for several days. Still more flexibility will be provided soon by the development and equipment of one or two more walls.

After the first fall the roof breaks every 70 to 75 ft. Overlying the drawslate is approximately 75 ft. of sandstone. The wall farthest from the outcrop is now under 785 ft. of cover. One wall has been advanced 1,200 ft., and it will be driven to the property line, a total distance of 4,800 ft.

The distance each wall advanced before the first cave occurred has varied as follows: No. 1 wall, which is 275 ft. long, 375 ft.; No. 2, 287 ft. long, 400 ft.; No. 3, 265 ft. long, 600 ft. No. 4 wall, which is 240 ft. long, has been driven 525 ft., and as yet no break has occurred.

Up to Dec. 1, when 290,524 tons had been mined by the new system, approximately 100 conveyor pans and some chain had been lost. In equipment this represents a monetary loss of something over $800. But since the timber inspector was employed only 8 pans have been destroyed.

THE presence of gas complicates the work. Some months ago, before the mine was put on closed lights, nine men working on a wall—comprising a fireboss and the night crew of that working unit—lost their lives in an explosion. During the cutting a gas feeder was struck. Apparently the crew stopped the machine and retreated to the fresh air at the upper end of the wall, but a shotfirer ignited the gas with his open light when coming up toward the machine from the lower end. It is thought that the large open area, about 300 ft. which had not caved, was a factor in preventing the explosion from propagating throughout the mine.

The management is to be commended for its use of water on the cutter bars of its mining machines. This precaution, together with some road sprinkling and the discharge of

Boat Handling Timber

exhaust steam from the fan, keeps the mine quite damp and limits the distribution of fine dust.

Recently an improved type of mining machine was put into use on one of the walls. This is a Sullivan with a flameproof automatic starter which is left at the heading. The rubber-sheathed cable connecting the starter and machine contains two control wires in addition to the regular power lines.

ONLY PERMISSIBLE explosives in sticks measuring 1⅛ x 4 in. are used. The shots, placed 8 ft. apart, are exploded by a shotfirer who uses an electric blasting machine. The face is drilled electrically by two men who with the shotfirer are part of the night crew for that wall. At times when the weight at the face is considerable, little or no shooting is needed.

The entire night crew per wall consists of seven men, including those using the undercutter. At the end of the day shift a permanent row of timbers has been set 3½ ft. from the cleaned-up face, allowing just enough room for the operation of the longwall machine. The procedure of the night crew in moving the conveyor is as follows:

The top run of the chain is disconnected in 24-ft. sections, moved to the next aisle between props and there connected. One at a time the pans are then moved forward between the timbers and placed over the chain. Next the bottom run of chain is moved also in sections, but is placed in the trough and becomes the upper run. The pans are leveled by slipping timbers under the bottom chain and under the two-by-fours on the pan.

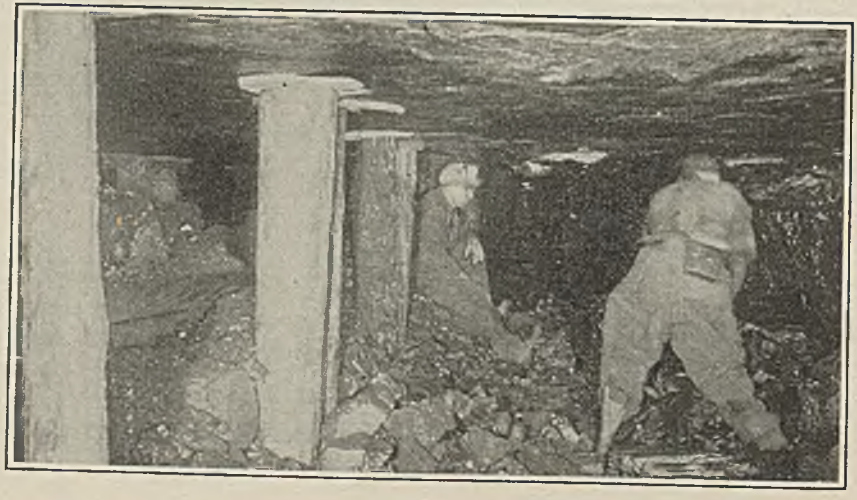
Production is about 4 tons per inside man, including the trackmen, motormen, hoistmen and foremen.

AS TO THE ECONOMIC side of the method, J. D. Moffat says: "Our experience to date with longwall has shown a higher cost per ton than with the panel system. The difference is about 15 per cent. Even so we prefer the longwall and will continue mining by that method for the following reasons:

"We have been able to double the production and are getting larger lumps though our miners are less experienced than those we formerly employed. Local rolls do not halt progress, though the coal thins sometimes to 18 in."

At the tipple the preparation equipment includes two 400-ton jigs. The products, consisting principally of three sizes—6-in. lump, 6 x 3½-in. washed egg, and under 3½-in. washed—are marketed as "Monarch" Cahaba Red Ash. The careful preparation includes a water spray in the egg loading boom. This removes to a conveyor all fines which have adhered to the egg. Some of the under 3½-in. washed is burned at the mine power plant, and the rest is shipped as fuel for steam plants and railroad locomotives.

Shoveling Coal Onto Conveyor in Longwall Working



Inspiration for SAFETY

Centers in Top Management

By John T. Ryan
Vice-President, Mine Safety Appliances Co.

INSPIRATION and responsibility for safety must start where authority is centered—at the top. Many of the men responsible for broad management policies in the coal-mining industry, because of pressure of production and sales activities, have failed to extend their vision into the field of safety, with the result that too often this subject becomes a problem of minor concern and the responsibility for promoting it is handed down to other officials.

The steel industry is proud of the steady improvement in its accident rates, which at one time were higher than those of coal mines. For years the steel industry wandered aimlessly in the field of safety. It was not until the executive heads assumed full responsibility and vowed full financial and moral support of activities for the elimination of accidents that the safety movement showed progress in that industry. Its problem is now largely confined to reducing lost-time accidents, instead of fatalities, with which it began to deal at the inception of its safety campaigns but which have been largely eliminated.

Without entering into a discussion of safety from a monetary standpoint, it may be said that expenditures in this direction earn a satisfactory return. But money assistance is not all that is required. It is far less influential than the mental attitude—the sincerity of management in the work. Expenditures for safety go chiefly to the installation of mechanical protection, the first step in a safety program; a portion of it is required for the employment of a specialized personnel.

Mechanical safeguards and general improvement of operating conditions will eliminate scarcely more than from 15 to 25 per cent of all the accidents. A company may go the limit

in spending money for the betterment of the physical aspects of safety and yet find that, roughly, 75 per cent of all the hazards still exist. These cannot be eliminated except by teaching employees to think safety and to exercise it as a mental rather than a mechanical process. Their minds must be trained to prompt and direct measures that will assure it.

This requires a comprehensive educational program. The diffusion of knowledge of safety requires, first, well qualified teachers, then a well thought-out plan, and finally and most important, proper supervision to carry out the program. This education must first be absorbed by and have the full support of the chief executives, then be handed down in steps to the mine officials and the workers. The educational work must be planned and not left to the individual devices of the mine officials. All work must be laid out and orders directed with safety as the primary consideration.

As the working place must necessarily serve as the schoolroom, the mine officials who visit these working places must be the teachers in molding the safety attitude of the workers. As the rank and file of the employees know and appreciate the management only as they understand the officials with whom they come in daily contact, these men are designated the "key men" in carrying out the safety educational program. This program must, however, be authorized by and have the full support of the highest executive of the company.

AS RESULTS will depend largely upon the capabilities of these "key men," they should be carefully selected and trained and they should demonstrate the qualities of leadership necessary to carry out the company's safety policies.

The U. S. Bureau of Mines, the National Safety Council and a number of other organizations have planted the seed of this safety education, but they lack the facilities to cultivate it. A few companies have assumed the task with results that have more than justified the effort and expense. Management must take action and bring safety to the front in the coal-mining industry by clear vision of correct procedure, by sincere effort, and by determination of accomplishment.

John T Ryan

HOW TO *Improve* COAL MERCHANDISING

By W. A. Marshall

President
W. A. Marshall & Co.

Lack of co-ordination of production and sales policies in bituminous coal has been responsible for most of the losses which the industry has suffered in recent years. Bringing the large consumer into the picture would go far in regulating output to consumption requirements, improving service and making sales yield a reasonable profit to the producer.

THE story of soft coal for 1927 was a sad one, inasmuch as more companies had losses to record than for any other year in the history of the industry. During the first half of the year production exceeded the tonnage for the first six months of any previous year. Yet this was not sufficient to improve the price and bring a profit to the industry. This increase was due to a fair rate of consumption, plus surplus requirements for storage in anticipation of the strike April 1.

After July 1, the market became extremely dull, and the demand for coal very limited, resulting in a general lowering of prices. The consumption and reduced demand were due to four factors:

(1) Continued rains resulted in a voluminous water supply for the hydro-electric plants and reduced their consumption of coal to 25 per cent, or less, of normal.

(2) The large storage supplies were immediately attacked after the Illinois settlement.

(3) Abnormally warm weather during the fall and winter reduced the requirements of domestic coal and coal for heating purposes.

(4) There was a sudden falling off of general business, which affected generally the whole last half of the year.

The whole industry is blindly groping for a way out of its dilemma. Opinions are divided as to the solution, some feeling that the law of supply and demand must continue, resulting in the elimination of the weaker interests; others feel that the solution lies in consolidation. It seems to me that the latter is the one to be encouraged.

FAILURE to make profits in the production of coal has been primarily due to the total lack of co-ordination of the entire industry and to the persistent desire on the part of every operating company to force upon a buying public six days' production when but four days' supply would or could be absorbed. The constant effort to save less than 5c. per ton in labor cost has resulted in a net operating loss of generally 10 to 15c. per ton, and with overhead considered, 10 to 25c. a ton. Furnishing as needed what the market requires would not only overcome this bad situation but provide a net profit of at least 10 to 15c. a ton without protest from the buying public.

It hardly seems possible that this situation can be corrected without consolidations, and this should be brought about as quickly as possible in order to prevent any unnecessary bankruptcies. Consolidating coal properties through equalization of values, however, is a slow and difficult problem, due to the great variety of financial set-ups and to the inclination to delay action through trading on valuations. In addition is the great need in most instances for further financing, the basis of which is lacking, due either to excessive indebtedness or to the lack of a proper earning record in recent years.

UNDER the circumstances it is best, in fact almost necessary, to let the financial situation remain where it now stands—primarily, in the hands of local bankers—and resort to the quick and easy process of creating a few large sales agencies and tying up to them the production of as many mines as possible for a period of five to ten years on a percentage basis of the sales price. These sales agencies, in turn, should act more or less in the capacity of managers and sub-contract the sale of their production to those concerns now selling coal and having the good will of the buying public.

If these agencies are not too numerous and are well managed the coal situation will soon become controlled and coal will be furnished to the buyer when wanted; not, as at present, thirty days in advance of that time. Although there is a prevailing fear that this would be in violation of the Sherman act, I believe that fear is groundless.

Co-ordination between the National Coal Association and the National Association of Purchasing Agents and purchasers of coal generally is to be desired and should be encouraged. Without doubt many points of mutual importance could be developed.

Recently the president of the National Association of Purchasing Agents displayed an interest in the coal situation and inquired as to what

that association could do that would be mutually beneficial as well as helpful to the coal situation. Mention was made of the fact that buyers are blamed for buying too much at one time and too little at another, and the question was raised whether that could be overcome.

THIS conversation, which occurred at the time of the Illinois settlement, led to the thought that if by chance the National Association of Purchasing Agents would indicate to its clients a suggested program for the gradual clearing up of the excess supplies and indicate to the National Coal Association the expected weekly requirements, the latter could in turn indicate to coal operators the number of days per week that mines could operate.

The operators, with these data available, could create a program under which the mines could be operated at a minimum cost and money be saved. When coal was wanted in increased quantity, the National Association of Purchasing Agents could inform the National Coal Association, which, in turn could notify the operating companies in advance to prepare for the increased load in an orderly manner and without endangering reasonable wage rates. Such a program would not only help establish a more uniform and steady price on coal but would be more satisfactory to the average buyer.

Improved preparation and a more complete study of coal also are problems which must be faced. It is noticeable that the districts making the largest gain in production during the last five years are those having developed the higher stage of preparation through mechanical equipment.

Coal must be made popular in order to increase its demand. It is difficult to go further in reference to lowering the price, but it is possible to improve its quality and satisfaction.

Standardization of sizes is something particularly needed. At present the same specifications may mean entirely different things, depending upon whether bar screens or shaker screens are used and whether the shaker screens are slotted or provided with square or round holes. This applies particularly where the fracture of hard-structure coal varies, whether it is inclined to be flat, as in the case of splint coal, or square, as in the case of gas coals. This lack of uniformity in size on similar specifications has led to serious losses to the coal industry —particularly at the end of peak periods, such as occurred after the anthracite strike of 1926. All possibility of repudiation of contracts should be removed by establishing a standardization of sizing that will apply anywhere and everywhere.

Wanted: Thinkers!

Thinkers are badly needed on the sales staffs of many coal distributing companies—men who will apply engineering skill and foresight to the problems of merchandising. The day of the coal peddler is passing. He must give way to the man who knows coal values and how to sell those values to the consumer.

STANDARDIZATION of quality should be encouraged on the basis of analysis and structure only. This should be done through standard principles of sampling and analyzing, and only those should be permitted to take samples or to analyze coal who have previously been accepted in some society, after having made a certain number of tests on uniform principles of both sampling and analyzing, checked by prime members of the society.

A large proportion of coal produced is used in stoker plants, and yet is bought in mine-run size and crushed by the consumer, all at an extra expense in first cost plus the cost of crushing. At the same time coal producers, without any means of co-ordination, are striving to find a market for nut-and-slack already prepared in the ideal size needed for this purpose. In this case both operator and consumer are losing.

Slack is not a byproduct, a standard size and, except on those grades producing a slightly higher percentage of ash than the same coal in mine-run size, should be worth the mine-run price at least. The cause for its low present price is the lack of co-ordination with the consumer, the custom and expectation of the seller that it is necessary to sell it at a reduced price and the lack of uniformity in its rate of production.

The solution to the rate of production lies in the establishment of a reserve storage plant at or near the scales on each railroad for the use of all shippers in the particular district with a fixed charge per ton for the privilege. In all probability it would be wise to establish a central dry-cleaning plant for slack coal at the same point, instead of plants at each mine. The first cost and the cost of operation would be much less, and the reputation of the coal from the whole district would be materially improved.

IN ALL probability the demand for nut-and-slack coal would increase more rapidly than for any other size, and the elimination of the fine coal for these particular purposes would naturally create a more valuable product in the way of coarse coal for hand-fired purposes and as a domestic fuel. Under this program the value of a coal would be increased.

It is remarkable to note the almost total absence of real good salesmen in the coal industry. Thinkers are badly needed — those having engineering characteristics and foresight. There is no reason why a capable coal salesman cannot study a plant condition and make a tender in the same form as a salesman for an equipment company, a tender which will show what results in dollars and cents can be obtained by a change in fuel or a change in methods. Where a material saving can be shown, there is no reason why that saving cannot apply to the benefit of the coal seller as well as the consumer and be mutually beneficial. Salesmen should be educated on combustion principles. This is not too much for them to learn and should be a part of their duties.

Constant study of new equipment for the use of coal should be made and the best should be encouraged, in order to make coal popular. A capital account should be carried for demonstrations, and study of the various types of coal in the various types of equipment and under varying combustion conditions should be made.

CLOSER co-operation with each other and with the railroads should be had in order to study the effect of outside competition. Germany is supplying some of her steamers today with bunker coal for the trip to the United States and return. England is anticipating the possibility of developing a market on bituminous coal in New England and Canada by way of obtaining ballast rates from the steamship owners.

Hardly a month passes by without some new development occurring—either favorable to the industry or otherwise—and we should be quick to take advantage of everything arising to create a better general condition, dividing the benefits equitably between the public and the industry.

RESEARCH—

What It Means to the FUTURE *of the* COAL INDUSTRY

By Sumner Boyer Ely
Secretary
International Conference on Bituminous Coal

THE technical expert and the scientist are beginning to realize that a criterion based merely on furnace efficiency is not the final word in the solution of the best utilization and combustion of coal. The old methods of trying to make every heat unit available will in a certain sense have to be modified.

To explain what is meant by this changing viewpoint, suppose for the moment that, in addition to carbon and its other constituents, coal contained considerable gold. Under such circumstances we would devise some means of getting out the gold before burning the coal. While coal does not contain gold it does contain many things of value which are now burned up, destroyed and lost.

Suppose, for example, coal is heated in a closed retort or oven so that it is not in contact with the air and cannot burn. As the coal becomes heated, gas is driven off carrying tar in the form of vapor. When this is cooled there results a permanent gas and a liquid tar. There also is a coke left in the retort. The result of such a process then is a gas and a coke which can be used as fuels and in addition a tar which also could be used as a fuel; but instead we might refine the tar into various oils, motor fuel, medicines, dyes and a host of finer chemical compounds.

Furthermore, if this distillation takes place at a comparatively low temperature, the coke resulting is a smokeless and readily ignited fuel, differing from the familiar high-temperature metallurgical coke. Such a free-burning fuel is well adapted for domestic use and will compete with anthracite for this purpose.

It is possible, therefore, by some

Sumner Boyer Ely

form of pre-treatment to transform coal into a different type of fuel or to change its character so that it is much better adapted for particular purposes than if used in the raw state. The problem of the future is to make coal a more valuable commodity; and the province of research is to point the way so that this can be accomplished in a practical and efficient manner.

Dr. Thomas S. Baker, president of Carnegie Institute of Technology, aware of this problem and wishing to make available the scattered information and the records of experimental work already performed, conceived the idea of bringing together the men who had done notable work in this field. As most of the important work had been done abroad he therefore spent some time in Europe, conferring with the leading technologists in France, Germany and England.

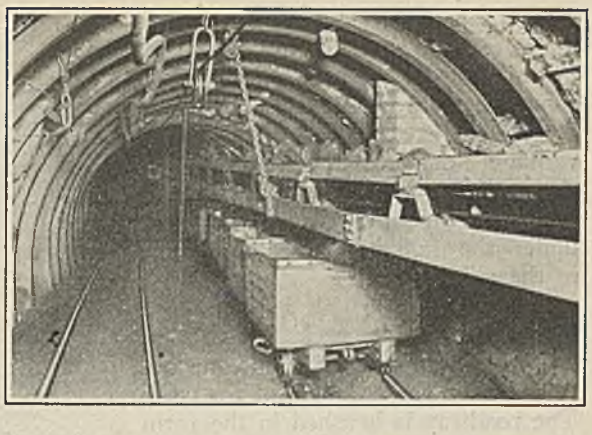
Dr. Baker found extraordinary interest everywhere, and the result was that the world's greatest fuel experts assembled at the International Conference on Bituminous Coal held at Carnegie Institute of Technology, Pittsburg, Pa., in November, 1926. This was the first conference of its kind and in the large volume of its proceedings will be found papers dealing with such subjects as the transformation of coal into oil by hydrogenation and by synthesis, the production of methanol, high- and low-temperature carbonization of coal, gasification of coal, utilization of coal-tar products, coal as a source for fertilizer, smokeless fuel, etc., etc.

These new processes and pre-treatments of coal can hardly be said to be on a commercial basis as yet, although some advocates claim that for them. It would be nearer the truth to say that they are on the border line of commercial success. Research is the key to the situation.

Carnegie Institute of Technology is trying to do its part and is starting a bureau of coal research, where not only will the purely scientific side of research be taken up but special investigations and tests undertaken for anyone desiring such work.

The Carnegie Institute of Technology also will hold a Second International Conference on Bituminous Coal in Pittsburgh during the week of Nov. 19, 1928. At this second conference the subjects discussed at the first conference will be brought up to date and in addition certain subjects will be specially emphasized. The subjects of fixed nitrogen, the part catalysts play in coal transformations, the fusibility of ash and the production and use of oxygen in gas generation seem to be of especial interest and importance.

STEEL *at the* FACE



By Robert Gibson

Underground Manager,
Dominion Coal Co.,
Glace Bay, Nova Scotia, Canada

STEEL PROPS and crosspieces are displacing wood at the coal face and in the gateways, entries and aircourses of the mines of Great Britain, especially in connection with longwall operation.

Though longwall often fails from over-concentration or from a lack of system, one of the most frequent causes of failure is the cost of the cribwood and props that are lost when the roof settles. This loss, it is true, has been held to be, in a measure, advantageous, for the support given by the timber permits the roof to settle gradually over the gob, the lost timber in this case taking the place of packwalls. At times the non-recovery of cribwood is a most serious disadvantage, for the timber left is charged with throwing the weight of the overburden on the face and of causing excessive crushing of the coal or even a loss of the working face.

To prevent the excessive cost and to forestall the disadvantage, tubular steel props with steel straps are now used at many Scotch collieries. By a "steel strap" is meant, in this case, a thin plate resting at each end on a post. Packwalls also are constructed, the correct distance between them and their width being found by experimentation. The action of the roof is noted and the distance between the packs is made such that the roof will break just so far back in the gob as to leave such weight and only such weight on the face as will assist in breaking down the coal after undercutting and yet will allow the roof to break almost systematically and near enough to the face to make conditions safe.

The "Surface Mine" section of the Lindsay Colliery, operated by the Fife Coal Co. in Scotland, is a good example of the successful application of steel props and steel straps in the support of the roof at the working face and in taking the place of cribwood in the making of the "line of break" in the gob during the working of the "Upper Splint" seam, a section of which is shown in Fig. 1. Here the total cover is about 300 ft.

Fig. 2 shows a sectional view of the steel prop used. It consists of a hollow steel cylinder of 4-in. diameter, $\frac{3}{16}$ in. thick and 6 in. shorter than the thickness of the seam.

INSIDE THIS is a softwood cylinder which is in turn 6 in. shorter than the steel tube and turned to the exact inside diameter of the latter. This leaves a 3-in. space at each end of the tube, and in these ends hardwood plugs are driven which protrude from the ends of the tube about 3 in. when new but which when in use are soon driven flush by the compression.

The steel straps are from $4\frac{1}{2}$ to 5 ft. long, depending on the depth of undercut, 6 in. wide and $\frac{3}{16}$ in. thick. They are of mild steel and have three corrugations running parallel with their length.

Figs. 1 and 2—Cross-section of seam and steel prop

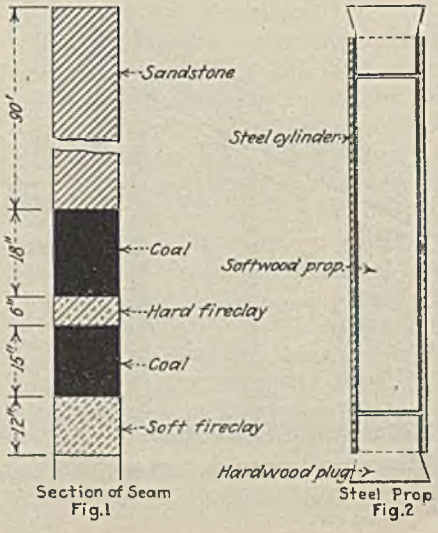


Fig. 3 shows how these straps and props are used in the working of a 690-ft. longwall face. It shows the arrangement of supports at the end of the loading shift on the upper part of the face and at the beginning of the loading shift in the lower part of the face.

In a single shift one-half of the face is cut by machine and the conveyor moved forward to a new position where it is protected by a new line of props. On the next shift the old prop lines near the gob are withdrawn and thrown toward the face for the use of the loaders, the packwalls are extended, the roof is brushed and the gate-end loader moved forward. On the third shift the coal is loaded out and the steel props reset. The loading is done in the day and afternoon shifts.

When setting steel props and straps the prop nearest the gob is set in line with the previous face prop. The face props are then set on a new line at such a distance from the face as will allow the passage of the coal cutter. In this mine chain machines are used, the props being set 2 ft. 9 in. from the face. The coal is undercut 4 ft. and the length of steel strap accordingly is $4\frac{1}{2}$ ft. The props are set on 4-ft. centers.

SOFTWOOD BLOCKS 6 in. square and 2 in. to 4 in. thick are sent into the workings to be used as sole-pieces wherever a prop it too short. Pieces of 1-in. plank placed between the top of the steel prop and the strap prevent them from slipping on each other when the prop is "taking weight." The softwood sole-pieces are crushed when weight comes on them, thus preventing the prop from bending.

The fireclay shown underlying the

seam premits the steel prop to sink under excessive weight and also helps to prevent the "steels" from bending. Few props are bent and few lost. The simple steel cylinder has an advantage over more complicated shapes, having no protruding parts to prevent it from being drawn from under the falls of roof that occur in the gob.

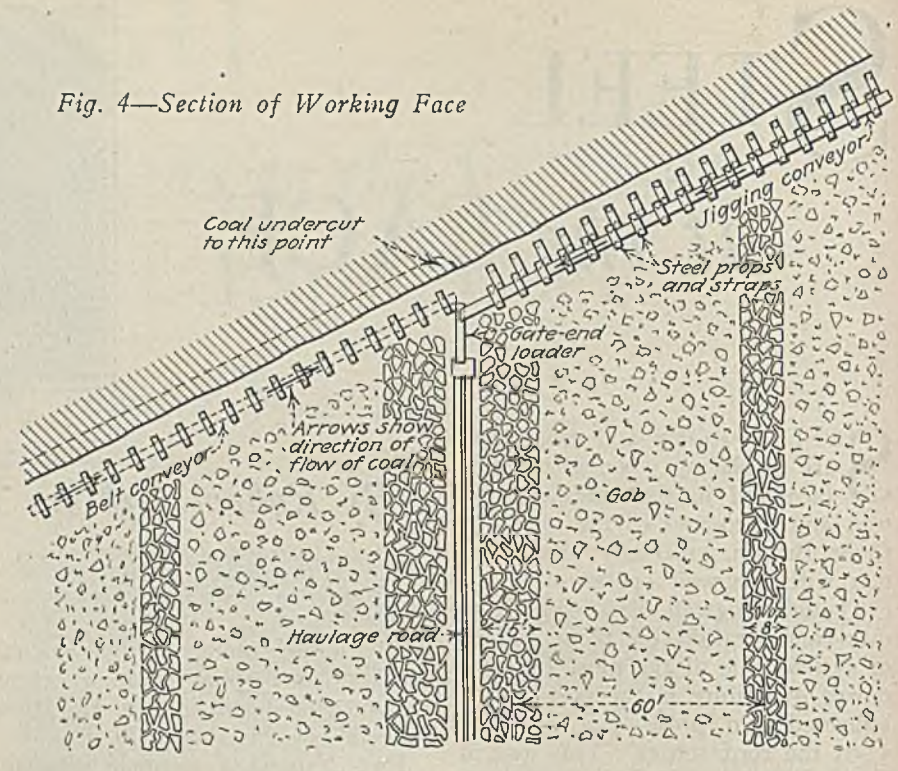
THE roadside packs are 15 ft. wide and built of sandstone obtained from the brushing of the roof. The roadway is brushed in the form of an arch to a height of 4 or 5 ft. and shaped so as to accommodate the "horseshoe" girders now being used on aircourses and haulage roads.

When placed the girders are 7 ft. in height from the floor to the highest point in the girder. Pieces of softwood are placed between the girder and the roof. These in conjunction with the soft fireclay take up subsidence. The roadways usually are about 6 ft. high at the center of the arch.

These girders, as used on haulage roads, are of 60-lb. steel. They are made in two sections and easily erected by fishplating and bolting the two parts at the center of arch. This method of connection makes recovery easy whenever the withdrawal of the girders is desired. The packwalls on this face are placed at 60-ft. centers and are 8 ft. wide. Material for packs is obtained from the dirt parting in the seam and from the gob.

Narrow work has been completely abolished under the system employed. A shaker conveyor 390 ft. long is used to bring coal from the rise to the haulage road, and a belt conveyor 300 ft. long brings the coal from the dip to the same point, where a gate-end loader of the belt type loads the coal into cars.

Fig. 4—Section of Working Face

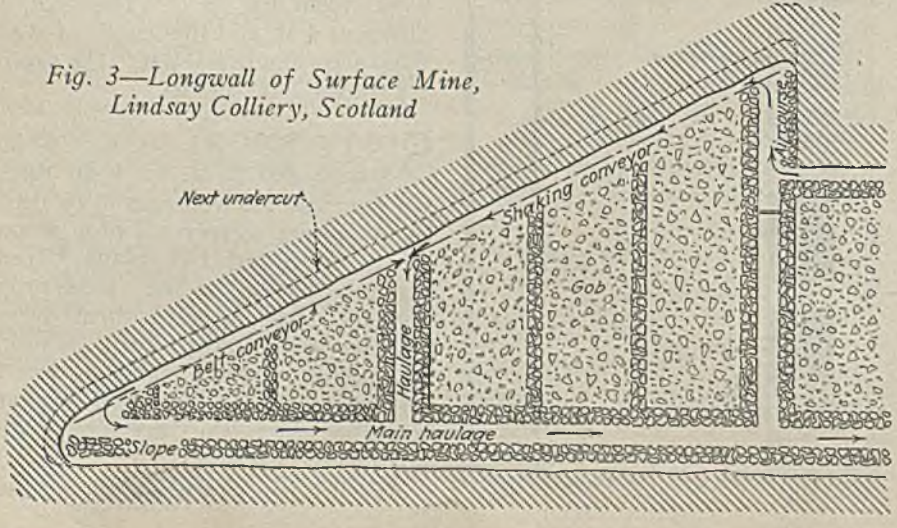


At Newtongrange, Scotland, the Lothian Coal Co. employs steel props and steel straps exclusively in the extraction of the various seams worked at its collieries. The cover at this mine in some cases exceeds 2,000 ft. In the mining of the "Great Seam," which is 5 ft. 9 in. thick and contains no dirt partings, no timber is used.

Nine-foot packwalls on 200-ft. faces are placed on 32-ft. centers. The material for packing, which is a coarse-grained sandstone, is obtained from the gob. Bent straps and props are sent from the mines to the surface and straightened in a machine designed for this purpose, and long props from one seam which are frayed at the ends are cut and sent to seams of less height.

By the use of these steel props and a well-chosen use of packwalls, timber costs and the danger of losing a face have been reduced to a minimum.

Fig. 3—Longwall of Surface Mine, Lindsay Colliery, Scotland



Doors to Save Lives?

As a means of preventing loss of life when a fire breaks out in an intake airway and of greatly reducing that loss whenever a serious explosion occurs, T. A. Southern advocated at a meeting of the Institution of Mining Engineers, in London, England, Jan. 10, that a life-saving door be erected in the main intake of each working district.

This, he said, should be located near the inbye end but outbye the first branch haulage road leading to the face, so that when shut it would effectually stop the ventilation from passing inbye to any of the working faces and the branch roads leading thereto.

In case of a newly opened working district the door should be erected before, say, as many as 30 men are put to work in any one shift in the faces and branch roads of the district. The author would make the door of wood in two halves, shutting "with the wind." The sides of the door should be sufficiently recessed to receive the door frame. This should give an opening equal in height and width to the airway before being recessed, so that the door would be less likely to be damaged by an explosion or trip derailment.

Power *from* Cell *or* Wire?

By John B. Hicks
Consolidation Coal Co., Fairmont, W. Va.

PERMISSIBLE machinery is making steady headway in coal mines. In fact, some operators are using this type of equipment in both their gaseous and non-gaseous mines and some manufacturers who, heretofore, have built both open and approved types of equipment are now in their later-designed machines building them as permissible only.

The Consolidation Coal Co. has taken an active part in this development. It first applied the permissible storage-battery idea to locomotives for gathering coal from the face to the main-line side tracks. After this application had proved successful, attention was turned to undercutting of coal by the same method, which was considered a radical departure when first suggested and in fact was condemned by some manufacturers. However, the officials of the company were not discouraged and continued to experiment at practically no expense by connecting the batteries of gathering locomotives in series until a sufficient number of cells were assembled to give the proper voltage.

THE STANDARD mining machine with 250-volt d.c. equipment was used with no change whatever in design. The machine used on the battery power could be operated from a trolley circuit by removing the running plug from the machine cable and hooking the cable ends to the trolley wire and to the rail.. This experiment demonstrated that coal could be cut by battery power. A power truck, which is nothing more than a self-propelling frame with a suitable storage battery, was built and placed in service April, 1923. For nearly a year the truck was under close observation by the local mine management and officials, and at the end of the period an order was placed for six additional battery trucks. There are now in service 22 such units, several of which have extra boxes and batteries.

This battery power was then applied to main-line haulage, stationary gathering and portable pumps, rock-dusting machines, portable air compressors, loading machines and portable concrete mixers. The development of these applications made it possible to remove all trolley and feeder wires, giving what might be termed a "wireless mine."

WITH THE GATHERING haulage problem solved, it was only a matter of design to build a main-line haulage locomotive. Each main-line locomotive consists of one chassis and two battery boxes, with a battery of 110 or 117 cells with suitable transfer racks, making it possible to charge one battery while the other is being used, thus enabling us to use the chassis continuously.

Self-Contained Units

Proceeding slowly from locomotives to coal cutters, pumps, rock-dusting machines, air compressors, loaders, and concrete mixers, the Consolidation Coal Co. at some of its mines has gradually mechanized operation, using power from storage-battery cells instead of from trolley wires and other feeders. It now has four mines thus protected against electric flashes. These produce about 9,000 tons daily.

The stationary gathering pump, which consists of a pump direct-connected to a permissible motor, is furnished power from the same size battery that is used for the mining machines, except that the battery is made up of cells which would not have sufficient capacity for cutting a full shift. The battery is placed in a box and taken to the pump location on a non-propelled truck, where it is set in on a stub switch, near the pump and left until discharged, when it is replaced by a fully charged battery. The portable pump is applied in the same manner as the stationary pump, except that the battery truck not only furnishes power but hauls the pump from place to place as needed.

THE ROCK-DUSTING machine is driven by a permissible motor, mounted upon a non-propelled truck. The machine is handled over the road and is furnished power by a battery truck, or gathering locomotive, which has been equipped for serving it.

The portable air compressors, loading machines and portable concrete mixers are furnished power through a conductor cable from the power trucks which are set in on stub switches or room necks near the work to be done.

At the present time the company has four so-called wireless mines producing an average of 9,000 tons daily. The men in charge have had many years' experience with wired mines. If left to their individual choice they would prefer the battery-equipped mine to the wired mine because of the dependability, flexibility and safety of wireless equipment.

WHAT, THEN, are these permissible machines? Equipment bearing the U. S. Bureau of Mines approval plate signifies that all compartments of a machine similar to that so marked, containing live contacts have been designed, built and tested according to certain standards of safety set by the Bureau. If it is operated and maintained according to the Bureau's instructions as set forth on the approval plate, it is termed permissible equipment and may be operated in a gaseous mine with a reasonable degree of safety.

In obtaining the U. S. Bureau of Mines approval, the manufacturer sends the drawings of the proposed equipment to the Bureau for its criticism. Generally there is a conference of the manufacturer's engineers and the engineers of the Bureau, by means of which any obvious objections are

eliminated before proceeding further.

After such a conference the manufacturer builds the machine in accordance with the findings of the conferees. Only those parts of the machine which contain live contacts are submitted to the Bureau. Each part submitted is tested separately, being first drilled and tapped for spark plugs and gas pipes. It is then put into a specially designed testing gallery, connected up and filled with a highly explosive mixture of gas, coal dust and air. The gas in the compartment is then ignited.

The test engineer makes observations through specially designed windows in the gallery. If he discovers flames about any joint of the compartment, the part is dismantled to see if all joints have been properly fitted. Sometimes it is necessary for the manufacturer to make changes in a compartment. After this is done, it is reassembled and the test repeated, until no flame is seen. When the parts tested have been approved by the Bureau they are returned to the manufacturer to be assembled into a complete machine. After this is done and the machine is wired, a Bureau engineer makes a final inspection.

IF THE MACHINE passes this satisfactorily, the test engineer recommends its approval, which is officially given by the Director of the Bureau of Mines. A number is then assigned to the approval plate. In building subsequent machines the manufacturer can change no part of the design, specifications and assembly, without obtaining an extension of approval from the Bureau.

The Bureau does not inspect and test every piece of approved equipment manufactured, but from time to time, with the co-operation of manufacturers and operators, inspects machines of the same design, in the field or factory. If in these inspections of similar machines it is found that they are not in accord with the Bureau's specifications and are not maintained properly, the manufacturer and operator are so advised. If a machine is found not to comply with the Bureau's standards, the operator and state officials decide whether the machine will be kept in service until compliance can be made with the recommendations of the Bureau.

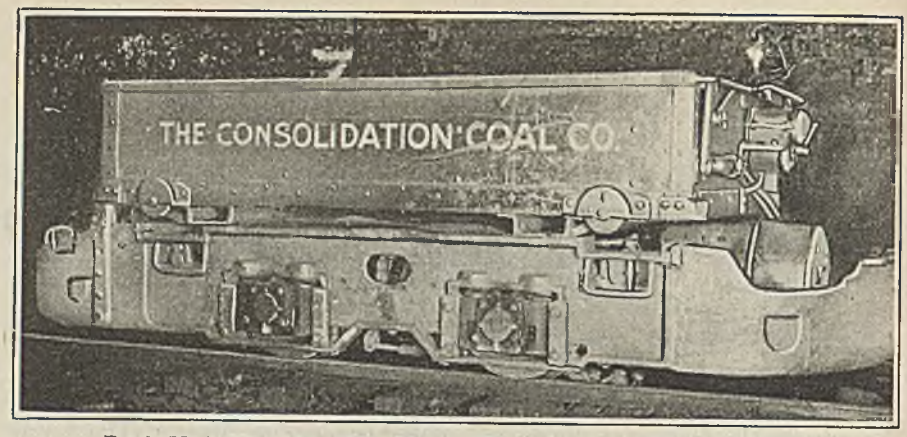
AFTER AN APPROVED machine is placed in service and the operator finds it advisable to make some change in the machine, the latter discusses this revision with the manufacturer, who in turn submits drawings and specifications of the proposed change to the Bureau, where they are considered, along with those on file of the first machine submitted.

If the change meets the approval of the Bureau an extension of approval is granted, on condition that the change be made under the supervision of the manufacturer's representative, who must make changes according to the drawings filed with the Bureau.

The operator's responsibility lies in seeing that the approved equipment is handled and maintained in accordance with the instructions found on the approval plate. The mine management demands daily inspection of the equipment by the chief electrician. Operatives who handle approved equipment are required to inspect the machine to see that the compartments are properly locked or sealed before the machine is taken from the locomotive barn. The mine foreman, assistant mine foreman and fireboss are instructed to be on the lookout at all times in the mine for unsafe practices in the operation of equipment.

The question is often asked: "How long does permissible equipment remain permissible?" The answer is, "Just so long as the mine officials demand that the equipment be operated and maintained according to the instructions on the Bureau of Mines approval plate."

THE OPERATOR who buys permissible equipment and does not maintain it as such establishes a false standard of safety and in reality has permitted a permissible machine to become a hazard. The machine, if not operated and maintained according to the Bureau's instructions, may be the cause of gas ignition by arcs escaping from improperly assembled permissible compartments, which may cause a mine explosion.



Each Unit Trails or Carries, as Here, Its Own Power House

Some manufacturers and operators are disposed to purchase for their convenience approved parts of other manufacturers' machines and to assemble these parts without submitting the complete detail and assembly drawings to the Bureau for its approval. Some have gone so far as to term such unapproved assemblies permissible. Safety principles do not permit of such a promiscuous assembling of parts. Such assemblies involve too great a hazard, as much depends on the manner in which the parts are assembled. Though all parts may have been approved, they may be put together and the wiring done in such a way as to make the assembled equipment unsafe.

Such a practice, as outlined above, would lower the standard of safety generally. Not having to undergo a neutral and unbiased inspection (such as the engineers of the Bureau can give), the assembly will not be made in a safe and workmanlike manner. Furthermore, no manufacturer could be held responsible for a machine made of approved parts thus assembled.

IN CASE of a disaster in a mine where equipment is in use including approved parts, but bearing no approval plate, the operator does not have the same degree of moral support that he would have commanded had the entire assembly been approved by the Bureau. The initial cost of permissible equipment is about 10 per cent higher than that of the open type. This difference is offset by its dependability and its lower maintenance cost. The first enclosed, or so-called flameproof, motor manufactured in this country, appeared in 1903. It was not until 1914 that the motor was developed to the extent that it was approved by the Bureau of Mines. The first motors of this type were used on cutting machines.

LUBRICATION

If Properly Done

Is a Good Investment

By F. K. Clark

Vice-President
Hulburt Oil & Grease Co.

NOT MANY YEARS AGO black oil was universally used for lubrication on all equipment in coal mines. It was cheap and of a better grade than the "black strap" marketed since the era of the automobile and other appliances which have enormously increased the demand for oil. In an effort to provide better lubrication of mining machinery black oil was first replaced by engine oil. Today the trend is toward fluid greases, applied by pressure guns through a spring oiler distribution system, wool-yarn elastic grease for journal-box packing and solid greases for roller bearings.

Correct lubrication is obtained when moving surfaces in close contact are continuously surrounded with a tenacious film of oil which allows them to slip with a minimum of friction. The greatest utility of oil as a lubricant occurs in ring-oil bearings because these are so constructed that the oil can be used over and over again, with little opportunity to escape. But most equipment does not retain its lubricant for a long time. Either because of wear or by reason of design, lubricants readily escape from the bearing surfaces of most mine equipment. The problem, therefore, is to select a lubricant that is most likely to "stay put."

A good grease contains high-grade mineral oil chiefly and just sufficient carrying agent, properly blended, to strengthen the oil film. By its nature grease sticks to the surface and resists heat and pressure. Alone, oil escapes more readily from the parts to be lubricated and therefore requires more frequent application to insure a renewal of the broken-down oil film.

A desire to keep the mechanical loader constantly in good working condition has influenced the introduction of quality lubricants for mining machinery more than any other factor. One prominent manufacturing company lays so much emphasis on correct lubrication that it specifies the kind of lubricant that should be used on its loading machines. On a correctly designed loading machine lubrication should be largely automatic, as many of the parts as possible being fed from a central reservoir. The most vital parts, so far as the correct all-around functioning of a loading machine is concerned, are

Out of the Way and Clean

the clutch bearings, and great care should be exercised in keeping them properly lubricated.

Shortwall machines were first lubricated by pouring black oil into the oil holes and on the cutter chains. When the machine became noticeably hot this oil was poured over the machine in a promiscuous manner. Particularly was this practiced after the machine had been sumped up to the point where only a few inches of clearance remained over it, prohibiting the application of lubricant to the oil holes. Engine oil, which was introduced later for this purpose, was applied more sparingly because of its substantially greater cost. This brought about provisions for lubrication from boxes filled with oil-soaked wool waste. But these boxes would soon become encrusted with coal dust and particles of slate, and when the waste was replenished with thin oil, the latter would wash this foreign matter down into the bearing, necessitating frequent repairs.

Cutting machines can be most effectively lubricated when equipped with a ball-spring oiling system, applied in such a way that each fitting is accessible to a pressure gun which forces the lubricant direct to a bearing. This system is so superior to the old that merely by listening to a number of machines in operation one can readily determine by sound the method by which each is lubricated. One of the largest coal-mining companies in the country recently standardized on this method of lubrication.

A grease gun containing a quantity of lubricant sufficient for the needs of his machine is issued to each runner. The guns are numbered and kept in a suitable rack. They may be delivered to the cutting machine along with a supply of sharp bits or they may be issued at a convenient place, as the electrical repair shop, the runner calling for and returning the gun assigned to his machine.

A fluid grease, specially prepared for cutting machines and also locomotives, is now available. Under normal conditions three pints of this lubricant is sufficient for the needs of a cutting machine during one shift. This system provides economy in the dispensing of the lubricant and at the same time permits the making of an accurate check on the quantity used by each machine.

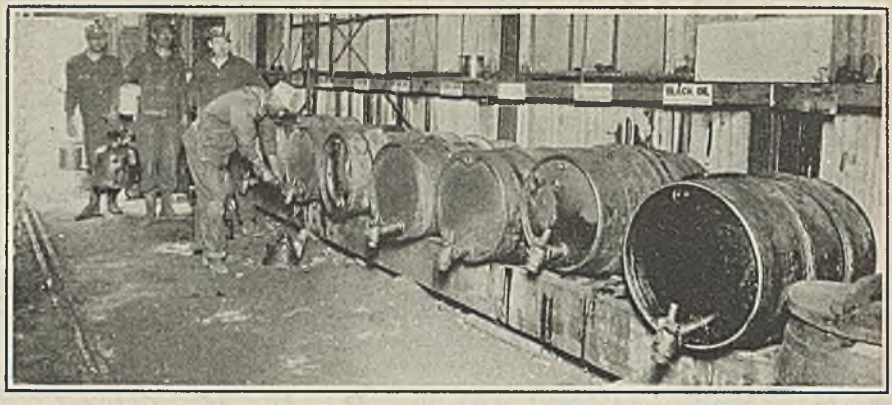
IMPROVEMENT in methods of lubricating locomotives has kept pace with the advancement in their design. Best results are obtained from a journal-box packing of wool yarn and horsehair saturated with a liquid grease, the preparation being known as wool yarn elastic grease. It should contain wool strands not less than 8 in. long and a fine quality of curled horsetail hair about 10 in. long. The horsehair gives resiliency and long

life to the packing, enabling it to feed continuously without settling or leaving the journal. It also keeps the strands of yarn separated, thereby allowing the lubricant to wick more freely. In packing a journal box the wool yarn elastic should be applied with a rotating motion. The replenishing compound is best added by a pressure gun through a ball-spring oiler. The cover of the journal box then need never be removed except for periodic examinations of the packing. This arrangement keeps the packing free from foreign matter. The replenisher is forced through the packing to the back collar and is not required to wick its way to that point, as is the case when it is poured on the packing.

It is advisable to use the best grade of wool yarn elastic grease available because a lubricant which does not withstand heat will cause a great deal of electrical trouble by separating and running into the armature case. Although the initial cost of high-grade wool yarn elastic grease may be higher than that of other lubricants, its use is justified by the fact that no other piece of coal-mine equipment is more responsive, in the matter of savings, to correct lubrication than the locomotive.

A LARGE PERCENTAGE of power demand at a mine is consumed in haulage and at many operations an appreciable portion of this power is wasted in overcoming needless friction on mine-car wheels. Also poor lubrication sends many mine cars to the repair shop. So it behooves every superintendent to keep the cars at his plant well lubricated. Larger mine cars and locomotives in longer trips and a general speeding up of haulage has brought about a greater appreciation of the imperative need for correct lubrication of rolling stock. Black oil, screeching bearings and tracks lined with oil drippings are things of the past. Today semi-fluid greases on plain bearings and solid greases on roller bearings are generally used except in cases where the equipment is so badly worn that correct lubrication is impossible.

For applying semi-fluid greases to car wheels a 3-gallon container integral with a pump is recommended. The container is filled direct from the original drum. It being portable, the operative is enabled to force the lubricant into the bearing through a small hose, eliminating waste and contamination from dust and dirt. A conservative estimate of the safe utility of an application of grease on plain bearings under normal conditions is 60 to 90 running days.



Plenty of Oil but None to Waste

On solid and roller-bearing car wheels a grease of heavy density is recommended. For applying this lubricant a hand-operated gun is available which pumps the grease direct from the original container, discharging into the bearing exactly ½ lb. to the full stroke. This device, which, incidentally, is inexpensive, has simplified and improved lubrication by heavy grease. Plain- or roller-bearing car wheels under normal conditions of operation should not require greasing more than two or three times per year.

Considerable waste is avoided when a measured quantity of grease is applied to each car-wheel bearing. Formerly it was the practice to force the lubricant into the wheel until an excess showed around the back collar. When the wheel was put into motion the surplus grease, packed around the rollers, was forced out and wasted.

Of all tipple equipment, eccentric bearings are the principal source of trouble from the standpoint of lubrication. The lubricant in these bearings is acted upon by centrifugal and vibratory forces which cause it to gather on certain sections of the bearing, leaving the remainder of the surface dry or comparatively so. It is important, therefore, that a force-feed system of lubrication be applied to bearings of this type as a means of assuring a more uniform and constant distribution of lubricant.

Lubrication of steel pan conveyors has been improved by use of an automatic lubricator consisting of a small double-cylinder single-acting pump which shoots a few drops of lubricant on each side of the conveyor wheels as they pass the points of application. The quantity of lubricant ejected can be varied by adjustment of valves in the feed lines. Loading booms and other tipple conveyors of the link and wheel type also can be equipped with this system of lubrication. The installation of this device on a 600-ft. conveyor at an Illinois mine reduced the power requirements of the unit to the extent that a 40-hp. motor, which frequently was overloaded in starting, was replaced by a 15-hp. motor.

Transfer of oils and greases from the shipping drum to storage tanks introduces danger of contamination. Therefore it is advisable to draw off the lubricant as needed directly from the drum by an inexpensive pump. Handling of the lubricants is facilitated by storing them on racks made of 6x6-in. timbers or track rails located at a convenient point on the outside. By this arrangement the drums may be rolled directly from the delivery truck onto the racks.

LUBRICANTS always should be issued by measure. In this way machine runners are assured a sufficient supply for the equipment under their care and ignorant or wanton waste is avoided. Responsibility for the issuance of lubricants should be centered upon one individual—a man in the shops or the supply room, who can conveniently attend to this duty as a side issue. No one else should have access to the supply.

Systematic dispensing enables the mine superintendent to keep for each unit of equipment accurate records of consumption and comparative lubrication costs per ton. Knowing these costs he will soon be impressed with the importance of this phase of his managerial responsibilities. It will also convince him that in the selection of lubricants, as in the purchasing of other supplies or equipment, the best obtainable usually is the cheapest in the long run.

American and British Experts To Collaborate in

SAFETY STUDIES

AS THE RESULT of a visit to this country of Dr. R. V. Wheeler, director of research, British Safety in Mines Research Board, and of Captain P. S. Hay, his executive assistant, plans have been laid for continuing for the fourth year the joint research on fundamental matters regarding the health and safety of miners now being conducted at Pittsburgh and Bruceton, Pa., in the United States and at Sheffield and Buxton in Great Britain.

The conjoint work will deal with the behavior of different coal dusts as regards flame propagation, the influence of the composition of the atmosphere (firedamp, blackdamp and moisture) on the propagation of a coal-dust explosion, electric arcs as initiators of such explosions, ignition of gases by heated surfaces, photographic examination on a rotating film of the ignition process when gas is ignited by an explosive, determination of the effect of confinement and the nature of tamping on the charge limit of explosives, comparative tests of American and British coal-mine explosives, current practice with regard to prevention of accidents from falls of coal and relation between coal composition and its susceptibility to oxidation.

Closely related subjects that will be studied in the two countries are: In the United States, the relative ignitability and pressure developed in the flammation of low-temperature coke on the one hand and of coal on the other; in Great Britain, the correlation of the chemical and physical properties of coal dusts with their flammability.

Another pair of cognate studies will be: In the United States, the relation between oxygen balance and explosive properties of eight samples of 40-per cent gelatine dynamite, and in Great Britain, the determination of the composition and quality of the products of detonation.

A third couple will be: In the United States, the effect of carbon dioxide, nitrogen and helium on the limits of flammability of carbon monoxide and hydrogen, two gases that result from mine fires and burn in air with a low oxygen percentage, and in Great Britain, the influence of various gases and vapors on the limits of flammability of firedamp-air mixtures.

The U. S. Bureau of Mines will study the following, communicating their results to the Safety in Mines Research Board of Great Britain: Chemistry of decay in relation to peat and coal formation, efficacy of devices for arresting an explosion after it has traveled some distance, effect of the manner in which dust is deposited on the ease of propagation of flame, accuracy in measurement of explosive pressures, determination of the temperatures attained by the products of detonation of explosives, propagation of flame in natural gas-air mixtures and general study of falls of roof and coal.

TO THESE STUDIES will be added four, three on the improvement respectively of (1) self-contained rescue apparatus, (2) oxygen-admission valves, (3) gas masks and self-rescue apparatus and one on carbon-monoxide estimators.

The British board will study the effect of the fineness of coal on its flammability, the effect of the chemical composition of the atmosphere on the ignition of coal dust, the effect of the arrangement of the gallery and the position of the point of ignition on the development of a coal-dust explosion, the ignition of firedamp from sparks, from picks, from falls of rock, from rock striking rock and from adiabatic compression. It also will endeavor to obtain a measure of the fineness of coal dust.

Other studies of the Safety in Mines Research Board will cover the effect of turbulence on the propagation of flame, the propagation of flame in closed vessels, the release of pressure from partially closed vessels, the projection of the flame of an explosion beyond the original confines of the explosive mixture, the uniform movement of flame, ionization during flame propagation, the control of gob fires, the pressures produced by momentary arcs and on the initiation and cessation of sustained arcs in closed vessels and the pressures produced by vaporization of fusible cut-outs.

The board also will make studies into flood lighting, the form and magnitude in time and in either temperature or pressure of the wave thrown out by an explosive, the conditions which may give rise to the ignition of methane-air mixtures occurring in breaks at or near a shot-hole and methods and appliances for testing the soundness of roofs.

Most of these British studies with special regard to the needs of American mining conditions will be pursued by the U. S. Bureau of Mines if funds are available.

Dr. W. Francis, coal-research chemist of the Safety in Mines Research Board, who is now detailed to the Bureau, with headquarters at Pittsburgh, will continue his studies of the relation between composition and oxidizability of different coals. It is thought that the degree to which a coal is oxidizable, or has been oxidized, is an index of relative liability to spontaneous combustion. of relative ignitability as a dust in air, and its relative coking quality.

WHEN DR. FRANCIS completes his year's detail in April he will return to England. In his place W. C. F. Shepherd, explosives chemist of the Buxton Station, a specialist on the photography of flames and pressure waves produced by detonating explosives, will, at the request of the Bureau, be detailed to the experiment station at Pittsburgh and to that for the testing of explosives located near the experimental mine. He also will make similar tests of American explosives.

Dr. Wheeler has requested the detailing for twelve months to the British Safety in Mines Research Board laboratories at Sheffield University of S. H. Katz, physical chemist of the Bureau, who has specialized in developing mine-gas and industrial masks. He will work on masks, self-contained mine-rescue apparatus, self-rescue apparatus and carbon-monoxide estimators.

It is expected also that George S. Rice, chief mining engineer of the Bureau and liaison officer in the British co-operative investigations, will visit England in April to further these international activities and advise in the layout of a proposed underground explosion gallery at Buxton.

Can Mines Strike

SPARKS—

Thus Igniting Gas and Coal Dust?

THOUGH only two men were killed in the explosion in the Hillcrest mine of Alberta, Canada, the premier of the province desired a most thorough examination of the conditions and George S. Rice, chief mining engineer, U. S. Bureau of Mines, was requested to supplement the investigation made by the provincial authorities.

Only just recently has the report of Mr. Rice been released by the Government of Alberta, though the explosion occurred Sept. 19, 1926. The significance of the explosion lies in the fact that it originated from natural causes with which the two men killed, who were the only men in the mine at the time, had nothing whatever to do.

The Hillcrest mine is about 25 years old. In a previous disastrous explosion on June 19, 1914, in which 189 men perished, the Commissioner, A. A. Carpenter, who was appointed to investigate was unable to determine either the point of origin or the cause of ignition.

JUST ACROSS the valley from the Hillcrest mine is the Bellevue operation, which works the same seam but in a different trough. Here occurred three mysterious explosions, two of which happened with no one in the mines. On these John T. Stirling, chief inspector of mines, Alberta, and Professor (later Sir) John Cadman reported.

The coal, which is a bituminous coking fuel, has about 1.5 per cent of moisture, 25 per cent of volatile matter, 56 per cent of fixed carbon and 17 per cent of ash. It contains only about 0.5 per cent of sulphur.

It is extremely friable and is mined entirely by hand picks and wedges, without the aid of any explosives. Where the slate has to be removed it is not blasted. The seam runs from 8 to 14 ft. in thickness and is free from large partings.

THE pitch in the rooms where the explosion is believed to have initiated runs from 25 to 35 deg. "Where the pitch of the chutes is 26 deg. or less," says Mr. Rice, "the coal must be 'bucked' down by the miners. When the chutes are flatter than, say, 20 deg., it is customary to divide the chute into two or even three parts, with flat places for car transfers between. The coal is loaded into small cars from a higher chute section above, and the cars are pushed along the flat place and dumped into the chute section below. The coal mined in crosscuts is loaded into small cars, which are pushed to the room and dumped into the chute.

"Thus all the coal except that in the level and counter headings is dumped once, and often two or three times, before dropping into the car on the level. As a result of the dumping and 'bucking' an enormous quantity of fine dust is produced. Large accumulations of dry dust are found in all rooms and levels, and much is of extremely fine size. This dust is nearly or quite as pure as the coal mined and shipped, as evidenced by the analysis of the samples.

"The coal dust in the rooms and crosscuts is not treated and there is little or no watering, and no rock-dusting in entries and slopes. The latter are wetted in places by seepage from the strata.

"THE mine, like others in the Crowsnest field, is rated as gassy. The gas does not issue in large blowers but apparently comes from the liberation of occluded gas and that held in slips and joints of the coal. It escapes steadily into the excavations, only in small quantities, it is true, in any one place; but generally throughout the mine.

"The mine officials expressed the opinion that the gas comes wholly from the coal seam and not from the roof or floor. They claim gas is rarely found in sufficient quantity in working places to show as a 'cap' in a safety lamp. 'Caps,' however, indicated to our investigating party that it was present at the faces of a number of rooms.

"In the analysis of one sample it was found that 0.15 per cent of the atmosphere was ethane. This is 4 per cent of the total flammable gas in this sample. Ethane has a lower explosive limit than methane, but the proportion present is less than found in most natural gas and is not sufficient in this case to have an important influence on the ignitability of the flammable gas present.

"IN my report to the Minister of Mines for British Columbia, in 1917, on 'Bumps and Outbursts of Gas in the Mines of Crowsnest Pass Coal Field' (published in the Report of the Minister of Mines for 1918)," says Mr. Rice, "I gave the results of experiments in grinding various coals at ordinary temperatures and also under water.

"The occluded gas given off by Pittsburgh coal—used as a standard—contained, per volume of coal, 0.12 volume of hydrocarbon gases, whereas the coal from one of the British Columbia Crowsnest Pass mines (No. 3) yielded 2.12 volumes of hydrocarbon gases—nearly 20 times as much as Pittsburgh coal. Further, ethane was the predominating component, forming, in fact, 77 per cent of the total hydrocarbon gas, or three times the volume of the methane. Although the coals in the Crowsnest fields of Alberta and British Columbia may not be identical, yet there is a probability of close similarity between them because they belong to the same geological period and have been exposed to similar geological stresses.

"The ignition temperature of ethane is about 520 deg. C., as compared with 650 deg. for methane. Curiously, the presence of ethane was not reported in analyses of the Crowsnest Pass (B. C.) gas blowers, and its presence has been only occasionally reported in analyses of gas from mines in the Crowsnest field of Alberta—notably from Bellevue, and in one sample from the Hillcrest mine, as previously stated. However, it is probable the Hillcrest coal contains ethane in occluded gas, and it may have been a factor in the ignition."

INDICATIONS of violence seemed to point to the origin of the explosion in a room of a panel which had long been unworked but was still being ventilated. In this room a large quantity of rock had fallen. There was no indication that an explosive had been used and no electric cables came within 1,200 ft. of the place. The rock which fell was part of a stratum of hard sandy shale, which had broken into angular blocks

with sharp edges. When small pieces were struck one against another no visible sparks were emitted.

"Above the sandy shale is a hard, dense, dark-colored sandstone composed of quartz sand strongly cemented together which contains bituminous matter. Broken pieces of this rock have sharp, flinty edges and make bright frictional sparks. This latter sandstone in most places forms the immediate roof of the same seam, No. 1, in the neighboring Bellevue mine.

"The suggestion that the ignition which started the Bellevue explosions (two of which occurred when no one was in the mine) may have been caused by pieces of this sandstone striking on one another, or upon the iron sheets in a chute, has the concurrence of the writer, who made an examination in the Bellevue mine shortly after that by the aforementioned authors and before the mine had been reopened.

"IN the Hillcrest mine the bituminous sandstone does not rest immediately on the coal in the parts of the mine visited, but it is said to do so in some places near the outcrop.

"When rocks strike iron, or vice versa, they make frictional sparks such as are produced in grinding steel or iron on a sandstone wheel. This everyone has witnessed. Such sparks, however, are not hot and tests have shown that under most circumstances they do not ignite methane-air mixtures, although they may ignite other hydrocarbon gas mixtures and may ignite even methane where the sparks are arrested and confined in a small space, preventing the rapid cooling which takes place when the sparks are projected into the atmosphere. That frictional sparks made by a car wheel on a sanded track will ignite methane-air mixtures has been demonstrated experimentally at Sheffield University.

"Many instances have been observed in the United States, both in bituminous and anthracite mines, where permissible undercutting machines have caused, supposedly by frictional sparks, the ignition of blowers of firedamp. Where pyrite is present, black powder in many instances has been prematurely fired when it was being tamped with iron bars. This ignition is due to frictional sparks. It must be remembered, however, that the ignition of black powder does not require a high temperature.

"We have not only to consider," adds Mr. Rice, "the possibility of large masses of the hard sandy shale striking sparks in falling on top of rock from previous falls, on a steep-pitching surface, where there would be a dragging frictional effect rather than a simple impact, but we must consider also the possibility of sparks made by a sliding contact of rock with cutting edges on a sheet-iron chute roughened by former use, and pitted by corrosion during a period of disuse.

"A THIRD possibility of ignition is through frictional heating rather than by sparks. At Hillcrest the sheet-iron or steel used in chutes was galvanized and, although some of the zinc was worn off, the sheets observed showed a fair coating of the metal, especially where a sheet was overturned, revealing an unscraped surface. Let us suppose that a sharp-edged rock, acting like a tool, should scrape the surface, producing zinc dust. This would develop heat, which might accelerate oxidation and further heating. It is well known that finely divided zinc dust will ignite at relatively low temperature, and burn. In this way the ignition temperature of methane would be reached.

"This brings up another question, the character of the gases that might be present and subject to ignition should a mass of rock slide on the floor of the room or on the sheet iron of a chute and thus cause frictional heat. There is an abundance of laboratory evidence that coals when crushed, even at ordinary temperatures, give off a large quantity of occluded gas.

"A fourth, and perhaps the most likely cause for hot frictional sparks and heating would occur where an iron nail from a chute or a piece of pitted plate would be dragged down the chute and would slide over the roughened plates, on which sandy particles probably would be lying and possibly pyrite particles and coal dust. It is well known that finely divided pyrite is easily ignited by friction, as numerous fires in stopes of pyrite mines attest.

"ACCORDING to Messrs. Stirling and Cadman, the coal analysis of the Bellevue mine showed 2.6 to 3.4 per cent sulphur, and in five samples of coal dust the sulphur content ranged from 2.7 to 3.4 per cent. However, the analyses of the Hillcrest coal and coal dust, given previously, show a low sulphur content."

Among the recommendations made were better stoppings, ascensional ventilation and rock-dusting, but, more interesting because less obvious, undercutting of all coal, driving rooms on the strike from engine planes, or else adopting the panel longwall-retreating system with face conveyors and in some cases retarding conveyors; also, where rooms have been driven, drawing pillars. If the pillars are to stand, unless the excavated areas are backfilled they should be inspected daily.

Mr. Rice says: "I strongly urge the general principle that workings which cannot be daily inspected, and hazards remedied, be sealed with strong stoppings of concrete or masonry."

Questions That Franklin Might Have Asked

To the Editor of *Coal Age:*

Will you please make the following correction, for which the writer (not the printer) is responsible, in connection with the third question, first column, page 25, *Coal Age,* issue of January, 1928, in the article captioned, "Certain Questions that Benjamin Franklin Might Have Asked." This paragraph should read:

"Would the further mechanization of coal mines contribute to the conservation of coal reserves, and would such reduce the accident ratio, now approximating 100 fatalities for each 21.8 occurring in the mines of Great Britain, France and Belgium, the comparison based on the number of 300-day workers employed?"

In order to clarify this question, I submit the following compilation of fatal accidents in coal mines for 1921-25, taken from the published records of the U. S. Bureau of Mines and authoritative foreign records:

Country	Average Number Men Employed	Total Men Killed	Per Thousand 300 Day Workers	Per Cent Ratio
United States				
Bituminous.	652,921	8,825	4.87	100
Anthracite.	158,882	2,252	3.71	76
Total.....	811,803	11,077	4.58	94
Great Britain.	1,175,114	5,495	1.13	23
France.....	*250,026	*903	*0.97	20
Belgium.....	161,930	812	1.00	21
Prussia.....	600,964	6,227	1.86	38

* For four years, 1921-1924, only.

The combined average fatality rates for the coal mines of Great Britain, France and Belgium show a loss of but 20.5 men to each 100 lost in our American bituminous mines, or 21.8 men to each 100 lost in all American mines. EUGENE MCAULIFFE.

COAL'S BIGGEST PROBLEM In 1928

• II •

MODIFICATION of the Sherman anti-trust law to permit closer co-ordination of supply and demand and to check cut-throat competition is appealing to a growing number of coal company executives as a solution of the problem of overproduction, which strikes so many leaders as the outstanding issue of 1928. This feeling finds expression in several comments received in response to the request for a statement of views addressed by *Coal Age* to a selected group of coal company executives. A number of these statements appeared in the January (1928) issue; several received too late for incorporation in that issue are published below.

The idea that there is something basically wrong with a price situation which gives general industry its fuel at less than the cost of production also is gaining ground. The president of one of the largest units in the bituminous field goes on record in this issue with the declaration that his company will strive to correct this condition during the current year in so far as its own sales of slack coal are involved. Others, too, are pondering upon the wisdom of disposing of one-third or more of their annual output at an actual loss.

Freight rates loom large in the consideration of 1928 problems in Kentucky and southern West Virginia. The labor situation also is approached from different angles. In the Middle West demand for a downward revision of wage rates is voiced; from the South comes the question whether a policy of squeezing down basic rates of pay to the worker as the quickest way to meet competitive selling conditions is, after all, the right way to solve the problems of modern merchandising.

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Open-Shop Operation Answers Labor Problem

AS HEAD of one of the large captive-mine interests, F. E. Herriman, president, Clearfield Bituminous Coal Corporation, finds the labor situation the outstanding problem. "I think," he adds, "that it has been solved by operating the mines open shop.

"We have done this somewhat reluctantly and only after long and earnest efforts to make a new contract with the United Mine Workers upon the expiration of the Jacksonville agreement had failed. Now, with clean hands and a clear conscience so far as that organization is concerned, we are working successfully with non-union labor."

Is the Law of the Jungle The Only Answer?

MUST we depend upon sheer economic pressure to cure the evils of overproduction and co-ordinate distribution?, asks C. B. Cardy, president J. K. Dering Coal Co. "By reason of overproduction," he points out, "coal is being sold generally well below the cost of production, and natural resources are being depleted without proper return on investment. When you ask for a solution of this problem we can hardly think of any which would not conflict with the present laws. The only solution left is the force of economic weight, but this has been under way for at least seven years and there has been no appreciable effect in reduction of output.

"Undoubtedly if consumption continues to increase only in a normal way, in the course of time output will be confined to the more efficient properties, either as to natural conditions or management. This is not a satisfactory solution when the future is considered,

Clarence B. Cardy

for it undoubtedly contemplates the present mining of the favorably located coal seams and their eventual exhaustion, so that in the course of years the nation will be called upon to pay a greater price for fuel when remaining coal seams are mined.

"In Illinois and Indiana, the important problem is the labor situation. The facts are conclusive that labor in these states must take a reduction in wages to permit further operations. This has been stubbornly resisted, and 1928 should see this matter settled one way or another. Whether the mining industry in the two states named will receive any relief cannot be predicted at this time. The feeling is, however, that with such a conclusive showing, undoubtedly mine labor will have to yield to sheer economic pressure."

General Curtailment of Output Would Help Situation

CURTAILMENT of output in every field would help the situation in the opinion of W. R. Kernohan, general manager, Houston Coal Co. "We have more coal now than the country can consume and there are a lot of mines that should close down for two reasons. The first one is they never should have been opened and the second is that their cost is out of line."

"Overproduction" is the biggest

problem, is the succinct comment made by Jabez Woolley, president, J. Woolley Coal Co.

That restriction of production is "the one great problem" is the view also held by George M. Jones, president, Logan County Coal Corporation, who says that "there is too much coal being forced on the market today and production must be curtailed by the mines in each producing district agreeing to produce not in excess of orders in hand. That would mean the end of the practice of consigning coal unsold either to the piers or to the large consuming centers such as Chicago and Detroit. Those in the industry must be educated up to speaking in terms of profits instead of tonnages produced."

Cost Reductions Crying Need In Middle West

REDUCTION in costs wherever possible is the major problem for the industry in 1928; this is the belief voiced by L. F. Lumaghi, president, Lumaghi Coal Co., who says that reduction "can be and probably will be accomplished by a more complete mechanization of the mines and with revision of wage rates. Many of the fit properties in United States from the standpoint of natural conditions, height of coal and location adjacent to markets have been artificially handicapped by having their natural advantages taken from them by abnormally high wage scales.

"In the end the property that naturally should be a low-cost producer and has the advantage of location close to markets must and will prevail. All artificial handicaps will eventually be removed, so that there will be a free flow of coal, which will result in the tonnage flowing toward the naturally economical property. The industry is moving in this direction at the present time and I predict that 1928 will show a great stride in this direction. A great increase in the use of machinery and moderate revisions in the wage scales where they are too high to be competitive will take place."

Hope for Orderly Solution Of Major Problems

ALTHOUGH there is no magic wand to make the problems of the coal industry vanish, the solution of most of the questions of national scope is proceeding along orderly lines, declares K. U. Meguire, president, Dawson Daylight Coal Co. "I am sure that, thanks to the invaluable work of associations and trade publications and to better methods of thinking among our coal operators today, the producers have a truer picture of the industry and of their own part therein.

"As far as Kentucky is concerned, the outstanding problem for 1928 is how we shall survive the recent trend of the Interstate Commerce Commission's decisions, which are increasing the advantages of nearby shippers of coal and other commodities at the expense of shippers like our Kentucky mines which are remote from the greatest markets. This zoning movement, if continued, will ruin the producers of raw materials who lack adequate markets close at hand. Competition, as it has heretofore existed in America, will be a thing of the past.

"The entire business life of Kentucky is pretty well convinced that these recent decisions in the lake cargo and Illinois cases have been influenced by considerations of politics, pressure from labor unions and other considerations other than transportation. The 'grapevine' reports and whispering about the case are unpleasant for the country at large.

"If, after having forced on them these additional handicaps in freight rates, Kentucky mines should witness the shrinkage of their advantage in labor costs, due to the non-union movement in western Pennsylvania and Ohio and the efforts to reduce wages by April 1 in Illinois and Indiana, the situation of Kentucky will be extremely serious. In such event the result would, of course, be the elimination of more and more of the weaker units. This process proceeded extensively from 1924 to 1926, but has been interrupted by the market improvement due to the British strike late in 1926 and to the Central Competitive Field strike in 1927. In 1928 the sheriff may again occupy the spotlight.

"The only favorable solution for Kentucky will be the restoration of access to American markets on reasonable freight rates, and the maintenance of free labor conditions. In this cause the state is solidly pledged from Governor Sampson to the trapper boy, and from the City Hall and the Stock Exchange to the Purchase, the Pennyrile and the backwoods."

Insistence Upon Fair Price for Slack Coal Points Way to Immediate Relief

AN END to the folly of selling slack coal at less than the cost of production appeals to J. D. A. Morrow, president, Pittsburgh Coal Co., as a way to immediate relief. Concentrating his comment upon this "single facet of the problems" facing the bituminous industry this year, Mr. Morrow says:

"It is rather astounding, when stated baldly, that American industrial users

J. D. A. Morrow

of coal confidently expect year after year, to buy their fuel supply—slack—at a price far below the cost of production—anywhere from 50c. to $1 per ton below the cost of production. Our manufacturing industries are largely built on the proposition that they are to obtain their fuel supply, comprising one-third of the output of a large section of the bituminous mining industry, at only a fraction of what it costs to produce that fuel supply.

"It is asserted that the low prices on slack must be made because of the difficulty in moving that product. Nevertheless, little of this grade of coal is sold to users who would buy another grade. Practically every ton is sold to buyers who want slack and intend to buy nothing else. Moreover, all the slack is sold every year. No significant quantities are stored by producers, though much of it purchased at bargain prices is stored by consumers. Therefore this is not a case where only a part of this grade of coal can be marketed, with an unsold balance hanging over the market. It is all sold every year, and all of it at prices indefensibly low.

"No criticism is intended or implied of the industrial buyer who avails himself of the weakness of coal men in offering slack at below-cost prices.

"In my view, there is not one single thing that would so immediately improve the position of the bituminous coal business as to have every seller of coal undertake to get a profit above production cost on his slack. We cannot hope to have a prosperous business when we deliberately start the sale of our product by writing red ink figures against a third of the output before we begin even to expect a profit.

"Fortunately, the trend of the market is in our favor. Stoker equipment and pulverized fuel plants are all based on the proposition that by utilizing this cheap fuel the purchasers of such installations will make large savings. The extension of equipment of this kind is increasing the use of slack and in this respect is inevitably leading to a better market for this product. However, unless coal men change their idea of the value of slack we will presently see some of them, not content with losing money on only a third of their product, begin to crush their entire production so that they can be sure of losing money on all of it by

selling the entire tonnage to the industrial consumer as slack coal.

"It is suggested, therefore, that here is one practical matter to which we can all of us devote our personal, individual attention, with some prospect of accomplishing something.

"It is necessary, however, to do more than talk. Some of us must lead the way. So far as the Pittsburgh Coal Co. is concerned you can write it down now that before the end of 1928 we will be obtaining a much better average price for fine coal than we have done heretofore."

Constructive Leadership Coal's Greatest Need

"IN MY opinion," writes Erle S. Ormsby, president, Donk Bros. Coal & Coke Co., "the biggest problem which the coal industry must face is that of constructive leadership. No industry can rise above the standards set by its leaders. We are in a highly competitive age, and the 'survival of the fittest' is the rule.

"When a cave man desired a trinket possessed by his brother cave man, he hid behind a tree with his club in his hand and gently tapped him on the head as he passed by. The transfer was made without argument. Our industry has not entirely passed out of the cave-man stage.

"We need a Judge Gary, a man who is a great leader, who has direct control of a large tonnage, and who believes that he can best promote the interests of his own company by promoting the interests of the industry as a whole. The anthracite people seem to be making progress. The railroads and the steel industry have found their way out of a similar situation. A great consolidation, headed by a great leader, would solve the problem and put the coal industry in its rightful place in the world of business. Until such a leader is found and adequate power is placed in his hands there is no hope for the early rehabilitation and prosperity in the soft-coal industry."

John Laing

Research, Modification of Sherman Law And Wage Stability Needed

RESEARCH to develop new markets and new uses for coal, greater co-operation between the industry and the government with the end in view of permitting a reasonable modification of the anti-trust laws and an end to the continual drive on wages in the mining fields are advanced by John Laing, president, Wyatt Coal Sales Co., as major problems which must be faced by the coal industry during the present year. Outlining these problems, Mr. Laing says:

"(1) The problem of searching for, developing and proving what further uses can be made of coal in order to create new markets, by testing coal for all purposes, particularly byproducts, dyes, etc., of all kinds and character. I think quite an increase in market can be obtained if these methods are properly developed, for we seem to be much behind Europe in this particular, and much as we need the business, I think we should allow nothing to prevent us from developing these facts in the most scientific manner.

"(2) We should endeavor to find the best method to accomplish such research work and develop it and should cooperate to this end, and each state and district should pay its pro rata share in this research work.

"(3) Co-operation must be had between the national government and the coal interests of the different states. Proper discussion and Congressional action should be had so that the coal interests of the different states and districts may be permitted to get together and agree upon prices for their products which will allow them reasonable profit and thereby allow the operators to carry out what they most desire; namely, the mining and producing of coal skilfully prepared and delivered to the consumer in the most scientific and satisfactory manner.

"If this permission is not granted the coal interests one of the greatest monopolies that the world has ever known will then be forced upon the people of the nation, and those least able to combat it will be the sufferers. If Congress, whose duty it is to investigate and legislate in respect to these matters, neglects them much longer, it will be too late. If this permission is not given, it means that capital will be forced, as a matter of self-preservation, to combine and consolidate the bituminous coal interests of the nation, and this would eliminate all competition from that time forward. Look at this situation as we may, we find it to be a condition and not a theory, and it is to be hoped that our representatives will promptly give this matter the thought it so justly deserves.

"And last, but not least, we regret exceedingly to note that in different parts of the nation operators are endeavoring to reduce wages of the miners and mine laborers. This, we believe, is one of the greatest mistakes that can possibly be made; for at the present time the miners would be happy and contented at present wages when given reasonable employment. But if wages are reduced it will create dissatisfaction among mine employees of all kinds and character and will spell disaster to the business as a whole. A dissatisfied employee is a menace at all times to the welfare of any organization.

"So it is the judgment of the writer that during that during 1928 no wages should be reduced in any of the states and operators should work together in an endeavor to stabilize wages as they are, so that we may have peace and contentment. No good can be accomplished by reducing wages, as doing so would not eliminate competition and the consumer would be only a temporary beneficiary; ultimately both consumers and operators would suffer because of the dissatisfaction which reduction of wages would create among miners and employees, and by strikes which would follow."

Modern Merchandising Looms As Biggest Problem

MARKETING is the biggest problem confronting the bituminous industry at the present time, in the opinion of W. C. Shank, president, Carbon Coal Co. "Statistical data disclose the fact that there exists a substantial surplus tonnage capacity exceeding all reasonable normal consumption demand. This situation was demonstrated in a very practical manner in 1927 between April 1 and Oct. 1, during which period most of the union bituminous mines were closed and all demands for fuel were met without any appreciable advance in average prices throughout the period.

"The economic law of supply and demand will eventually adjust production to proper proportion with consumption, but this is a slow involuntary process, leaving heavy loss in the wake of its operation. Owners of bituminous coal mines can save great sums for themselves by taking the situation in hand in a voluntary manner with unselfish purpose, and accomplish the same result just as effectively and in considerably shorter time than by permitting the situation to drag along over the involuntary route. Wherever a small surplus of any product offered for sale is found, price reactions are immediately reflected, and, in the same manner, wherever even a slight shortage of product is manifest, price advances immediately obtain.

"In my opinion the problem of overcapacity in the coal industry can be solved only by the owners of coal mines resolving not to accept orders for their

product which do not provide a profit. High-cost mines cannot compete with low-cost mines under existing conditions and, at least until the situation confronting the entire industry is clarified, high-cost mines will lose less money when closed down than when permitted to continue operating at a loss. I think a trend toward concentration and centralization of selling effort would contribute greatly to the solution of the problem confronting the bituminous coal industry of the United States at this time."

Overproduction Troubles Aftermath of War

OVERPRODUCTION is the biggest problem facing the industry in 1928 and the underlying cause of overproduction, according to W. M. Wiley, vice-president, Boone County Coal Corporation, was the speeding up process demanded by the World War. "The production was increased to 'win the war with coal,' which was the slogan common in the coal-mining industry and which came from our government. When the consumption incident to the war suddenly ceased, the production which had been encouraged was confronted with the problem as to how decreased production was to come about, and it appears that no one has yet found the solution of this problem of how to step down output to demand without wrecking the industry.

W. M. Wiley

"If the natural law of eliminating the unfit is to be solely depended upon for relief, the process is drastic and it is extremely uncomfortable to the whole trade while this process of elimination is in progress. It will take a long time to determine who are the unfit, and during this period the fit must suffer with the unfit."

Must We Wait, Like Israel, Forty Years Under an Oppressive Yoke?

THE CHILDREN of Israel submitted to the yoke of oppressive captivity in Egypt for forty years and scorned the bold spirits who brought them liberation. Must the coal industry, demands A. L. Allais, president, Columbus Mining Co., parallel this experience before leadership is recognized and relief comes? Must we wait, he asks, "another forty years until conditions become so unbearable that it will be impossible for any white man to live under it if this cut-throat competition continues?"

In seeking a remedy for an intolerable situation, Mr. Allais summarizes his viewpoint as follows:

"(1) Let there be a feeling of mutual understanding between miners and operators to the effect that they are really co-workers; that they need each other; that the interest of one is the protection of the other and let capital watch over the welfare of the employees and their families, and let the employee keep in mind at all times that the security of the capital needed to perpetuate the industry is a part of his task as much as the actual digging of coal.

"(2) Let those who have reached the position of power which money gives and are able to buy in large quantities at a price it is impossible to produce the article be led to realize that such a pernicious practice cannot continue for any length of time without entailing grief and serious embarrassment to themselves and to the community.

"(3) The public buying coal in small quantities and paying what they call an exorbitant price should be made to realize that for the coal which it is probably paying $9 or $10 delivered in the basement the coal operator is receiving but $1.75 to sometimes around $3 which is the peak of the market except on very rare occasions. The rest of the money goes to the railroad and to the retailer, who must employ labor to unload the coal in his yard and then reload said coal on trucks to haul it to the home and carry it into the basement. On an average out of $8 paid for coal delivered, the operator receives but one-fourth, out of which he must pay the miner, the supplies necessary to produce the coal and the upkeep of the property.

"While the small buyers of coal pay on an average of $1.75 to $3 f.o.b. mines, the large buyers pay from 50c. to $1, and in rare cases $1.25. As a ton of coal cannot be produced for these ridiculously low prices, and as there is one-third of the coal mined which must be sold at these very low prices, it looks very unfair to me that the industry is so helpless in the matter, and that consequently the operator must look to the consumer of coal who buys in small lots to pay enough for his fuel to overcome the loss which is caused by selling to the large buyers a third of his output below cost.

"Now, then, what is the solution? What I have stated above is briefly the situation as it exists.

"(1) Unless the Sherman law is modified the coal operators cannot get together and do what apparently all other lines of industry are permitted to do. Every time the coal man tries to face the problem as it actually is and tries to put himself on a basis where other industries have succeeded in placing themselves, he is immediately reminded of the Sherman law. Yet the coal man when he goes to buy steel rails finds that the price is fixed; the freight rate also is fixed; the electric power at the mines also is fixed, he must pay so much per kilowatt; when he goes to the powder manufacturer he finds that a keg of powder is so much, whether he buys from this concern or from another concern; when he goes to the meat packers and tries to buy for his miners, the price is so much per pound whether he buys from this company or that. The same is true of cement.

"Of course, I realize the Herculean task of reducing the coal industry to as few units as are found in the steel, meat packing, powder, cement and other industries. So it occurs to me, if we are going to achieve anything of a permanent and beneficial nature this coming year, it will be necessary for the coal operator now going single-handed to become a part of his fellow operators and conduct his business very much on the basis other industries are conducting their business today. In other words, consolidation is going to become absolutely necessary if the waste in the industry is to be stopped.

"And to make consolidation possible each operator must face the fact that his property can become a part of the whole only on a just and fair appraisal by an impartial tribunal. The operator also must realize that the money he now has invested single handed must remain a part of the whole, for no financier will ever look favorably upon the consolidation of interests if those who are engaged and have their money invested in the industry expect to receive cash for their property, and a part of the biggest problem in the coal industry will be in dealing with the selfishness of each individual who naturally feels that he should be the dominant factor in such consolidation. If the coal operators can be made to look upon the cause itself instead of personal and selfish interest, then we shall have accomplished something that is worth while for the protection of the industry and for the good of the nation as a whole.

"Having succeeded in grouping individual properties, the government will have to assume its share of the responsibility to keep the industry on a healthy basis by giving full power to the Interstate Commerce Commission or a similar agency to decide when and where new mines shall be opened."

NOTES

From Across the Sea

FORTUNATE indeed are the owners of coal lands who have well-consolidated and dry strata from the surface to the seams they propose to extract. Frequently in the United States the operator has favorable conditions for shaft sinking, whereas in Europe many of the shafts have to be sunk through measures that are loose and permeable. In some instances quicksands extend to great depth.

Where the flowing sand is quite shallow the shaft may be sunk by steel-piling or by caisson methods, but where the quicksands are deep, congelation of the water by refrigeration methods is the only solution, and this applies particularly to the Campine coal field of Belgium. Where, however, the measures have some degree of stability, yet where, nevertheless, large volumes of water are encountered, cementation has proved in Europe to be the quickest, cheapest and most satisfactory method of protecting the shaft against water and caving.

A patented system known as the François Cementation Method has been quite generally adopted in heavily watered ground. It consists of filling the crevices with thin cement grout under pressures as high as 3,000 lb. per square inch, such grouting being preceded by the injection of two chemicals, silicate of soda and sulphate of alumina, either separately or combined.

These chemicals are highly soluble in water and, consequently, can be pumped into the most tenuous of fissures. When they come into contact, a double reaction sets in, forming a precipitate of a colloidal nature which coats the surfaces of the fissures and which by its lubricating qualities makes it possible to inject cement grout to a greater depth than could otherwise be attained. Moreover, the pressure at which succeeding cement grout has to be injected is considerably lowered, an important feature in sand-filled or fine fissures. The efficacy of the treatment, furthermore, is greatly enhanced.

This grout, being under high pressure, the excess of water which the precipitate and grout contains is forced out by a filtration effect, causing the material to harden rapidly. The silicate of alumina and the cement, on hardening, completely close the fissures and shut off the water in the zone through which the shaft is to be sunk.

The cementation treatment is carried out in lengths of 60 to 120 ft. from the bottom of the shaft, a portion of cemented rock being left in the shaft bottom from the previous treatment to serve as a watertight plug for the succeeding treatment.

The alternate stages of cementation, sinking and lining are repeated until dry ground is reached, when, of course, the first operation is no longer necessary. All boring is done by means of special percussive hammer drills working on tubular and jointed boring rods, and the time required for boring and injecting is approximately 40 per cent of the total time for completing the sinking in the wet ground.

Sometimes the ground has been cemented by an external ring of boreholes around the shaft from the surface, but much more satisfactory results are attained by working in stages from the interior of the shaft and below permanent water level. In consequence the former method has been almost entirely superseded.

Such an example of stage cementation is provided by the Ollerton mine of the Butterly Co. in Nottinghamshire, England, where two shafts each 18 ft. in diameter were sunk recently through Triassic and Permian sandstones and through Permian limestone

No Crevice Too Fine to Fill

to reach the dry coal measures lying unconformably below at a depth of 966 ft. These sandstones overlie England's most valuable coal field, and the cementation, which is rendered difficult by the enormous quantities of water in the pores and sand-filled fissures of the rock, has been studied carefully and reduced to a standardized system to insure both results and speed.

AT OLLERTON, three groups of boreholes were used in each stage of cementation. The first group, drilled on a radius 1 ft. less than that of the excavation, consisted of eight boreholes which were sunk by 20-ft. stages to 120 ft. They were treated at each stage with a light dose of chemicals followed by cement, as their object was to fill the larger fissures.

Interspaced between these boreholes, and while the first group was under treatment, a second group consisting of 16 holes was prepared, and as soon as these were ready they were drilled in stages of 17 ft. to 119 ft., each stage of boring being followed by a heavy chemical injection succeeded by large quantities of cement grout, the object of these holes being to fill the subsidiary fissures and the larger pores.

Lastly a third group of holes, again 16 in number, was drilled in eight stages of 12 ft. and injected in such a way that any remaining fissures missed by the second group of holes were filled and the pores sealed.

The pressures of injection were limited to 1,500 lb. per square inch; otherwise the excessive pressure would have burst the soft sandstone and increased unnecessarily the consumption of materials.

The method used for securing standpipes in the rock at the shaft bottom was to drill holes with a $3\frac{1}{4}$-in. bit to a depth of 14 or 15 ft. Into this a 2-in. pipe was inserted which projected about 6 in. from the top of the hole. When this had been calked with special collapsible lead rings and lead wool, thick cement was forced into the pipe, whence it traveled down to the bottom of the hole and up between the pipe and the rock, thus filling the annular space and securing the pipe.

This calking was tested by boring 6 in. into the rock and injecting a thin solution of cement at the pressure which was ultimately to be used. The ground was bored for treatment through the 2-in. pipes by means of $1\frac{7}{8}$-in. crossbits.

In this way water has been excluded from the shafts even though they have been sunk through permeable measures which contain so much water that they, only one mile away, furnish to a water-works six million gallons of water in 24 hours with such ease that the water table at this pumping station, despite the heavy pumping draft, is lowered only 4 to 5 ft. in a severe summer drought.

The François method is receiving widespread application in Europe, there being at the present time nine or ten places at which it is being applied to coal mines. In the United States so far nothing has been attempted of a precisely similar character, but the Dravo Contracting Co., Pittsburgh, Pa., with the assistance of John S. Crawhall, of Great Britain, is preparing to close by this process a number of heavy feeders in the Shannon iron ore mine of the Gulf States Steel Co., near Birmingham, Ala.

The mine has encountered a fault at a point 2,300 ft. below the surface and from the advance boreholes have come water, mud and fault breccia. During the last two or three years attempts have been made to grout this fault, but as the water is under a pressure of 940 lb. per square inch a highly developed plant and skill are needed to deal with the situation. The Dravo Contracting Co. has contracted to construct two 11-ft. circular lined headings through the fault zone, and thence to the ore bed by means of slopes each about 600 ft. long.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Coal Miners' Pocketbook, 12th Ed., 1273 pp.; McGraw-Hill Book Co.

KEEPING pace with progress in the coal industry, "The Coal Miners' Pocketbook" makes its twelfth appearance in the technical field. This last edition is by no means a mere reprinting. In many parts it has been entirely rewritten, some less relevant material has been eliminated but much more has been added, so that the reader will find it fully representative of present-day practice. E. N. Zern was selected as the editor, a choice well made, for Mr. Zern combines a knowledge of both theory and practice. It covers well the field of mining engineering and mine operation.

The electrical section has been rewritten by Prof. Earl B. Stavely, of State College, Pa., and additions and revisions on concrete, boiler, steam and internal-combustion engines have been made by Prof. J. B. Grumbein, of Morgantown, W. Va. Additional information on anthracite mining methods has been provided by Irvin Schick, of Kingston, Pa. The book is suitable not only for the graduate and practising engineer but for those also whose acquaintance with mining engineering is less intimate.

"Flame-Proof Electrical Apparatus for Use in Coal Mines, Third Report—Ring-Relief Protection," by H. Rainford and R. V. Wheeler; Safety in Mines Research Board, British Mines Department.

To make the inclosing cases of mine electrical equipment so light as to prevent absolutely the intake of gas by breathing if operated or left in a gassy atmosphere, is generally considered impractical. For that reason the case should either be strong enough to withstand the pressure of an internal gas explosion or should be fitted with a device which will relieve the pressure without allowing flame to pass through.

The bulletin by Mr. Rainford and Dr. Wheeler describes experiments with two sizes of inclosing cases equipped with ring-relief.

"The general conclusion to be drawn from the experiments described in this report is that the ring-relief device provides satisfactory means of releasing the pressure from a firedamp explosion within the casing of mining electrical apparatus and at the same time preventing the passage of flame. The open area provided by the device affords ample release of pressure when the width of the gap between consecutive rings is no more than 0.02 in., whilst the passage of the flame does not occur when the gaps are 0.04 in. wide. The width of the rings should be 1½ in. but need not be more.

"To be completely effective as regards the release of pressure from a flame-proof enclosure, the total area provided by the ring-relief device should not be less than 1.3 sq.in. per cubic foot of free space within the enclosure."

* * *

Fifth Annual Report, British Safety in Mines Research Board.

Convinced that picks of mining machines can ignite gas, the Safety in Mines Research Board has been investigating this property. In its Fifth Annual Report it says: "The difficult problem of the ignition of firedamp by sparks from picks or from rocks striking on rock requires but little more experimental study. It has been found possible to cause the ignition of firedamp by rock (sandstone) rubbing against rock and by continued friction of steel picks against sandstone; not, however, by sparks then produced, but by reason of the rubbing surfaces becoming sufficiently heated. It will be understood that much power, applied continuously at the same spot, is required to heat rock surfaces in this manner. We have not succeeded in obtaining ignition of firedamp by sparks from picks, and we doubt if they are capable of causing ignition."

A fact that should be borne in mind when considering the ignition of firedamp (or other gases) is that the source of heat used to cause ignition, whether it be a heated surface or a flame, must be exposed to the flammable mixture during an appreciable time to be effective. When the source of heat is a flame, the time required may be only a few milliseconds, but ignition will not be obtained if less time is allowed. When the source of ignition is a heated surface several seconds of exposure may be necessary. "This "lag on ignition" thus assumes particular importance in connection with all possible sources of ignition of firedamp underground.

The report also declares that "with several different coal dusts it has been found that for every one per cent of firedamp in the air about 5 per cent more incombustible dust is required to render the mixture incapable of propagating flame than when the air is gas-free."

COAL AGE

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JOHN M. CARMODY, *Editor*

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New lights play on methane ignition

DISQUIETING indeed to those in charge of mines is the report of George S. Rice on the Hillcrest explosion, as is also that on the British investigations into the ignition of methane. That gas fortunately is slow to ignite at low temperatures and not as ready as some to explode at any degree of heat, but it is remarkable how infallibly it will ignite at relatively low temperatures if given sufficient time.

It is stated that rocks rubbing on rocks or picks cutting rocks (and doubtless pyrite also) have been proved capable of igniting methane. The British investigators doubt, as the American experimenters are also said to do, whether mechanical sparks will set fire to methane, but sparks lighting on a body or the continued tearing of a hard body by a pick or other hard substance will raise the temperature sufficiently to explode methane. What wonder, seeing that even savages centuries ago learned that a twirling stick would ignite punk. Besides, many mining engineers will testify that they have seen methane flash in cutting either coal or the hard substances associated with it. This can be corrected doubtless by using water on the cutter bar of the machine.

Then, again the British declare that compressions will ignite methane. That is not extraordinary for an experiment showed long ago that easily ignitable *substances* could be thus set on fire. Furthermore, it has been shown that air turbulence creates an electrostatic condition causing small lightning flashes that may or may not ignite methane but quite conceivably may do so.

In fact, all the air of a well-ventilated mine is doubtless charged with static electricity by its rubbing on the ribs, floor and roof and on itself. This is especially true when the air is dry as in the winter. As, however, flashes will occur only between atmospheres and environing substances of different electric potential, and as normally the charge of static electricity in any one part of the mine will be uniform, this is not an alarming consideration.

On the other hand, the escape of steam or air may possibly create a local electrostatic condition that might be dangerous. Also, the heating of bearings or the striking of mechanical parts like the blades of a fan might create heat that will ignite methane. It has been proved that mines without electrical equipment or electric wires may and often do have stray currents that conceivably may create sparks long enough in duration to cause methane to explode. Lightning is another source of danger where rails connect with the surface.

Explosions have been known to occur in mines when no men were in them, as at Maltby Main in Wales, Bellevue in British Columbia, and Eleanora in Pennsylvania. Consequently, the only safety against explosions lies in adequate ventilation of gassy mines and in the use of rockdust, where the coal dust is explosive, to extinguish the ignition when it occurs. Other preventives of ignition are valuable and necessary, but safety is best attained by the elimination of methane.

Look sharply at power bills

COST reductions effected by more complete electrification must necessarily be accompanied by an increase in the proportion that electric power and equipment items bear to the total. It becomes important, therefore, that every item of equipment be made to produce the maximum. Alternating-current generators, transmission lines, substations and motors can work to maximum capacity only when the power factor of the circuit or machine is unity, or 100 per cent.

Synchronous motors of proper design can be made to operate at unity or at a leading power factor, thus correcting for induction motor loads, provided, however, that the load on the synchronous motor does not change or that the field rheostat is adjusted for each change in load. Unfortunately many of the synchronous motor generators used in mine substations are subject to frequent changes in load. Before substations were converted to full automatic operators were on duty in many cases to adjust the rheostats to follow the general changes in load. A satisfactory average power factor could be maintained, but it was out of the question to adjust the rheostat quickly enough to enable the set to carry the peak loads of which it was capable.

Elimination of attendants by use of full automatic control left most of the substations without rheostatic adjustment. As a result power factor began to "run wild." The capacity of the motor generator was reduced, power bills were increased by useless heating of the lines and motors, and in some instances d.c. power interruptions due to opening of overload breakers became more frequent. Low power factor is the unsuspected cause of many undesirable conditions that can be definitely identified only by the application of power-factor meters. If full correction cannot be secured from substation motor generators and more synchronous motors cannot be added to the load, then install static condensers.

Mr. Melton, electrical and mechanical engineer of the West Kentucky Coal Co., whose achievement is described elsewhere in this issue of *Coal Age,* has made a genuine contribution to electrical science. His automatic method of varying the synchronous field current in proportion to the load, and with sufficient speed to enable the motor to carry the highest possible peaks without stopping, will commend itself to users of power everywhere. Developed within the coal industry, it will commend itself to every responsible coal-mine executive who is concerned to reduce his power costs.

Wave action following coal extraction

WHEN a long strip of plate is laid over a wide opening, it bends down in between the two supports, rests on their inner edges, and lifts up over them. Then if it is long enough the two ends of the plate must bend down onto the support so to form an arch fold and if still longer it must bend up and down again, so as to form a series of folds, troughs being followed by arches in continuous order but in decreasing size till the undulations fade to zero.

Something like this occurs or tends to occur with the roof above the coal measures when coal is extracted. The roof sags into the opening making its slope downward at the pillars toward the center of the excavation. This slope cannot be suddenly ended at the pillar edge. It continues upward over the pillar gradually declining in steepness till it becomes level, then again increasing in inclination till nearing the support it again flattens off. Thus undulations tend to be and are formed, but these are rendered less obvious by the tendency of the coal face to crush and let down the roof at the edge of the opening and by the lack of elasticity in the roof itself.

It is interesting to record what Wallace Thorneycraft, a British operating man, has remarked: "In taking out the coal below my house I watched the movements very carefully. It is now twenty years since I (first) found that a wave of subsidence traveling forward along with a longwall face caused a slight rise in front of the face which was followed by subsidence, and whenever I have watched surface movements since that date I have found the rise in front."

What is meant by "in front" probably means "over the unextracted coal," and so Professor Henry Briggs who makes the quotation interprets it. Unfortunately the language of subsidence is a little muddled. Evidently Mr. Thorneycraft found that the surface was higher over the unextracted coal by reason of the extraction of the coal in the vicinity.

Three other examples of uplifts due to mineral extraction are given in Young and Stoek's "Subsidence Resulting from Mining." This is said to have amounted in one case to 4 in. and in another case to about a foot. In many or most cases the coal will sink or crush enough to permit the flexure to take place without any uplift. Nevertheless the wave is there. Every flexure till it produces fracture must form waves. Yet how often that fact is overlooked.

Equipment manufacturers' contribution to industry

ALTOGETHER too frequently men work alone toward the solution of problems that have already been solved by others. Original thinking is stimulating and should be encouraged, but so far as practical problems are concerned advantage should be taken of previous discovery and recorded knowledge. In a field of production in which conditions vary from mine to mine, as they do in coal, operating officials are tempted to work out their own salvation. At least there is a tendency on the part of many to seek advice only when tasks give evidence of being unusually stubborn. This self-reliance is readily understood. The very nature of their responsibility demands it in large measure.

The rapid introduction of mechanical methods happly is changing this. It is gradually dawning on operating men that manufacturers of equipment have ceased to be mere designers and distributors of machinery but have become in fact a part of the industry they serve. A major portion of their equipment for service lies in an intelligent engineering staff trained to work with mining men on the job where each can supplement the special knowledge of the other. In addition to co-operation on the job, mining men and manufacturers reach common ground once a year when they meet in Cincinnati at the National Exposition of Coal Mine Equipment held there under the auspices of the manufacturers division of the American Mining Congress, May 7-11.

Music Hall, in which the exposition and meetings will be held, has been completely remodeled since last year. Facilities for display have been modernized and the acoustics in the meeting room have been so improved as to overcome previous difficulty in hearing speakers. The program committee, of which Dr. L. E. Young is chairman, is at work. Indications point toward a convention of genuine value. Attendance on the part of practical operating executives is not an expense; it is an investment in greater knowledge of equipment and in better mining methods.

Returns are in direct proportion to the ability of men in attendance to draw from each other, from formal papers and from manufacturers' representatives the latest and best practices applicable to their own special needs.

The BOSSES *Talk it Over*

Bringing Down the Coal

"THERE'S something else I want to take up with you before I go, Jim," remarked the Old Gent to the Super toward the close of an all-afternoon conference.

"I'm still listening," quietly replied Jim.

"Well, it's about our coal again—too much slack, which is not so good when you almost have to give it away. We must get more lump. An increase of about 10 per cent in 1¼-in., or better, would end my immediate worries. What can be done?"

"Mac and I have talked over that very thing many times," said Jim. "We knew you would pop the question sooner or later and sort of prepared ourselves. We have a plan we know will work after everybody gets used to it."

"Shoot!" impatiently demanded the Old Gent.

"All right, but let's start at the beginning," began Jim. "Our trouble lies in our slipshod ways of bringing down the coal—not only in the shooting, mind you, but in the whole works: cutting, bug-dusting, drilling, charging; yes, and even firing. It's a case of every man for himself, doing his particular job according to his own notions. But our biggest trouble, of course, is the shooting."

"But," interrupted the Old Gent, "haven't you been teaching the men the right methods in shooting?"

"We have; we tried that stunt for a long time and got only slight improvement. It can't be done that way. Too many men do the job and most of them never will learn how. We worked hard on that idea. Ramsey, in charge of the dip section, knows shooting if any man does. He's a bug on the teaching idea, and crows about the good shooting he gets from every loader in his section."

"Fine!" said the Old Gent, his face lighting up.

But the Super kept on talking: "We made individual screen tests of the output from representative places in Ramsey's section over a period of days and found good and bad shooting—mostly bad. You can't tell results of shooting by looking at the coal."

"Would shotfirers help?" asked the Old Gent.

"We're beginning to get somewhere now," replied Jim. "Use of shotfirers is a step in the right direction, but it's only one step. Remember, I didn't say our trouble was only in the shooting; it's in the bringing down of the coal. It starts with the cutting. For best results it must be a specialized operation and we'll have to think of it as one job. You can see that if a cut is not squared up and cleaned out, the best shooting in the world won't give results. Mac and I figured on using trained crews in a continuous cycle of operation, with drillers following close behind the cutters, and the shotfirers bringing up the rear, all working and being guided with one end in view—lump coal. The increased safety would be a donation."

"Donation?" exploded the Old Gent. "What do you mean? A coal mine is no Christmas tree. What will be the increased cost of this scheme of yours?"

"I'll let you answer that, Dad," responded Jim, "by answering this question: What will be the increased realization? We can't do worse than break even at the start and later we'll show results. The old way of doing the job flopped, didn't it? We're bound to try this new scheme some time; the sooner the better."

"You win. Try 'er out!"

When Jim told Mac about the interview, the foreman yelled: "Hot ziggety!" His only comment was: "My guess is the plan is going over big."

Where this proposed system is being used, how successful is it?
Will it increase the output per loader?
How should the wage and tonnage rates be adjusted to meet this change in operation?

All mining men are urged to discuss these questions.
Letters accepted will be paid for.

Electrical Men Speak Up

Upkeep Under Electrical Head Means Efficient Equipment

AT LAST Jim is coming to a system that will cut his maintenance cost to the limit. I have found that by putting responsibility for the upkeep of all electrical and mechanical equipment up to the electrical head of the mine he will strive to get 100 per cent efficiency by keeping all appliances in the best possible condition. In 18 years as a mine electrician I have seen this system work successfully in mines of all sizes from 300 tons to 5,000 tons output.

If a mine has enough equipment to require an electrician it should have one capable of taking charge of it without interference by the foreman—some of the greatest difficulties I have encountered in mine repair work were due to this. As a rule the mine foreman's knowledge of machinery is limited, but because he is boss he wants to tell everyone on the payroll how to do his work.

As a mine foreman I have got the best results by making it understood that repair work was the electrical force's job and not mine. If the foreman attends to all the other work that the operator and the mining law demand from him his time will be so occupied that he will not have time to look after the electrical end other than to see that legal and safety precautions are not being violated. And with a capable mine electrician there will be no violations. From my experience, totaling 22 years, I am confident that if Jim puts this system into effect for six months he will not change back to the old way under any circumstances.

MAL SEESE
Cairnbrook, Pa.

Electrician Who Can't Save Expense in His Job Is Misfit

WHAT W. D. says to Jim sounds very like home, for it is something that is worrying many operating heads, especially those having charge of underground operations. The Jims, Macs and Shorties have got to get some action. Not many foremen will allow the electrical or mechanical department to have any say inside the mine. This is an old idea that will quickly pass, and the man who cannot keep abreast with progress will get run over.

Very few mine foremen are capable of being intrusted with the maintenance of electrical machines, attending to the duties of mine foreman and doing a good job. I always give the electrician full charge of all electrical machinery inside and out of the mine. The wiring and bonding also are under his supervision and he is responsible to me for the performance of this machinery. When he thinks a certain machine should be cut out of the day's run we cut it out, or if I decide that it is needed in the run badly enough to take the risk of keeping it in service I assume all responsibility for what may happen. As I do not try to "pass the buck" my electrician feels that he will not be imposed upon and therefore takes a real interest in his work.

I have worked in the same sort of mines that W. D. mentions, and they are always in shape, with few interruptions in output. I can't see, however, what difference it makes whether the electrician or the master mechanic is given charge of the work in his department in a large or small mine. If there is only one man on maintenance work he should be capable of handling the work; if he isn't, then the management is falling down in not getting a qualified man.

If Shorty can't save the company money by having full charge of his own work he is a very poor electrician; but from what I have read of these two fellows Shorty clicks more often than Mac—that will be found in most cases where the foreman has charge of all maintenance work. The latter is not fitted for this work, yet he wants to have the final say and quite often he does things with the machinery that Shorty knows are wrong. Shorty is handcuffed, however, and when the machine gives way under the strain Shorty gets hell on all sides. The superintendent or general mine foreman doesn't get the real "dope" unless he digs to the bottom for it.

Topic for March

Shorty is all worked up about Melton's discovery of

Power Factor Control

as related by Mr. Edwards in this issue of "Coal Age."

Next month Shorty will tell Jim and Mac how to apply this plan to their mine and save money on power.

It would be grimly amusing to read an accurate account of the things that machines around the mines are expected to do and stand up under—the surprising thing is that they do stand the "gaff" much longer than the manufacturers ever thought they could. The trouble is that many companies buy a new locomotive, mining machine or pump, send it to the mine and never see it again or think of it any more until it goes up in smoke.

There is a loud wail from the mine, then, but any real mining man knows just about what has happened. A new locomotive arrives at the mine. Jim looks her over and thinks how nice his haulage will go now; Mac and Shorty give her the "once-over" too. After taking in all the good features Mac will say: "All right, Shorty; get those fuses out of there." So out come the fuse blocks and in go two pieces of 0000 wire; from then on Shorty's work is cut out for him.

A new pump is bought, but as nothing was said about the type of motor the manufacturer shipped a compound interpole motor. All other motors in this mine being "series" motors, the pump is installed back in the works. Mac doesn't want to pay an attendant; therefore every time the power goes off the pump stops, so the starting-box lever is tied in the "off" position, in order that it will start under full voltage. Shorty knows there is an automatic breaker built for that job, but he is only a hammer and chisel man and his boss has most respect for the man who can walk the farthest and carry the most, so Shorty sits tight.

A new machine for 220 volts is bought, but in the section where it is to be put to work there is only 90 to 110 volts. Shorty can see in his sleep about how long it will take to murder all the nice new insulation in that machine when Mike and Joe (Hungarians) let the bits get dull and start to outdo a horseback or niggerhead.

Such occurrences take place every day, and the sad part of it is that the remedy is the simplest thing in the world. It is only necessary to glance in a handbook and find tables that will set one right. The average foreman, however, won't go to that trouble.

If Mac and Shorty would bury the hatchet and handcuff themselves together Jim and W. D. would be walking on air. Shorty could get to sleep sometimes at night, Mac would be getting his coveted tonnage and the stockholders might get a little coin back out of this white elephant.

OSTIL BULLOCK,
General Foreman, Holt Mine
Central City, Ky. *Gibraltar Coal Co.*

Sees "Lindy's" Success Due Largely to Care of Equipment

THE superintendent in charge of any electrically equipped mine of appreciable size will make no mistake in placing the responsibility of equipment maintenance promarily on the shoulders of the chief electrician and master mechanic, because they are the ones who know whether or not the operatives of such equipment are handling the machinery with the proper care as to overloads and properly lubricating them at required intervals.

Every mine electrician should periodically check the condition and ampere load of every electrically driven unit under his care in order to eliminate breakdowns. A meter test should be made on each locomotive while under load to ascertain the size trips the locomotive should haul. The same test applies to all other electric apparatus.

The mechanic likewise should keep a close watch over the different units of equipment under his control. An efficient mechanic once eliminated a source of trouble and expense by rebuilding a cutting chain on a mining machine which reduced the strain on every other movable part connected with the machine. This not only made the machine cut more coal with less power and ease but it reduced maintenance to a minimum.

I know of no equipment that is more abused and neglected than machinery located in and around small mines, and this despite the fact that underground equipment is operated in an atmosphere highly polluted with sulphurs, which causes the armatures, fields and the general wiring of electric motors to draw dampness. This breaks down the insulation, causing burnouts, grounds, etc. The mechanical end of such equipment also freely corrodes under such conditions, which alone is evidence that the machinery underground should be carefully looked after by an experienced man.

The mine foreman or his assistant, in making daily rounds throughout the mines, should inspect, in a preliminary way, the

machinery that is responsible for output, reporting any defects to the chief electrician or master mechanic. By relieving the mine foreman of equipment breakdowns will give him more time to concentrate on mining and safety problems, thereby insuring higher efficiency in the workmen and eliminating accidents.

The electrician and mechanic responsible for equipment maintenance should work out a system that will enable them to know the exact condition of each unit of equipment at all times. This may be done by personal interview with the workmen, daily reports or any other plan devised to suit the particular mine, but I am of the opinion that satisfactory, economical and efficient operation of mine machinery would be better assured by daily inspections than by any other system requiring the tabulation of red-tape reports showing the condition of such equipment.

Reports are very good under certain conditions and to file for future reference, but the live-wire mechanic sees and does more in one minute than he could write in ten.

Colonel Lindbergh has set a good goal for mine electricians and mechanics to shoot at. When this gentleman starts on a flight he gets there. He has covered uncharted courses and achieved his objective not only through his skill as a pilot but because of his thoroughness and his ability as a mechanic. He takes zealous care of his motor and always sees to it that it is in perfect working order before he hops off. The methods of "Lindy" can well be emulated by all mechanics who are engaged in the production of coal.

C. T. GRIMM.
Adrian, W. Va.

Simple Records Best Except In Case of Recurrent Trouble

LOSSES from breakdowns must be met by systematic periodical inspection and the keeping of simple records of the history of the equipment. Mechanical and electrical appliances should be inspected by an engineer experienced in those lines, and the same holds true of mining equipment.

Each piece of equipment should receive careful scrutiny, say, every three months or, if subject to severe conditions, every six weeks. This work should be done during slack times, being split up so that one week will call for insulation resistance, the next week for bearings, followed by switch gear, winding ropes, etc. Any defects found should be reported to whoever is responsible for maintenance.

There seems to be no good reason for making out numerous reports; the inspector should simply report to the superintendent anything that requires his attention or state that everything is O. K. The inspector should keep a book, a page being allotted to each piece of equipment for notation of defects found, repairs made and condition of apparatus. At the end of the year the inspector should make out a report on the condition of the equipment, with remarks and recommendations, which should be sent to the management.

For an inspection system to be a success it is necessary that those doing the work be experienced men, and, being so, they should be given as free a hand as possible. Elaborate records should be avoided; reports should be based principally on recurrent trouble, with recommendations, rather than on minor defects, which should go no further than the inspector's own book. The one responsible for inspection could be one of the maintenance staff, reporting trouble he thinks remediable to the maintenance men, but anything more serious, especially if it affects other personnel in the mine, should be reported to the superintendent.

Brentford, England. W. E. WARNER.

Pressed to Maintain Output, Mine Foreman Takes a Chance

IT IS MY BELIEF that as a rule all chief electricians and master mechanics should report to the superintendent instead of to the mine foreman. My experience has shown that much may be accomplished in this way toward eliminating costly delays caused by the failure of locomotives or other machinery during the day's run.

The mine foreman usually is hard pushed to maintain a certain daily output expected by the management, consequently he is constantly striving to get as many cars as possible loaded and hauled to the tipple during the shift. Therefore if the mine electrician should suggest that a certain locomotive be put in the shop for an hour for needed repairs it is ten to one that the foreman, rather than stop the locomotive, will gamble on the chance of its running, until the day's work is finished. If, however, the electrician had authority from the superintendent to use his best judgment in cases of this kind the necessary repairs could be made in time to save considerable money for repair parts as well as avert a more expensive delay.

The most important feature in connection with making the mine electrician or mechanic responsible for the upkeep of the machinery is for the superintendent to maintain perfect co-operation at all times between the mine foreman and the repair department and between the operatives of machinery and the repairmen. If this be effected and a system of inspection and reports worked out suitable to the size of the mine and the conditions existing therein it will not be long before there is a marked decrease in the delays incident to the failure of machinery as well as a reduction in the expense for purchasing repair parts.

GEORGE W. ROSE.
Virginia Iron, Coal & Coke Co.
St. Charles, Va.

Careful Check-Up Necessary; Never Depend on Guesswork

ONLY by having an efficient organization and by co-operation between the different departments from the purchasing department down the line to the maintenance department can repair costs be kept at a minimum. The purchasing department, if the company has one, or if not, then the superintendent, should keep on hand at all times sufficient replacement parts to take care adequately of all breakdowns and necessary repairs.

This may seem like starting at the wrong end of the problem, but my experience shows that here is the place to begin cutting repair costs. For instance, if Shorty is retrucking a motor he may find that he needs a new axle brass. At the supply room he may find there is none on hand. Asking to look over the invoices, he finds none on order, although he personally ordered six a month ago. Inquiry of the supply man reveals that the superintendent canceled all orders near the end of the month to keep the cost down.

That this is not far-fetched is revealed by an experience I had several years ago at a mine where I hired out as electrician. I reported at the main office and was seated with the chief electrician. As he was looking over requisitions from several mines I noticed that he cut down the quantities of various articles ordered by the different electricians.

Date Dec. 10th 1927.

Machine Report

How many Machines operating.. 20 .....
How many out of operation .....
How long each Machine was out of operation
No.. 17 - 30 Min. .....
No. 10 - 45 Min. .....
No. 3 - 15 Min. .....
Repairs used to put in operation 17-1-625 G.E. lead. 10-Comp. rheostat. 3-2-42 G.E. side straps
General Condition of machine 17-Wiring will soon need replacing. 10-Now in good shape. 3-Cutting chain badly worn
Remarks No. 17- Delay caused by broken insulation. No. 10-Breakdown of mica; can be repaired. No. 3 struck rock
..... Shorty .....Machine Boss

One item was for twelve 800-amp. section switches ordered by an electrician at one of the mines. The requisition, passing through the usual channel, went to the superintendent, who cut the order to six. Thence it went to the general superintendent, who pared it to three. In the hands of the chief electrician, where I saw the order, it was shaved down to one switch.

I asked the chief if one switch was all that particular mine needed. He said: "Hell, no; it needs twice as many as were ordered." When I asked him why the cut, his only explanation was that he *had* to cut. I bade him goodby and hunted another job.

But to get back to Shorty: He has no new brasses, it's darned near quitting time and that motor has to run tomorrow. Well, the old brass will last a week, and by that time the superintendent can get some new ones. So in goes the old, thin, worn-out brass.

After the motor is in operation again either the superintendent forgets to order or things happen too fast for Shorty, and the old brass is neglected. Result: the brass cuts through, letting the boxing down on the axle. In a couple of days a ruined axle and boxing. Who was primarily to blame? The superintendent or the purchasing department, as the case may be.

There are efficient purchasing departments, of course, but many of them have been the source of endless profanity. The average company has a supply clerk who doesn't know a cutter head from a chain guide or a setscrew from an armature. I remember one who had quit a trapping job for the supply-room post. He noticed one of the electricians take about 25 bonds each morning for a few days. He became afraid, I suppose, that this procedure would "break" the company, so he decided to reason with the electrician.

"Say, Buddy," said the supply clerk, "it appears to me that you are using a powerful lot of them copper things, and they cost like the deuce. You had better see if you can't get along with less of them."

At another place where I was employed the purchasing department obtained a supply of gathering-reel motor cable at a bargain price. It ought to have been marked: "Won't last long at this price," because it didn't. But the maintenance department got the devil because the cable went to the bad so fast.

If the clerk is just a clerk, and not a master mechanic, all he ought to be allowed to do with requisitions is to file them ready

for the chief of the department, and if the chief or the company is going to hold the electrician responsible for breakdowns and repair costs, then orders should be sent through as per requisition, regardless of what the clerk thinks the electrician may need.

Maintenance in 90 per cent of coal operations is done by rule of thumb—that is, not until a breakdown occurs does the repairman get busy. Nor is the fault always due to slipshod methods by the maintenance department. Usually this department is cut so fine that it has no chance for periodic inspection, and the consequence is that it is working night and day patching.

One practice which makes repair bills mount is loading down the cutting machines with more men than they can possibly cut for. This is in line with the machine man who, having a machine of the right type, sumps on the fast feed, with the inevitable accompaniment of heavy repair costs. Failure of the electrician to adjust the friction correctly on certain types of machines leads to the same result.

To get around and keep check on repairs our electricians have printed reports, one of which they fill out on each repair job. These reports go to the chief electrician, and from him to the superintendent in charge. If repair bills show an upward tendency there is an itemized account, day by day and month by month, which can be checked up, and the reason easily located. Herewith is shown one of the reports our machine electrician fills out. Motor repairmen fill out similar blanks headed "Motor Report."

When operating normally we use 20 coal-cutting machines; we own 21. When a machine needs repairs we take the one out of the shop to work and bring in the defective one. The latter is torn down and rebuilt, making it ready for work as good as new. When it is ready for use we place it in operation and bring in another, and so on *ad infinitum*. This gives each machine, when running full time, a thorough rejuvenation about once a year.

In the motor department we have fifteen cable-reel gathering locomotives, but we use only fourteen, and follow the same procedure as in the machine department. The same holds true for pumps.

As this company has 57 pumps of various sizes one man is kept busy repairing them, acting as inspector, mechanic and boss over the pump departments at the different mines. In three of the mines, which have water that will eat up wrought-iron fittings in 24 hours, we use lead-lined or acid-resisting bronze pumps, and it keeps one man on his toes keeping them in first-class shape.

Most of our motors are ball-bearing, so we use the Alemite system of greasing, and the date of lubrication is recorded. On lubricating the motors we make a general inspection and check with a gage the gap between the pole piece and armature. A record also is kept of the date an armature goes on duty, the man who installed it and the one who wound it.

The chief electrician over the several mines occasionally drops in unexpectedly—maybe when an operative is in bed—and, with a portable recording watthour meter and recording voltmeter, will give things the "once-over." The unpleasant sequel may be that someone will be called on the carpet to explain why a certain section is using so much more power than it was several months ago. By thus keeping everybody on his toes bad bonds, poor return, low voltage and consequent burn-outs are avoided.

Records are kept of each cable on machine and gathering motors as well as of cutter chains and drag chains. All our bosses fill out reports dealing with their various duties, and these data go to the boss higher up. Another check is made of mine against mine, so that if the supply cost in one operation is 30c. per ton and it is only 25c. in another, the general superintendent usually wants to know why.

A cost sheet is kept at each mine, which gives a complete check on every item entering into the cost of a ton of coal. Each fireboss or mine examiner, besides filling in his report in the inspection books, makes out the accompanying sheet for quick perusal by the mine boss. The mine boss does the same for the superintendent.

Our system is not only to check one mine against another but one department against the others and one report against another, thus keeping as complete a check as possible on every department. It seems to me that Jim, Mac and Tom would do well to follow suit and quit guessing.

THOMAS JAMES,
Mine Superintendent, No. 3 Mine,
Knox Consolidated Coal Co.
Vincennes, Ind.

Date Dec. 10th 1927.

Mine Boss Report

Seals Leaking 4-S-12ES
Pump Condition Good
New Seals Finished 192S-12WS. End
Ventilation Condition Good
Water Condition Good
Road Condition Fair-8WS Dirty
Bonds Condition Good except 10EN
Wire Condition Good
Trolley Condition Good
New Concrete Brattices No. 65 B.T. M.S.
Gas 506N-10EN
Pressure on Seals None
Machine Condition Good
Motors Condition Good
Tracks pulled, where R.S. 1 & 5-7S-8WS
Wire pulled, where — — —
Timber pulled, where — — —
New Entries 3 & 4S-14ES
New Rooms 17 & 18 1S-14ES
Entries Stopped, why None
Rooms Stopped, why None
Remarks General condition good. Starting to build new O.C. at 13ES

W.S. Miner Mine Boss

Date Dec. 10th 1927.

Fire Boss Report

Condition of Doors, 1-X cut 7N-12E broken hinge
Condition of Brattices Good
Condition of Seals 4S-12ES leaking →10
Fires None
Ventilation Good
More than one open breakthrough 1S-14ES
Places marked out because of gas 596N-10EN

Falls In No. 10 R-48-12WS.
Cave in 5N-10EN

Remarks Gas showing over falls Rl. 3, 4, 7, 9, 11, 5N, 10EN
W. Examiner Fire Boss

Safety Gives Returns

SPEAKING from experience I can say that safety unquestionably pays. One of the hardest things for a mine operator to do is to keep his men satisfied so that they will stay at one operation. We cannot promote the safety of the employees without creating a better feeling among them towards the employer for it is but human nature to have at heart the interest of those who are interested in us.

So when we increase the safety of the miners we raise their efficiency as well as that of the mine, as satisfied men will do more and better work, are less liable to lay off or strike, and will load cleaner and better coal. In fact we cannot have efficiency without safety.

When we make a mine safe we eliminate many of the delays that cut down production and increase cost, such as wrecks, falls on the entries and at the faces, short circuits on the power line due to falls and waste of power from conductors not properly insulated.

We can have neither safety nor efficiency in a mine that is badly ventilated or dusty, with dangerous roof, where loose rock is not either taken down or properly secured by timbering, where the track is bad and liable to cause delays and injuries from wrecks, or where the haulageways are dirty or gobbed up until it is impossible to pass around trips easily.

In other words improving the safety of the men increases the production of the mine, lowers the cost per ton and decreases the cost of compensation. As a result safety pays large dividends.

Mine owners frequently make the same mistake that many of us make in our homes. That is, they try to economize by putting off spending the money that is necessary for repairs to a mine that is in an inefficient and dangerous condition, one that can only be operated at a loss or when coal is selling for a high price.

In order to promote safety the manager should adopt a set of safety rules and instruct the superintendent to see that they are carried out. He should enforce them by the dismissal of anyone disobeying them.

In order to better enforce these rules the superintendent should employ at least one competent man to attend to safety in general. Furthermore in each section of the mine he should have a man who is paid something in addition to his regular wages to look after the safety of that particular section. He should have all these various safety committeemen report to him in writing any unsafe condition or practice. He can then instruct the mine foreman to have these unsafe conditions rectified. The safety rules should include provisions that: All inexperienced persons should work with, and under the supervision of, an experienced man for at least six months. All shots should be fired by competent shot firers. No person except the motorman and brakeman should be permitted to ride upon any trip except a man trip. No one should be permitted to get into or out of a man trip while it is in motion. No one should be allowed to get into or out of man trip on the same side as the electric wires. A bonus should be paid to each section boss each month if no employee under him has been injured.

A safety meeting should be held at least once a week. The manager, superintendent, mine foreman and all the assistant foremen should attend these safety meetings. The employees should be told that these are their meetings and that it is desired that they study and talk safety.

C. E. LIVELY,
Box 235, Vivian, W. Va.

WORD *from the* FIELD

Industries Use More Coal; Reserves Decline

Bituminous coal stocks held by industries in the United States decreased approximately 3,500,000 tons during December, according to a report by the National Association of Purchasing Agents. The total in storage, including hard and soft coal, in the United States and Canada on Jan. 1 was 51,689,000 tons. Consumption in December was 37,225,000 tons, which was an increase of 1,500,000 tons over the preceding month, due primarily to the extra day in the month.

Industrial stocks at the beginning of the year constituted an average supply sufficient for 43 days based on current rate of consumption, as compared with 39 days a year ago. Actually stocks in industry were 3,000,000 tons less than the year before and about 1,000,000 lower than two years ago. Consumption, however, being less than in those periods, accounted for an increase in days' supply of 10 per cent. With the exception of railroads and byproduct coke plants the stocks held by all consumers were lower than at the corresponding period a year ago.

DAYS' SUPPLY OF COAL ON HAND IN VARIOUS INDUSTRIES

Byproduct coke	39
Electric utilities and coal-gas plants	60
Railroads	41
Steel Mills	38
Other industries	41

COMPARATIVE ESTIMATE OF OUTPUT, CONSUMPTION AND STOCKS
(In Tons)

	Output	Industrial Consumption	On Hand in Industries
June	41,999,000	36,690,000	66,510,000
July	38,597,000	33,560,000	62,585,000
August	48,907,000	33,900,000	59,697,000
September	48.592,000	33,195,000	59,179,000
October	51,400,000	35,813,000	60,154,000
November	47,100,000	35,514,000	58,602,000
December	47,308,000	37,225,000	55,725,000
Jan. 1	.....	.....	51,689,000

Bituminous coal stocks held by railroads of the country on Jan. 1, 1928, showed a decrease of 455,098 tons from the reserves held on Dec. 15, according to reports made to the American Railway Association. Total stocks held by the carriers on Jan. 1 were 14,729,372 tons, as against 15,184,470 tons two weeks earlier. Roads reporting to the association had 2,673,798 tons on cars and 12,055,574 tons in storage on the ground at the beginning of the present year.

The quantity held on cars on Dec. 15 was 2,793,980 tons; ground storage piles totaled 12,390,490 tons. At the beginning of December the total reserves of the reporting roads were 15,463,334 tons. When union mines suspended operations last April these same carriers had reserves of 22,806,000 tons.

Labor Launches Drive On Injunctions

Plans by organized labor to carry the fight against injunctions to Congress and the country were launched in Washington Feb. 7, when about 125 labor leaders, including officers of the American Federation of Labor, representatives of the railroad brotherhoods, the United Mine Workers and officers of other unions held a meeting.

A motion by Matthew Woll, vice-president of the Federation, was adopted unanimously to go in a body before the Senate judiciary committee Feb. 8 and advocate the Shipstead bill, which opposes injunction proceedings except for the protection of tangible, transferable property. The executive council of the Federation also was instructed to arrange for mass meetings in all parts of the country to enlist labor forces in the movement to force action by Congress.

Hatfield-Campbell Creek Co. Merges Old Interests

Consolidation of the Hatfield-Reliance Coal Co. and the Campbell's Creek Coal Co., two large coal and river transportation interests operating in West Virginia and eastern Kentucky, was announced Feb. 2 in Cincinnati, Ohio, by Irwin Davis, new president of the merged companies. The new company will be known as the Hatfield-Campbell Creek Coal Co. and will have a capital of about $8,000,000.

Captain J. T. Hatfield is chairman of the board, with the following as vice-presidents: Robert P. Gilham, president of the Campbell's Creek company; J. T. Hatfield, Jr., and Julius Fleischmann. F. J. E. Bramlage, vice-president of the First National Bank of Covington, Ky., is secretary and W. W. Miller, treasurer.

To Hold Safety Banquet

The New England Fuel & Transportation Co. will hold its first annual safety banquet at 8 p.m., Feb. 18, in the Fairmont Hotel, Fairmont, W. Va.

Anthracite Engineers Hail Year of Progress

That Charles Dorrance, consulting engineer, Scranton, Pa., will succeed R. H. Buchanan, receiver, South Penn Collieries Co., as president of the Engineers' Society of Northeastern Pennsylvania was announced at the annual banquet of the association, which was held at Wilkes-Barre, Jan. 24. Mr. Buchanan reported that the net gain in membership in the past year had been 250, thus adding about 80 per cent to the former membership of 300. A permanent paid secretary was quite feasible, he said, provided a slight further gain in membership was obtained.

Among the speakers at the banquet were John B. Kennedy, associate editor, *Collier's Weekly*, who spoke on the value of an idealistic as opposed to a materialistic conception of life. L. A. Hawkins, executive engineer, research laboratory, General Electric Co., discussed the importance of inquiries into physical laws and into their application to industry. The lack of research had made the United States dependent on Germany prior to the war and would make it always more or less dependent on any nation more enterprising than our own in the matter of research unless interest was increased in that regard.

J. M. Carmody, editor of *Coal Age*, discussed the merchandising of coal and stressed the importance of instituting research with the purpose of determining the most suitable kind of equipment for the combustion of any given coal. He urged that an effort be made to inform all who purchase coal for domestic use as to the manner in which it may be burned with maximum efficiency.

W. G. Metzger, safety engineer, Hudson Coal Co., Scranton, was declared to have been elected as vice-president; B. H. Schaefer, engineer of power plant, Hudson Coal Co., Scranton, as secretary; W. R. Tavenner, colliery superintendent, Von Storch Colliery, South Penn Collieries Co., Scranton, as treasurer. A. B. Jessup, Jeddo; M. S. Knight, Scranton, and E. H. Suender, Frackville, were declared the directors for the coming year. About six hundred persons were present.

Illinois Output Declines

Output by shipping coal mines in Illinois, in 1927 totaled 44,814,776 tons, according to A. D. Lewis, director of the State Department of Mines and Minerals. This shows a decline of nearly 35 per cent when compared with 67,836,441 tons produced in the preceding year.

Industrial Blast Accidental

The explosion and resultant fire which killed 21 miners in Mine No. 18 of the Industrial Coal Co., at West Frankfort, Ill., on Jan. 9 was of accidental origin, a coroner's jury decided after listening to testimony for five hours.

The witnesses had been examined by A. C. Lewis, chief counsel of the United Mine Workers, and State's Attorney Roy C. Martin. Fred Burnette, superintendent of Mine No. 18, represented the owners.

Gas that had accumulated in the mine apparently was set off by a spark from an electric loading machine, causing the explosion.

Big Consolidations Planned In Smokeless Field

The second step in coal-company consolidations in West Virginia came to light Jan. 30 with the purchase by a New York syndicate of the interests of John C. Sullivan in five companies for $390,000. The purchase is part of a proposed $3,000,000 merger of coal properties in Raleigh and Wyoming counties under the name of the Comago Smokeless Fuel Co. The Sullivan properties were bid in by G. M. Hinckley, acting as the representative of Northern interests.

The Sullivan holdings purchased were the Wood-Sullivan, Tommy Creek, Raleigh-Fire Creek, Pickshin and Meade-Pocahontas companies. The buyers had previously acquired the Sullivan-Pocahontas Coal Co. and the equipment of the Harty Creek and Barkers Creek companies.

About ten days previous to the announcement of this deal Isaac T. Mann, president of the Pocahontas Fuel Co., said that 25 or 30 of the largest producing companies in the Pocahontas, New River and Winding Gulf fields were to be consolidated into a single company. Mr. Mann stated that plans were well matured for the closing of the merger.

Among those mentioned by Mr. Mann as taking part in conferences in connection with the fusion of interests were Robert H. Gross, Boston, president of the New River Co.; C. W. Watson, president, Consolidation Coal Co.; James L. Richards, president, Massachusetts Gas Cos.; W. C. Atwater, president, American Coal Co.; T. B. Davis, president, Pond Creek Pocahontas Co.; Major W. P. Tams, Jr., president, Gulf Smokeless Coal Co.; E. J. Berwind, Berwind-White Coal Mining Co.; Ralph Knode, president, General Coal Co.; G. H. Caperton, president, Slab Fork Coal Co., and Captain Edward Page, Crozer Pocahontas Co.

Mr. Berwind, though mentioned by Mr. Mann as taking part in the conferences looking toward the consummation of the merger, has not indicated his intention of becoming a partner in the consolidation or of turning over any of his properties to it.

Illinois Miners Reject Arbitration And Cut; Parley Adjourns

CHICAGO, ILL., Feb. 8.—Flat rejection by the miners of unbiased arbitration and a reduction in wages together with improvement in the working agreement for the operators wrecked the joint conference of Illinois operators and miners today. The conference adjourned *sine die* in complete disagreement.

The miners proposed an enlargement of the wage investigating commission which was created under the truce agreement Oct. 1, last, for the purpose of establishing a scale in Illinois competitive with the non-union fields.

The operators offered to accept the miners' proposal, which would create a commission of ten members—five operators and five miners—to continue the wage investigation, providing the miners would agree to an eleventh member to be appointed by the Chief Justice of the United States Supreme Court for consideration of all points that the ten members could not agree on.

THE miners unanimously rejected the operators' suggestion. It was stated that an eleventh member would not be acceptable even if he was the President of the United States. The enlargement of the commission and the arbitration question consumed the entire morning session.

In the afternoon meeting the operators offered the miners a $6 a day wage, a tonnage rate of 84c., establishment of a rate for miners employed on mechanical devices in the mines of the state and improvement in the working agreement for the operators which contemplates better control of the miners by the producers. This the miners rejected.

Union officials said they had no authority to accept a wage reduction since such action was entirely in the hands of the policy committee of the United Mine Workers. It left no other course for the conference to take except adjournment *sine die*.

Despite the gloomy outlook, certain of the best informed operators and miners predict that before the expiration of the existing truce Jacksonville agreement a conference will be called that will end the dispute satisfactorily to both sides. The pact expires March 31.

The operators released the statement, brief and exhibits on behalf of the Coal Operators' Association of Illinois in the matter of the readjustment of wages, working conditions, etc., at the Illinois mines, on which the proposal for the $6 a day wage was based.

The commission's statement is a serious and comprehensive study of the problems affecting the Illinois coal industry with respect to the non-competitive conditions as between the Illinois mines and operations in the non-union fields. It states that Illinois coal is from 50 to 75c. a ton too high under present conditions to compete and hold its markets.

"Failure to grasp this opportunity for a splendid example of real collective bargaining and to reach a wise and mutually needed adjustment of an outgrown wage relationship will be disastrous," the statement says. "If the situation is fully met and a just and proper conclusion reached and announced by this commission the benefit for miners and operators will be real and immediate.

"There must be a wage readjustment and there should be no restrictions upon the use of machinery which makes for the betterment of operating conditions in the way of greater safety or greater efficiency, and which will result in lessening the cost of production.

"THE success of the industry requires full co-operation on the part of the miners with the mine operators to the end that the miners may receive proper wages under proper working conditions adjusted in harmony with the fundamental and economic fact that a wage scale and prescribed working conditions are valueless unless there is work to be done.

"We earnestly believe that the time has long passed when any slight or small adjustment will be of benefit. The patient is very ill and needs real medicine. At the same time we are on record as not seeking or desiring low wages. It is to our interest that employees be fairly paid and able to live well and happily.

"It is the wage rates and unnecessarily restrictive conditions that can be wisely adjusted. In the case of many thousands of Illinois miners now suffering deprivation, a substantial reduction of wage rates and removal of abortive wage conditions will bring needed and substantial increases of annual earnings.

"For example, there are many mines where a removal of limitations on machines or outputs would permit tonnage men to earn on a substantially lower wage rate the same amounts they have been earning under the Jacksonville scale."

To Open Coal Bids

Bids will be opened Feb. 23 by the U. S. District Engineer at Philadelphia, Pa., for furnishing and delivering 15,000 gross tons of semi-bituminous coal during the period between April 1, 1928, and March 31, 1929.

Washington Letter

By Paul Wooton
Special Correspondent

THE expected legislative demonstration of the United Mine Workers took the form of a resolution to investigate conditions existing in the coal fields of central Pennsylvania, western Pennsylvania, West Virginia and Ohio. The resolution, which was presented by Senator Johnson of California asks specifically for a thorough investigation "to ascertain whether the railroad companies and their officials have been or are, by agreement or otherwise, endeavoring to depress the labor cost of coal produced by union mine labor." Reference is made to the eviction of persons from their homes and the committee is to ascertain if the courts have employed the injunction in violation of constitutional rights.

Senator Johnson supported the resolution by an extended speech on the floor of the Senate. As this is written, hearings are scheduled to begin before the interstate commerce committee of the Senate on Feb. 10 to determine whether or not there should be an investigation. The coal industry feels that it has been investigated to an unjustifiable extent by the federal legislature during the past several years and is expected to oppose the hearing. It will be contended that the investigation is being advocated by those who are anxious to curry political favor with the union and that there is nothing in the situation which justifies intervention of the federal government. The feeling is, however, that an investigation will be ordered. It is recognized that it will afford the operators an opportunity to get their side of the story before the public, as well as give such an opportunity to the union.

MEMBERS of Congress who have not taken sides in the present controversy and who are able to look at the issues from the point of view of the public, hope that if there is an investigation it will deal with the fundamental issues. It is well appreciated that the appointment of deputy police officers paid by employers has led to abuses in more than one state. There also is some feeling in the same quarter that the courts have gone to undue lengths in issuing injunctions. It is pointed out, however, that more is involved than the ethics of conducting a strike.

Those who look with favor on collective bargaining as an ideal of industrial relations, many believe, will have to find some way of making it sufficiently flexible to take into account competitive conditions. In the present overdeveloped state of the industry a fixed wage in the outlying territory along the non-union front is admitted to be impossible. The only alternative seen to out-and-out open-shop conditions is a sliding scale based on price or some form of profit sharing in which receipts are divided between capital and labor according to some standard percentage based on past

Sherman Melton

In his early teens Sherman Melton started work as a helper boy at a country sawmill. In a short time he could "see" the action of a slide valve as if the steam chest were of glass. No rest for him until he understood everything mechanical with which he came in contact. So on as electricity was introduced for light and power in his community. First direct current, then alternating current with its many complications. A study of fundamentals, first-hand experience and individual thinking characterize him as a "Will Rogers" among men of his profession. Mr. Melton is the inventor of the power-factor control equipment described on pages 75 to 77 of this issue.

experience. It is of interest that some mines in Ohio have reached an agreement as to such a profit-sharing basis.

IF THE United Mine Workers would accept some profit-sharing scheme some of the independent thinking members of Congress would support their demand for recognition by the operators. As it is they feel it is natural that Pennsylvania and Ohio operators, on finding that the union would consider nothing but the Jacksonville scale, should resort to the open shop as the only possible alternative.

Should the union abandon its demands, which many regard as impossible, and agree to a scale that would adjust itself automatically to the ability of the district to pay, it is felt that the operators would be wise to accept it. In districts which have been union for fifty years, as has much of Ohio, the spirit of organization is hard to down. If the operators should succeed in breaking the union, it is felt that it would be at a serious cost because of the ill-will and unwillingness of their labor to work effectively under open-shop conditions.

Less attention has been attracted by the Copeland-Jacobstein bill introduced Jan. 4, five days before the Johnson resolution. The bill authorizes coal companies to form district associations for the purpose of acting together in mining or in collective marketing of bituminous coal in interstate commerce. Such an association is to be exempt from the anti-trust law. The bill provides for supervision of such associations by the Secretary of Commerce, whose approval must be obtained for geographical limits and to whom associations are to furnish such reports as he requests.

Representative Meyer Jacobstein, New York, made the following comment to a representative of *Coal Age* on the subject of his bill:

"All fair-minded persons will admit that the soft-coal industry is in bad shape. The industry as a whole has lost millions within the last three years, labor has suffered severely, and the general public has been inconvenienced greatly. The bill that has been introduced by myself in the House and by Senator Copeland in the Senate is of a constructive character designed to help and not hurt the industry.

"We do not seek to expose still further the ills of the industry or to attach any blame. We are simply seeking to effect a cure. The cure we offer is one that has worked out successfully in Germany, is being tried in England, and has worked out in other industries. The method is the elimination of cutthroat competition and the regulation of marketing by the industry itself instead of by the government. Our bill seeks to do this by promoting consolidation and trade agreements in the soft-coal industry.

"At the present time the Sherman anti-trust act stands in the way. Our bill suspends this act so far as the soft-coal industry is concerned. The bill leaves it purely discretionary for the industry to avail itself of the advantages under the law. There is no compulsion about it. If the industry really desires to set itself in order, it ought to get behind this bill. If enacted into law it would not hurt anyone in the industry but on the other hand would be of benefit. Our bill simply gives the coal industry a chance to make good.

"Two years ago Secretary Hoover suggested that the coal industry should be given until this Congress convened to readjust itself. Congress has convened now and the situation is, if anything, worse. It is my hope that the industry will be broad-minded enough to get behind this measure. It is significant that I have had 25 letters of indorsement from the Governors of the coal-mining states. I would point out that the bill is only tentative. If the idea of setting up Hoover as a czar strikes displeasure, a commission could be substituted."

Safety Council Picks New York

New York City has been chosen as the scene of the 1928 congress of the National Safety Council, which will be held Oct. 1-5. This was decided late in January by the national executive committee.

The semi-annual conference of sectional chairman and committeemen will be held at the Commodore Hotel, New York City, at 10 a.m., Feb. 18.

Discuss Safety in Alabama; Fies Elected

Having as one of its main objects the reduction of accidents from falls of roof, the annual meeting of the Holmes Safety Association of Alabama was held Jan. 28 at the Tutwiler Hotel, Birmingham. Emphasis was placed on the fact that although the total number of coal-mine fatalities in the state dropped from 139 in 1926 to 93 in 1927, there was an increase of nearly 50 per cent in those due to falls of roof and coal—62 in 1927 compared with 42 in the preceding year.

Talks on safety were given by J. J. Forbes, U. S. Bureau of Mines; Milton H. Fies, vice-president, DeBardeleben Coal Corporation, Birmingham; James L. Davidson, secretary, Alabama Mining Institute; Harry L. Gandy, executive secretary, National Coal Association, and Erskine Ramsay, chairman of the board, Alabama By-Products Corporation. Harold McDermitt, vice-president, Newcastle Coal Co., and president, Alabama Council of the Holmes association, was chairman.

These officers were elected for the ensuing year: Milton H. Fies, president; F. R. Bell, general manager, Alabama Fuel & Iron Co., vice-president, and H. E. Mills, Alabama Mining Institute, secretary.

Coming Meetings

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

Midwest Power Conference. Feb. 14-17, Chicago.

New York State Coal Merchants' Association. Group meeting, Feb. 16, Hotel Syracuse, Syracuse, N. Y.

American Institute of Mining and Metallurgical Engineers. Annual meeting, Feb. 20-23, Engineering Societies Building, 29 West 39th St., New York City.

The Rocky Mountain Coal Mining Institute. Winter meeting, Feb. 27-29, Cosmopolitan Hotel, Denver, Colo.

Canadian Institute of Mining and Metallurgy. Annual meeting, Chateau Frontenac, Quebec, Canada, March 7-9.

American Institute of Electrical Engineers. Meeting of the Lehigh section at Hotel Casey, Scranton, March 23.

New England Coal Dealers' Association. Annual convention, April 4-5, Horticultural Hall, Boston, Mass.

Indiana Fuel Conference. April 5-6, at Purdue University, Lafayette, Ind., under the direction of the Engineering Extension Department and the School of Mechanical Engineering, with the School of Chemical Engineering of Purdue University co-operating.

American Mining Congress, manufacturers' division. Fifth annual convention and national exposition, May 7-11, Cincinnati, Ohio.

National Coal Association. Eleventh annual meeting, May 23-25, Cleveland Hotel, Cleveland, Ohio.

National Association of Purchasing Agents. Thirteenth international convention and inform-a-show, May 28-31, American Royal Building, Kansas City, Mo.

American Society for Testing Materials. Annual meeting, June 25-29, Chalfonte-Haddon Hall, Atlantic City, N. J.

Renewed Outbreaks Focus Attention On Pittsburgh Coal Situation

RENEWED outbursts of violence in the Pittsburgh (Pa.) coal field have resulted in an investigation being started by order of Governor Fisher and a Congressional probe now looms as a possibility following first-hand observation of conditions by Representative LaGuardia of New York. Mr. LaGuardia visited Bruceton, Horning, Broughton and Lick Run, interviewing union and non-union miners and observing the activities of the coal and iron police.

In a telegram to Senator Johnson of California on Feb. 3 urging that the latter press his resolution to a vote, Mr. LaGuardia charged the private police with shocking brutality and utter disregard of the law.

"It seems to me," he declared, "the operators are trying to provoke the unfortunate strikers to retaliation in order to justify, perhaps, some acts of violence already committed. This strike could be settled in one hour, provided the operators would condescend to a little decency. Surely the cost of maintaining the coal and iron police must be far in excess of the difference in wages they want to pay the miners and the Jacksonville wage scale of 1924."

"I shall hear the operators' side of the case, if they will talk to me," Mr. LaGuardia said on Feb. 4, "but it will take a lot of explaining to account for men walking along a ridge, as at Bruceton, the other day, and firing into the barracks of these suffering miners and for the firing into a school where, I understand, school was in session. If the operators can convince me they are not responsible for these outrages, I will come out clearly and say so."

Representative LaGuardia announced that he would present his findings on the coal strike in the House next Feb. 8, consent having been gained for that purpose, and would urge that an investigation be started immediately.

Suggestions that the coal controversy be ended by an armistice, after which negotiations would be opened, elicited conflicting statements from leading coal operators and representatives of the United Mine Workers.

John L. Lewis, president of the union, said the miners were willing to consider an armistice and open negotiations.

C. E. Lesher of the Pittsburgh Coal Co., said: "We indicated our position when we refused to attend the conference called by Secretary of Labor Davis, and it has not changed. We will not meet the union's representatives because we have nothing to discuss with them."

H. F. Baker, president of the Pittsburgh Terminal Coal Corporation, said: "The time for compromise has passed. We have won the fight. As I see it there is no alternative for the strikers but to continue idle or return to work on our terms. It is too late for discussion."

Wage reductions of from 4 to 8c. an hour, but not affecting all classes of work, were made by the Pittsburgh Coal Co. effective Jan. 11. The new rates, according to the company's announcement, range from 59 to 87½c. an hour for underground work and 51 to 68c. for outside work. Production by the company in its eighteen open-shop mines in January totaled 708,568 tons, as compared with 607,948 tons in December.

Capital and Labor Indorse Voluntary Arbitration

Much favorable comment has been elicited by a plan to have contracts between employers and employees embody a clause providing for voluntary arbitration of differences. This attitude has been shown in communications in response to a proposal of the subcommittee of the committee on commerce of the American Bar Association to give legal standing to such voluntary contracts and make them enforceable.

Julius Henry Cohen, chairman of the sub-committee, has received a large number of acceptances to an invitation to attend public hearings on the subject on Feb. 16, 17 and 18 at the headquarters of the Bar Association of the City of New York.

Matthew Woll, vice-president of the American Federation of Labor, and other labor officials have commended the plan. A special committee of labor leaders, which included Mr. Woll, conferred several times with the Bar Association's subcommittee.

Ohio Union Official Derides Co-operative Plan

Moved by reports of distress among miners' families in the Ohio coal fields, Governor Vic Donahey of that state sent letters to Lee Hall, president of district 12, United Mines Workers, and S. H. Robbins, president of the Ohio Coal Operators' Association, suggesting a conference on Jan. 16 to discuss a possible settlement of the wage controversy. The Senate Chamber of the State Capitol, Columbus, was designated as the place for the proposed meeting.

Lee Hall, the Ohio union president, readily expressed the willingness of the mine workers to meet the operators' representatives in an effort to compose their differences. The producers, however, refused to take part in the proposed conference, a committee headed by Mr. Robbins, which called on the Governor, stating that they felt that entire responsibility for unemployment of Ohio

miners rested with the union and that the suggested meeting would not correct existing conditions.

Plans for reopening a number of mines in southern and eastern Ohio on a co-operative basis embodying a modification of the Morris plan, devised by Page Morris, of the New York Coal Co., have been announced. Among the companies affected are the Ohio Collieries Co., Sunday Creek Coal Co., New York Coal Co., Essex Coal Co., Boston Consolidated Coal Co. and several smaller operators in the southern part of the state, as well as the Warner Collieries Co., in eastern Ohio.

In the Hocking Valley, Sunday Creek and Crooksville districts the scheme contemplates the formation of a joint association of operators and miners to be known as the Hocking Mutual Mining Association. Officered by a board of directors consisting of four operators and four miners, the organization would govern the operation of mines, determining wages to be paid, working conditions and other matters coming within the scope of negotiations between operators and the union.

Provision is made for a basic scale of $5 for day labor and 58c. for hand drilling, shooting and loading for the first three months. In case the product of the concerns operating under the plan sells above an average price of $2 for mine-run the scale is to be advanced proportionately, being decreased if the price goes below that figure.

Lee Hall scoffed at the scheme, declaring: "The miners will never accept that kind of a proposition. It's no kind of a plan." A meeting of miners near Nelsonville voted not to accept less than the Jacksonville scale.

Fills Anthracite Inspectors' Examining Board

Governor John S. Fisher of Pennsylvania has appointed five members of the Anthracite Mine Inspectors' Examining Board, two of the members being mining engineers and three miners. There had been vacancies on the board for nearly a year. Of the members appointed only one, Harry W. Montz, Kingston, a mining engineer, had been a member of the board before. The other members are Cadwallader Evans, Jr., Scranton, mining engineer; Frank Keast, Coaldale; John Skelding, Mt. Carmel, and David L. Parry, Carbondale, miners.

West Kentucky Coal Bureau Re-elects Hart

Members of the West Kentucky Coal Bureau turned out in force for the annual meeting of the organization, held Jan. 17 at the Brown Hotel, Louisville. It was voted to continue indefinitely the credit division of the bureau and there was considerable discussion of legislation recently proposed in the Kentucky Legislature and the national Congress.

Brent Hart, president, Hart Coal Corporation, was re-elected president of the bureau; A. P. Barnard, general manager, Beaver Dam Coal Co., was chosen vice-president, and C. E. Reed was named secretary-treasurer.

Philip M. Snyder

P. M. Snyder Named to Head Castner, Curran & Bullitt

Philip M. Snyder, of Mount Hope, W. Va., has been elected president of Castner, Curran & Bullitt, Inc., the well-known selling organization with headquarters in New York City. He succeeds William C. Dykes, who retires from active connection with the company after having been president since last April. Mr. Snyder also is president of the C. C. B. Smokeless Coal Co., representing the fusion of a number of West Virginia producing companies acquired several years ago by the Massachusetts Gas Cos. He was named to the latter post last spring following the death of Robert Grant.

Hoover Names Committee To Tokio Congress

Seventy-eight of the nation's most prominent engineers and scientists have accepted appointment by Secretary Herbert Hoover, as honorary chairman, on the American Committee of the World Congress of Engineers, to be held in Tokio in November, 1929, according to Elmer A. Sperry, chairman of the National Research Council.

Among well known members of the American Committee are Thomas A. Edison, John Hays Hammond, Charles M. Schwab, Gerard Swope, president, General Electric Co.; James H. McGraw, president, McGraw-Hill Publishing Co.; William Green, president, American Federation of Labor; William L. Batt, E. M. Herr, John W. Lieb, Fred R. Low, Editor, *Power;* J. V. W. Reynders, Calvin W. Rice, E. W. Rice, Jr., H. Foster Bain, George Otis Smith and Dean Dexter Kimball.

A.I.M.E. to Study Coal From Many Aspects

Features of marked interest to coal operators and coal mining engineers will be on the program of the American Institute of Mining and Metallurgical Engineers' meeting Feb. 20-23. E. C. Mahan, president of the National Coal Association, will be one of the speakers at a general conference on the "Problems of Overproduction in the Mineral Industry," set for Tuesday afternoon of convention week. H. N. Eavenson, chairman of the coal and coal products committee of the Institute, has built up an attractive program of one general session and a day devoted to a general symposium on the classification of coal. J. R. Campbell also will speak before the blast-furnace session of the iron and steel committee Wednesday forenoon on "Cleaning Bituminous Coal."

General features of the meeting will include a smoker Monday evening, an excursion to see the ventilating system of the Holland Tunnel, and a dinner-dance at the Waldorf on Tuesday evening Feb. 21. On this occasion the Saunders gold medal will be presented to Herbert Hoover, the Douglas medal to S. G. Blaylock, and the Hunt medal to John A. Mathews.

Sessions on mine ventilation will be held morning and afternoon on Feb. 20, with George S. Rice and E. A. Holbrook, respectively as chairman. Reports of sub-committees will be presented by Dan Harrington, metal mining; Frank Haas, coal mining; R. R. Sayers, physiological; A. C. Callen, fans and ventilation physics. W. S. Weeks will read a paper on "The Air-Current Regulator," the discussion being led by A. C. Callen. "Propeller-Fan Computation" will be the title of F. E. Brackett's paper, with G. E. McElroy leading the discussion. L. W. Huber will lead a discussion on "Ventilation of the Liberty Tunnel." A paper will be presented by H. P. Greenwald and H. C. Howarth on "Some Tests of Recirculation of Air and Mine Gases by Auxiliary Fans," H. I. Smith leading the discussion. George S. Rice's subject will be "Controlling Factors in Formulation of a Code for Coal-Mine Ventilation"; discussion led by Frank Haas.

At the morning session on Feb. 22 devoted to ground movement and subsidence, of which R. V. Norris will be chairman and George S. Rice, vice-chairman, H. W. Montz will discuss "Surface Subsidence From Anthracite Mining." H. G. Moulton will be chairman of the afternoon session, when these topics will be treated: "Barrier Pillars," by George H. Ashley; "Oxidation Subsidence," Augustus Locke, and "Bursting of the Gros Ventre Landslide Dam" (illustrated), W. C. Alden.

Coal and coal products will hold attention at another session on the afternoon of the same day, with H. N. Eavenson as chairman. Papers will be read by J. E. Tiffany and S. S. Lubelsky on "Blasting Coal Effectively

and Safely in Southern Illinois"; John B. Dilworth, "Valuation of Coal Properties"; Charles E. Stuart, "Mining and General Conditions in Russia" (illustrated); John A. Garcia, "Coal-Mining Industry in Russia"; B. M. Bird and H. F. Yancey, "Hindered-Settling Classification of Feed to Coal-Washing Tables," and "Re-treating Middlings From Coal-Washing Tables by Hindered-Settling Classification."

Classification of coal will be discussed at morning and afternoon sessions on Feb. 23 with these participants: Eugene McAuliffe, Malcolm Macfarlane, R. V. Wheeler, Clarence A. Seyler, H. J. Rose and others. M. D. Cooper will be chairman.

Rocky Mountain Institute Plans 3-Day Meeting

Three days—Feb. 27-29—will be devoted to the winter meeting of the Rocky Mountain Coal Mining Institute, to be held at the Cosmopolitan Hotel, Denver, Colo. Morning and afternoon sessions will be held each day, with a banquet followed by dancing in the evening of Feb. 27 and a theater party the following night.

The program, which is practically complete, will include the following: Feb. 27, registration, organization, reports and appointment of committees in the morning. In the afternoon a paper on "The Mine Circuit" will be read by L. W. Birch, Ohio Brass Co., followed by an address by Harry L. Gandy, executive secretary, National Coal Association, and concluding with "New Analysis of Some Colorado Coals," by Prof. C. B. Carpenter and Mr. Manuel, Colorado School of Mines.

W. J. Elwood, Standardville, Utah, will describe "Driving a Rock Tunnel" on the morning of the second day and C. E. Karstrom will tell about "The Cardox Cartridge." Two papers will feature the afternoon session, "Modernizing an Old Tipple," by W. J. Schenler, Colorado Fuel & Iron Co., and "The Castlegate (Utah) Tipple of the Utah Fuel Co.," by Andrews Allen, of Allen & Garcia.

"Some Modern Developments in Washing Coal" will be described by George Watkin Evans, Seattle, Wash., on the morning of the third day, followed by G. D. Jones, Victor American Fuel Co., whose paper will be "New System of Mechanical Loading." T. J. Waddell, Phelps Dodge Corporation, will address the afternoon session on "Experiences at Dawson With Mine-Car Greasing," after which officers will be elected.

Form Mine-Run Sales Agency

Stabilization of mine-run coal in western Kentucky is sought through the formation of a sales agency, which, it is reported, hopes to handle and distribute 75 per cent of the output of the smaller mines in the field. The agency was organized by the Coil Coal & Mining Co., Madisonville, Ky.

James Needham

James Needham Dies

James Needham, president of the St. Paul Coal Co., a subsidiary of the Chicago, Milwaukee & St. Paul Ry., and general superintendent of all the coal properties of the railroad company, died Jan. 30 at Maquoketa, Iowa. Death was due to pneumonia, which developed from a mild cold. He was 57 years old.

Savaria Property Sold

Plant and property of the Savaria Coal Co. was sold under the hammer for approximately $43,000 at a receiver's sale on Jan. 30 at Clarksburg, W. Va. Nine separate parcels, including valuable mining lands in the Grant and Elk districts near Mt. Clare, were purchased by the Citizens' Title & Trust Co. of Uniontown, Pa.

Broadcast Safety by Posters

The Hercules Powder Co., Wilmington, Del., has entered into a co-operative arrangement with the National Safety Council for disseminating accident-prevention information to all who use explosives. A series of cartoons known as "Nip and Tuck," the first of which has been issued, will be distributed in poster form as part of the campaign for safety.

Glen Alden Trade Marks Coal

The Glen Alden Coal Co. has adopted a blue trade mark for its anthracite to distinguish it from the product of other companies. The coal is sprayed with a bright blue fluid, which has caused dealers and consumers in New England and upper New York State to call for it as "peacock coal."

William H. MacEwan, vice-president and secretary of the Philadelphia & Reading Coal & Iron Co., died Jan. 21 at his home in Haverford, Pa., as the result of a stroke. He was 58 years old and had been connected with the P. & R. for 35 years.

Personal Notes

David Boies has been chosen as secretary of the Anthracite Coal Operators' Association, succeeding W. J. Thompson. The office of the organization has been moved from the Atlantic Building, Philadelphia, Pa., to the Bowman Building, Scranton, Pa.

Frank A. Learned, mechanical and construction engineer, has been made assistant to A. J. Maloney, president of the Philadelphia & Reading Coal & Iron Co., with headquarters in Pottsville.

Frank Rosbottom, of Duquoin, Ill., state mine examiner, for the Ninth district, has been appointed assistant Director of Mines and Minerals for the state.

The Sunday Creek Coal Co., Columbus, Ohio, announces the appointment of Howard H. Upson as assistant to the president.

Charles A. Warden has resigned as general manager of the Kingston-Pocahontas Coal Co., it was announced recently at Hemphill, W. Va. He will give his attention to private business affairs. Mr. Warden has been succeeded by Ernest L. Bailey.

Arthur J. Hoskin has been appointed to the staff of the school of chemical engineering at Purdue University, Lafayette, Ind. He plans to make a study of the spontaneous ignition of stored coal with special attention to Indiana coals.

Charles W. Lotz has been appointed research engineer of all the operations of the Susquehanna Collieries Co. and the Lytle Coal Co., with headquarters in Wilkes-Barre, Pa. Joseph Mette is now inspector of electrical and mechanical equipment, operating from Shamokin.

Harry Treadwell, for five years superintendent of the Chicago, Wilmington & Franklin Coal Co.'s Mine No. 1, at West Frankfort, Ill., has been promoted to operating engineer.. His old post will be filled by John Rodenbush, formerly superintendent at the New Orient mine. John R. Foster becomes superintendent of the New Orient mine.

Pierpont V. Davis, vice-president of the National City Bank, New York City, was elected a director of the Philadelphia & Reading Coal & Iron Corporation and the Philadelphia & Reading Coal & Iron Co. on Jan. 27. He succeeds Robert J. Montgomery, resigned. Charles A. Hurff was elected vice-president and Martin P. McDermott secretary.

Edward Griffith has been appointed general manager of the Lehigh & Wilkes-Barre Coal Co., Wilkes-Barre, Pa., succeeding the late Douglas Bunting. Charles E. Ash, formerly secretary and treasurer, has been made vice-president and secretary. C. H. Bonham, hitherto auditor of payrolls, was advanced to the post of treasurer. J. B. Tamblyn has been named assistant general manager, being succeeded as superintendent of the Wilkes-Barre division by W. L. Davis.

Urges Removal of Buchanan as South Penn Receiver

In a petition filed in U. S. District Court in Philadelphia, Pa., Warren T. Acker, of Scranton, Pa., asks for the dismissal of R. H. Buchanan as receiver of the South Penn Collieries Co. Mr. Acker urges that the court appoint a disinterested person as the coal company's receiver, holding that alleged imprudent management by Mr. Buchanan forced the company into difficulties.

It also is contended by Mr. Acker that the appointment of Mr. Buchanan as receiver was the result of collusion among the officers and directors of the company after he had brought suit in court in Scranton to enforce payment of a claim of $500,000 against the company.

Franklin S. Edmunds, Philadelphia attorney, has been named special master in the case. He was appointed after the attorney for the receiver had said the only solution of the coal company's difficulties was a sale of the assets under a foreclosure of a second mortgage of $2,000,000 or a general sale to pay the claims of creditors. Mr. Acker objected to any sale until his status as a creditor and the charges against the company officials had been passed upon. The South Penn company is supposed to own coal lands valued at $17,000,000.

Dismiss Miner for Smoking Where Blast Killed 21

Caught with a lighted cigarette in his hand five days after the explosion of Jan. 9 which resulted in the death of 21 miners in No. 18 mine of the Industrial Coal Co., West Frankfort, Ill., a machine man in that operation was summarily discharged. The Peabody Coal Co., which manages the mine, withheld the offender's name out of consideration for his future. A fellow miner notified the management of the violation of the company's rule against smoking in the mine.

Mining Congress Sets Date

Dates for the spring meeting of the American Mining Congress and the National Exposition of Coal Mine Equipment have been definitely set for May 7-11. As in recent years, the meeting will be held in the Music Hall, which has been completely remodeled.

Dr. L. E. Young, operating vice-president, Pittsburgh Coal Co., is chairman of the program committee, which meets in Pittsburgh Feb. 10 to work out details.

Just Out After a Hot Lunch Underground

This party, which includes, three engineers from Russia, made a trip recently through the Pratt No. 8 mine of the Tennessee Coal, Iron & Railroad Co., at Wylam, Ala. A feature of much interest in this mine is the belt conveyor which has displaced rope haulage on the main slope. The installation takes 4,700 ft. of 48-in. rubber belting.

From left to right the party are as follows: L. B. Clouse, electrician of Wylam division; P. G. Cowin, of Salmon & Cowin, Birmingham; F. Brawley, superintendent of Wylam division; J. H. Edwards, associate editor, "Coal Age," Huntington, W. Va.; Edward Flynn, safety inspector; Alexander A. Scotchinsky, professor of mining engineering, Mining Institute, Leningrad; G. P. Small, Sullivan Machinery Co., Birmingham; Constantin A. Kouznetzoff, M.E., technical director of Stalin coal mines of Jugostal (steel) Trust, Stalin, Donetz Basin; J. M. McHugh, general superintendent of coal mines; W. A. Hamilton, assistant general superintendent of coal mines; W. C. Adams, of Allen & Garcia, Birmingham, and Alexander S. Ilycheff, mining engineer, United Coal Industries of Donetz Basin.

After three hours in the mine the party was treated to a piping hot meal of steak and all the trimmings which was prepared some four miles away but served in the underground office.

Indiana Fuel Conference To Be Held at Purdue

A two-day Indiana Fuel Conference will be held at Purdue University, Lafayette, Ind., April 5 and 6 under the direction of the engineering extension department and the school of mechanical engineering with the school of chemical engineering of Purdue co-operating. According to tentative arrangements authorities on Indiana fuel resources, preparation of coal for commercial and domestic uses, marketing and storage will have places on the program.

Among the subjects to be discussed will be "The Fuel Resources of Indiana," "Fuel and Power as Affecting Progress," "Fuel Research Problems"; a symposium on "Burning Indiana Coal — Commercially and Domestically"; "How May Engineers, Producers and Consumers Co-operate"; "Coal Storage," "Smoke Elimination," "Coal Marketing: (a) Fitting the Coal to the Plant; (b) Standardizing Marketing Methods."

Loader Company Formed By U. P. Officials

The Rock Springs Loader Co. has been organized with these officers: Eugene McAuliffe, president; George B. Pryde, vice-president; A. W. Dickinson, treasurer, and Frank Tallmire, secretary. Mr. McAuliffe is president of the Union Pacific Coal Co. and the other officers also are connected with that company. Headquarters of the new concern will be at Rock Springs, Wyo.

Patent rights have been acquired on the McCarthy Duck Bill and the Ernsbarger Universal shaker loader, which when attached to shaking conveyors of the Eickhoff, Mavor & Coulson, Link-Belt, Ottumwa, Ironton and other types converts these devices, nominally used as room or modified longwall transportation equipment, into mechanical coal or ore loaders, which eliminate hand shoveling.

The new corporation will manufacture and distribute the Duck Bill, which was developed in the mines of the Union Pacific Coal Co., where 33 units were used in the latter part of last year, the company having loaded 1,108,000 tons of coal mechanically in 1927. The Union Pacific company has found the device adapted to entry and room driving, pillar drawing, driving breakthroughs and loading coal on a modification of the longwall face system.

Fuel Research Going Ahead

The American Society of Mechanical Engineers has approved a number of recommendations to its special committee on research in fuels, of which F. R. Wadleigh is chairman. The committee has assigned to each member the collection of data in his special field, and reports of definite progress are expected at an early date.

Current Prices of Mining Supplies

SINCE LAST MONTH

STEEL prices continue to rise, with the latest advance, Jan. 19, bringing the market on the principal hot-rolled products to the current level of $1.85 per 100 lb., Pittsburgh, for carloads. While the prices of non-ferrous metals tend upward, there is apparently little actual buying. In most of the minor supplies the price movement is downward.

STEEL RAILS—The following quotations are per ton f.o b. in carload or larger lots:

	Pittsburgh			
	Current	One Year Ago	Birmingham	Chicago
Standard Bessemer rails	$43.00	$43.00	$43.00	$43.00
Standard openhearth rails	43.00	43.00	43.00	43.00
Light rails, 25 to 45 lb.	36.00	36.00	34@36	1.80@1.90*

*Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh mill for carload lots, together with warehouse prices at the places named:

	Pittsburgh			
	Current	One Year Ago	Chicago	Birmingham
Standard spikes, 5/16-in. and larger	$2.70@$2.80	$2.80@$2.90	$3.55	$3.00
Track bolts	3.80	3.90@4.25	4.55	3.90
Standard section angle bars, splice bars or fish plates	2.75	2.85	3.40	2.95

WROUGHT STEEL PIPE—From warehouses at the places named the following discounts hold for welded steel pipe:

	Black		
	New York	Chicago	St. Louis
1 to 3 in. butt welded	53%	54%	49%
2½ to 6 in. lap welded	48%	51%	46%
	Galvanized		
	New York	Chicago	St. Louis
1 to 3 in. butt welded	39%	41%	36%
2½ to 6 in. lap welded	35%	38%	33%

Malleable fittings, Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36—5% off.

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches External	Diameter in Inches Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
¾	.58½	2.875	2.469	.203
1	.76½	3.5	3.068	.216
1¼	.92	4.0	3.548	.226
1½	1.09	4.5	4.026	.237
2	1.27	5.0	4.506	.247
2½	1.48	5.563	5.047	.258
3	1.92	6.625	6.065	.28

CAST-IRON PIPE—Prices per net ton for Class B in carload lots:

			New York	
	Birmingham	Burlington, N. J.	Current	One Year Ago
4 in.	$31.00	$38.00	$40.60	$51 60
6 in. and over	28.00	35.00	37.60	47.60
	Pittsburgh	Chicago	St. Louis	San Francisco
4 in.	$39.50	$39.20	$36.60	$42.00
6 in. and over	36.50	36.20	33.60	39.00

Gas pipe and Class "A," $4 per ton extra.

BOLTS AND NUTS—Discounts from new list, Apr. 1, 1927, on immediate deliveries from warehouse in New York and vicinity: Machine bolts, square heads and nuts, up to 1x30-in., full kegs or cases, 50%; Carriage bolts, up to ¾ x 6-in., full kegs or cases, 55%; Nuts, hot-pressed or cold-punched, blank or tapped, square or hexagonal, full kegs or cases, 55%.

STEEL PLATES—Following are base prices per 100 lb. in carload lots, f.o.b. for ¼-in. thick and heavier:

Pittsburgh $1.85 Birmingham $1.90@$2.20

STRUCTURAL RIVETS—The following quotations are per 100 lb., in carload lots, f.o.b. mill, for ½-in.:

Pittsburgh $2.75 Cleveland $2.75 Chicago $2.85

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized, in New York and territory east of Missouri River:

	Per Cent
Plow steel round strand rope	35
Special steel round strand rope	30
Cast steel round strand rope	20
Round strand iron and iron tiller	5
Galvanized steel rigging and guy rope	7½
Galvanized iron rigging and guy rope (add to list)	12½

RAIL BONDS—Stranded copper, 28-in., 0000, welded, at points east of the Mississippi, price per 100. $90.36.

DRILL ROD—Discounts from list:

New York 60% Cleveland 55% Chicago 50

DRILL ROD—Discounts from list:

New York 60% Cleveland 55% Chicago 50%

FRICTION TAPE—Size ¾-in. in 100 lb. lots in Eastern territory, per lb., 02_9$

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
Chicago, white oak, plain	$1.40	$1.78
Chicago, empty cell creosoted	1.80	2.40
Chicago, zinc treated	1.60	2.10
St. Louis, white oak, plain	1.25	1.50
St. Louis, zinc treated	1.65	1.90
St. Louis, red oak, plain	1.15	1.40
Birmingham, white oak	1.25	1.45

STEEL MINE TIES—Prices range from $0.38 to $0.60 per tie, f.o.b. Pennsylvania and West Virginia districts, depending on quantity, gage of track and weight of rail.

CALCIUM CARBIDE—In drums, round lots in New York market, per lb. $0.05@$0.06.

BRATTICE CLOTH—Prices f.o.b. cars New York, Philadelphia, St. Louis or Chicago, per sq.yd.:

Jute, 24-oz., double warp	$0.22	Jute, waterproof	$0.28
Jute, 22-oz.	.18	Duck, waterproof	.36
Jute, 18-oz.	.16	Duck, non-inflammable	.34
Old sail cloth	.55		

COTTON WASTE—The following prices are in cents per lb.:

	New York	Cleveland	Chicago
White	10.00@13.50	16.00	15.00@20.00
Colored	9.00@13.00	12.00	12.00@17.00

MACHINE OIL—Medium bodied, in 55 gal. metal barrels, per gal., as follows,

New York $0.27 Cleveland $0.35 Chicago $0.26

SCRAP IRON AND STEEL—The prices following are f.o.b. per ton paid by dealers:

	New York	Chicago	Birmingham
No. 1 railroad wrought	$12.50@$13.00	$11.25@$11.75	$11.00@$12.00
Stove plate	8.00@8.50	12.75@13.25	13.00@14.00
No. 1 machinery cast	15.00@16.00	15.50@16.00	15.00@16.00
Machine shop turnings	7.00@7.75	6.00@6.50	8.00@8.50
Cast borings	7.50@7.75	8.75@9.25	8.00@8.50
Railroad malleable	11.25@11.75	12.75@13.25	12.00@13.00
Re-rolling rails	11.50@12.00	13.00@13.50	15.00@16.00
Re-laying rails	23.00@24.00	.....	22.00@23.00
Heavy melting steel	7.75@11.25	10.75@11.25	12.00@12.25

SCRAP COPPER AND BRASS—Dealers' purchasing prices in cents per lb.:

	New York	Cleveland	Chicago
Crucible copper	12.25 @ 12.50	11.50	11.00@11.50
Copper, heavy, and wire	11.50 @ 12.25	10.75	10.25@10.75
Copper, light, and bottoms	10.00 @ 10.50	9.50	9.25@9.75
Brass, heavy, yellow	7.12½@7.37½	7.25	7.00@7.50
Brass, heavy, red	9.00 @ 9.50	9.75	9.00@9.50
Brass, light	5.50 @ 6.00	7.00	6.00@6.50
No. 1 yellow rod turnings	7.25 @ 7.75	7.50	7.00@5.50

COPPER WIRE—Prices of bare wire, base, at warehouse, in cents per lb. are as follows:

New York 19.37½ Cleveland 19.37½ Chicago (mill) 15½@15½

TROLLEY WIRE—In carload lots, f.o.b., producing point, all sizes, round 15½c. per lb.; grooved, 15½c.; Fig. 8, 16½c.

TROLLEY WHEELS—F.o.b. Jersey City, N. J., 4-in., $1.00@$1.20 each; 6-in., $1.70@$1.90 each.

MINING MACHINE CABLE—F.o.b. producing point, rope lay patterns, single conductor, per M. ft.:

Braided		All Rubber Covered	
Size 2	$102.60	Size 2	$220.00
Size 3	71.75	Size 3	196.00
Size 4	63.50	Size 4	166.00

LOCOMOTIVE CABLE—F.o.b. producing point, braided, Size 3, $83.00 per M. ft.; Size 4, $69.00 per M. ft.

FEEDER CABLE—Price M. ft. in larger buying centers east of the Mississippi:

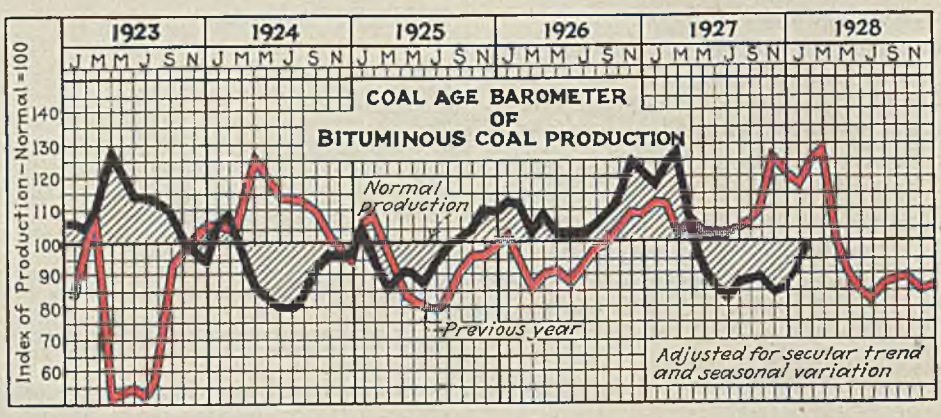
B. & S. Size	Two Conductor	Three Conductor
No. 14 solid	$30.00 (net)	$46.00 (net)
No. 12 solid	136.00	180.00
No. 10 solid	185.00	235.00
No. 8 stranded	305.00	375.00
No. 6 stranded	440.00	530.00

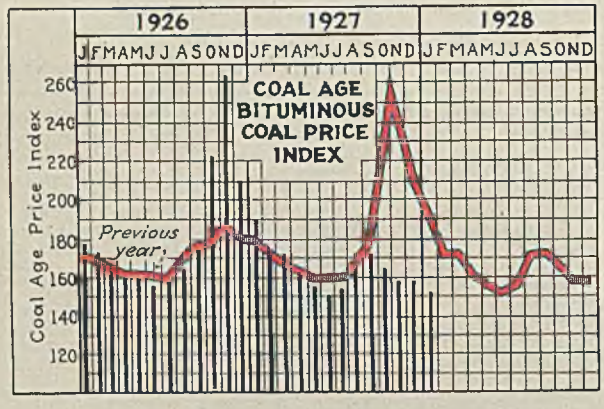
From the above lists discounts are: Less than coil lots, 50%; Coils to 1,000 ft., 60% 1,000 to 5,000 ft., 65%; 5,000 ft. and over, 67%.

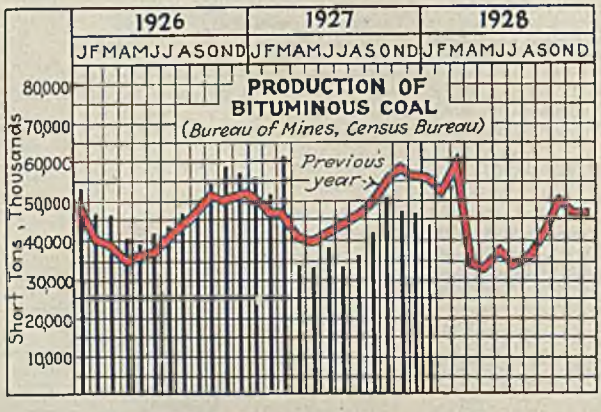
EXPLOSIVES—F.o.b. in carload lots:

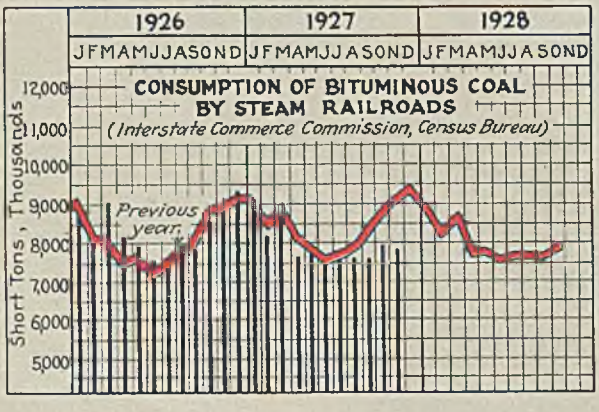
	Districts		
Black Powder, FF, $NaNO_3$ base, 800 kegs per car, per 25 lb. keg	West Virginia $1.70@$1.80	Pennsylvania $1.70	Missouri $1.75
Ammonium permissible, 1¼ x 8 in. sticks, 20,000 lb. per car, per 100 lb.	14.50@15.50	14.25	14.50

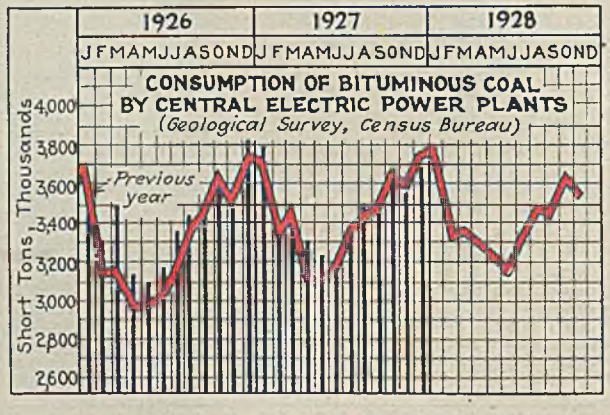
Indicators of Activities in the Coal Industry

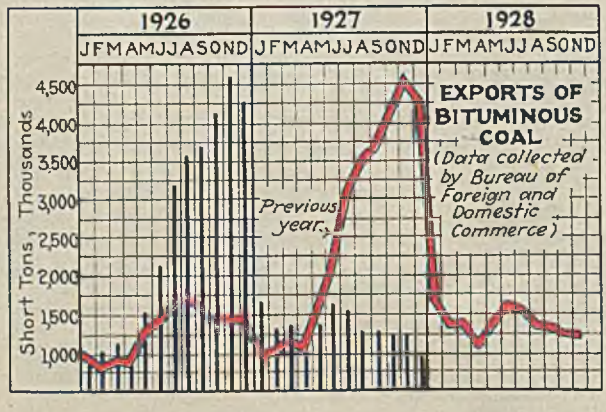


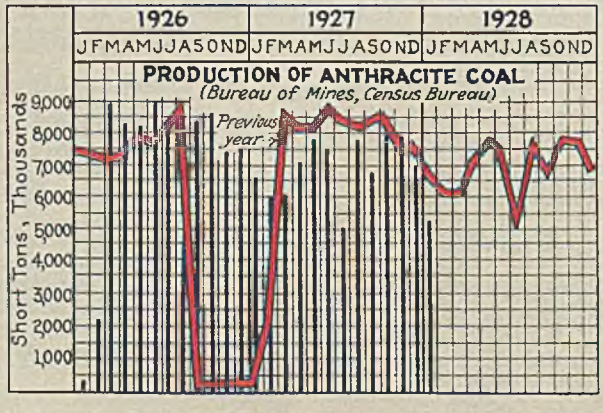












MARKETS *in Review*

BITUMINOUS coal markets during the first month of the current calendar year offered little to cheer the producer depending upon spot-coal sales for profit. Anthracite movement was equally discouraging. Weather was the controlling factor in determining the volume of retail buying and weather conditions on the whole were not conducive to large demand for fuel for heating purposes.

In the industrial markets of the country the coal trade suffered not only from the slowing up in many manufacturing lines but also from the accumulations of coal stocks put into storage prior to last April. According to the estimates of the National Association of Purchasing Agents bituminous stocks decreased only 3,500,000 tons during December, leaving 51,689,000 tons in the hands of industry on Jan. 1.

Under such circumstances it is not surprising that spot prices were weaker. *Coal Age* Index of spot bituminous prices declined from 161 on Jan. 7 to 160 on Jan. 14 and fell to 144 on Jan. 21. The Index on Jan. 28 also was 144. The corresponding weighted average prices were $1.95, $1.94, $1.75 and $1.74. The Index number for January, 1927, was 190 and the weighted average price, $2.34.

WEATHER more seasonable in Florida than in the Middle West depressed consumer demand for coal in the Chicago market during the greater part of January. Industrial consumers still held substantial storage reserves and retail distributors did not care to build up yard stocks when domestic demand was slow. The high temperatures quickly smothered the baby boom brought on by sub-zero days early in the month, ended a downward movement in screenings and killed advances in quotations on western Kentucky prepared sizes.

Mines in Illinois, Indiana and western Kentucky did not average better than half time, with southern Illinois and Kentucky enjoying steadier work than other districts in the group. Domestic prices were soft and middlemen had no difficulty in buying coal 25 to 50c. under circular. Screenings were helped by the domestic situation, but hurt by low prices on mine-run. Some industrial consumers bought mine-run and crushed it to beat the spot market in screenings.

Despite more strict enforcement of car-supply regulations the month closed with approximately 5,000 "no bills" of large coal in Illinois and 1,300 cars in Indiana. There was a slight pick-up in buying toward the end of the month, but the edge was taken off demand by the knowledge that the Illinois joint wage commission would report on Feb. 7 and a general feeling that there would be no labor trouble in the Midwest this spring.

OF THE Eastern coals entering the Chicago market smokeless was the most active. Sales during the early cold snap took care of the bulk of the spot tonnage moving westward. Lump, egg and nut were particularly tight although lump weakened slightly late in the month. Mine-run was firm at $1.85@$2.25, with most of the coal going at the top figure. Eastern high volatiles were a drug on the market with good quality egg as low as $1.40 and slack, 50c. Anthracite demand was light, with prices firm. The situation in domestic coke was on all fours with that in hard coal.

The situation in St. Louis was discouraging. Weather conditions worked against the coal trade and western Kentucky competition pressed hard upon Illinois mines. Unfavorable weather conditions also hit the Louisville market and inquiry for domestic sizes did not begin to pick up until toward the end of the month. On the other hand, utility and general industrial buying was slightly better because stockpiles were diminishing, but the area of sales was limited because Illinois and Indiana were in a position to serve their regular trade.

Kentucky mines averaged about three days a week. On the whole the price situation in Louisville was steady, but the figures at which coal was sold were too low to be satisfactory to the producers who were denied the usual midwinter advances. In the industrial market western Kentucky fared better than the eastern section of the state—possibly because demand for prepared sizes of western Kentucky coal was light. Considerable complaint is heard because of the freight-rate situation and operators are fearful that suspension of the 20c. reduction in lake cargo rates will put them at a disadvantage.

JANUARY movement of coal from the docks at the Head of the Lakes was substantial despite comparatively mild weather. Although most of the buying was on a hand-to-mouth basis, the volume of tonnage shipped probably equalled that of last year, when 27,547 cars were loaded. Industrial demand was larger, with public utilities coming into the market for more fuel because

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

	Market Quoted	Week Ending Jan. 7, 1928 Independent	Jan. 7, 1928 Company	Jan. 14, 1928 Independent	Jan. 14, 1928 Company	Jan. 21, 1928 Independent	Jan. 21, 1928 Company	Jan. 28, 1928 Independent	Jan. 28, 1928 Company
Broken	New York	.....	$8.25@$8.75	.....	$8.25@$8.75	.....	$8.25@$8.75	.....	$8.25@$8.75
Broken	Philadelphia	$8.50@$8.75	8.25@ .850	$8.50@$8.75	8.25@ 8.50	$8.50@$8.75	8.25@ 8.50	$8.50@$8.75	8.25@ 8.50
Egg	New York	8.25@ 8.75	8.75	8.35@ 8.75	8.75	8.50@ 8.75	8.75	8.35@ 8.70	8.75
Egg	Philadelphia	8.75@ 9.30	8.75@ 8.85	8.75@ 9.30	8.75@ 8.85	8.75@ 9.30	8.75@ 8.85	8.75@ 9.30	8.75@ 8.85
Egg	Chicago*	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13
Stove	New York	9.00@ 9.25	9.25	9.00@ 9.25	9.25	8.90@ 9.25	9.25	8.70@ 9.25	9.25
Stove	Philadelphia	9.25@ 9.75	9.25	9.25@ 9.75	9.25	9.25@ 9.75	9.25	9.25@ 9.75	9.25
Stove	Chicago*	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58
Chestnut	New York	8.75@ 9.00	8.75	8.75@ 9.00	8.75	8.75@ 9.00	8.75	8.50@ 9.00	8.75
Chestnut	Philadelphia	8.75@ 9.25	8.75	8.75@ 9.25	8.75	8.75@ 9.25	8.75	8.75@ 9.25	8.75
Chestnut	Chicago*	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13
Pea	New York	5.75@ 6.00	6.00@ 6.50	5.75@ 6.00	6.00@ 6.50	5.50@ 6.00	6.00@ 6.50	5.25@ 6.00	6.00@ 6.50
Pea	Philadelphia	5.75@ 6.50	6.00	5.75@ 6.50	6.00	5.75@ 6.50	6.00	5.75@ 6.50	6.00
Pea	Chicago*	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10
Buck	New York	3.25@ 3.35	†3.00@ 3.25	3.00@ 3.25	†3.00@ 3.25	3.00@ 3.25	†3.00@ 3.25	2.70@ 3.10	†3.00@ 3.25
Buck	Philadelphia	3.00@ 3.50	3.00@ 3.25	3.00@ 3.50	3.00@ 3.25	3.00@ 3.50	3.00@ 3.25	3.00@ 3.50	3.00@ 3.25
Rice	New York	2.25@ 2.40	2.00@ 2.25	2.35@ 2.50	2.00@ 2.25	2.25@ 2.50	2.00@ 2.25	2.50@ 2.75	2.00@ 2.25
Rice	Philadelphia	2.00@ 2.25	2.00@ 2.15	2.00@ 2.25	2.00@ 2.15	2.00@ 2.25	2.00@ 2.15	2.00@ 2.25	2.00@ 2.15
Barley	New York	1.50@ 1.75	1.50@ 1.75	1.60@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.00@ 1.75	1.50@ 1.75
Barley	Philadelphia	1.50@ 1.75	1.50@ 1.60	1.50@ 1.75	1.50@ 1.60	1.50@ 1.75	1.50@ 1.60	1.50@ 1.75	1.50@ 1.60
Birdseye	New York	.....	1.60	.....	1.60	.....	1.50	.....	1.60

* Net tons, f.o.b. mines. † Domestic buckwheat (D., L. & W.), $3.75.

many hydro-electric plants were forced to shift to coal.

On the domestic side much of the buying has centered upon prepared sizes of smokeless. Dock companies specializing in anthracite are feeling the trend to other fuels. Domestic coke is finding a wider market as the result of an educational selling campaign. Stocks on the docks on Jan. 15 were estimated at 4,900,000 tons of bituminous coal and 550,000 tons of anthracite. Coal prices have been well maintained and the prospects for a profitable season are bright. There were some downward revisions in coke and briquets.

Diminishing production and some improvement in retail demand brought stronger prices in the Kansas City market the first week in January, lifting shaft-mined lump from $4 to $4.50@$4.75 and strip-pit lump from $3 to $3.50@$4. These prices were held under pressure for the rest of the month. Screenings were $2@$2.25. Operators reported an accumulation of "no bills" of all sizes except nut.

THE strike situation had very little effect upon the Colorado market last month. Walsenburg and Trinidad mines were operating close to 70 per cent of capacity and improvement also was reported in the northern lignite field. Complaint is no longer that there is a lack of men but that man-power is less effective. After a brisk opening fortnight, warmer weather took the edge off the market and a few "no bills" accumulated in the southern part of the state.

Colorado prices throughout the month were as follows: Walsenburg-Canon City lump, $5.75; washed nut, $4.75; washed chestnut, $4.25; Trinidad coking lump, $4.25; nut, $3.75; chestnut, $3.25; Routt County lump, $5.75; nut, $4.75; 4-in. lignite lump, $4; anthracite, $9. Screenings ranged from $1.25 to $1.50.

A slight upturn in prepared prices in Cincinnati the first week of the year was followed by a return to a lower basis which held throughout the rest of the month. In the steam market, rumors of large-scale consolidations stiffened quotations on byproduct slack without changing the actual levels. The low volatiles fluctuated but little, the average spread being 25c. The marked exception was slack, which dropped from 90c.@$1.25 to 50c.@$1, with occasional sales under the 50c. minimum.

THE spread in high volatiles has been wider. The best grades of prepared coals, however, managed to hold close to $3@$3.25 in the face of keen competition. Less firmly established coals ranged from $2 up, with southeastern Kentucky quotations falling in line with West Virginia prices. A soggy mine-run market robbed slack of any benefit which might have accrued from curtailed production of the prepared sizes. In the local Cincinnati retail trade prices were firm, but deliveries were spotty.

Stockpiles accumulated last year still act as a brake on spot buying in the Columbus industrial market. Retail movement has been more brisk and there has been fairly steady buying.

Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F. O. B. Mines

		Week Ending			
LOW-VOLATILE, EASTERN	Market Quoted	Jan. 7, 1928	Jan. 14, 1928	Jan. 21, 1928	Jan. 28, 1928
Smokeless lump	Columbus	$3.50@$3.75	$3.50@$3.75	$3.50@$3.75	$3.50@$3.75
Smokeless mine-run	Columbus	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
Smokeless screenings	Columbus	1.00@ 1.50	1.00@ 1.50	1.00@ 1.45	1.00@ 1.40
Smokeless lump	Chicago	3.75	3.50@ 3.75	3.50@ 3.75	3.50@ 3.75
Smokeless mine-run	Chicago	2.00@ 2.25	1.85@ 2.25	1.85@ 2.25	1.85@ 2.25
Smokeless lump	Cincinnati	3.75	3.50@ 3.75	3.50@ 3.75	3.75
Smokeless mine-run	Cincinnati	1.90@ 2.25	1.90@ 2.25	2.00@ 2.25	2.00@ 2.25
Smokeless screenings	Cincinnati	.90@ 1.25	.75@ 1.10	.50@ 1.10	.50@ 1.00
Smokeless mine-run	Boston	3.90@ 4.10	3.90@ 4.10	4.00@ 4.15	4.20@ 4.25
Clearfield mine-run	Boston	1.70@ 1.95	1.70@ 1.95	1.70@ 1.95	1.65@ 1.90
Cambria mine-run	Boston	1.85@ 2.10	1.85@ 2.10	1.80@ 2.10	1.75@ 2.00
Somerset mine-run	Boston	2.00@ 2.20	2.00@ 2.20	1.90@ 2.15	1.90@ 2.15
Pool 1 (Navy Standard)	New York	2.50@ 2.75	2.50@ 2.75	2.50@ 2.65	2.50@ 2.65
Pool 1 (Navy Standard)	Philadelphia	2.50@ 2.80	2.50@ 2.80	2.50@ 2.80	2.50@ 2.80
Pool 1 (Navy Standard)	Baltimore	2.20@ 2.30	2.25@ 2.35	2.15@ 2.25	2.15@ 2.25
Pool 9 (super. low. vol.)	New York	1.90@ 2.15	1.90@ 2.15	1.90@ 2.15	1.90@ 2.15
Pool 9 (super. low. vol.)	Philadelphia	1.95@ 2.25	1.95@ 2.25	1.95@ 2.25	1.95@ 2.25
Pool 9 (super. low. vol.)	Baltimore	1.80@ 1.85	1.85@ 1.95	1.75@ 1.80	1.75@ 1.80
Pool 10 (h. gr. low. vol.)	New York	1.65@ 1.90	1.65@ 1.90	1.65@ 1.90	1.65@ 1.90
Pool 10 (h. gr. low. vol.)	Philadelphia	1.65@ 1.85	1.65@ 1.85	1.65@ 1.85	1.65@ 1.85
Pool 10 (h. gr. low. vol.)	Baltimore	1.60@ 1.75	1.65@ 1.85	1.50@ 1.65	1.50@ 1.65
Pool 11 (low. vol.)	New York	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Pool 11 (low. vol.)	Philadelphia	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pool 11 (low. vol.)	Baltimore	1.45@ 1.55	1.50@ 1.65	1.40@ 1.50	1.40@ 1.50
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.)	New York	$1.25@$1.50	$1.25@$1.50	$1.30@$1.50	$1.30@$1.50
Pool 54-64 (gas and st.)	Philadelphia	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60
Pool 54-64 (gas and st.)	Baltimore	1.25@ 1.45	1.35@ 1.50	1.20@ 1.40	1.20@ 1.40
Pittsburgh se'd gas	Pittsburgh	2.10@ 2.25	2.00@ 2.25	2.00@ 2.50	2.00@ 2.50
Pittsburgh gas mine-run	Pittsburgh	1.85@ 2.00	1.75@ 2.00	1.85@ 2.00	1.90@ 2.15
Pittsburgh st. mine-run	Pittsburgh	1.75@ 1.85	1.75@ 1.90	1.75@ 1.85	1.75@ 1.85
Pittsburgh gas slack	Pittsburgh	1.00@ 1.10	1.10@ 1.25	1.25	1.00@ 1.25
Kanawha lump	Columbus	2.00@ 3.00	2.00@ 3.00	2.00@ 3.00	2.00@ 2.75
Kanawha mine-run	Columbus	1.25@ 1.65	1.25@ 1.65	1.25@ 1.65	1.25@ 1.60
Kanawha screenings	Columbus	.65@ 1.00	.70@ 1.00	.60@ 1.00	.60@ 1.00
W. Va. lump	Cincinnati	2.25@ 3.25	2.25@ 3.00	2.00@ 3.00	2.00@ 3.00
W. Va. gas mine-run	Cincinnati	1.35@ 1.75	1.35@ 1.75	1.35@ 1.65	1.35@ 1.65
W. Va. steam mine-run	Cincinnati	1.15@ 1.35	1.10@ 1.40	1.00@ 1.50	1.00@ 1.50
W. Va. screenings	Cincinnati	.50@ 1.00	.50@ 1.00	.50@ 1.00	.50@ 1.00
Hocking lump	Columbus	2.00@ 2.30	2.00@ 2.30	2.00@ 2.25	2.00@ 2.25
Hocking mine-run	Columbus	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Hocking screenings	Columbus	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25	1.00@ 1.20
Pitts. No. 8 lump	Cleveland	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pitts. No. 8 mine-run	Cleveland	1.35@ 1.75	1.35@ 1.75	1.35@ 1.75	1.35@ 1.75
Pitts. No. 8 screenings	Cleveland	1.00@ 1.30	1.00@ 1.30	1.00@ 1.30	1.10@ 1.30

* Gross tons, f.o.b. vessel, Hampton Roads.

Large production in the Southern fields, however, has prevented any upturn in prices on the larger sizes of coal and some fancy grades from West Virginia have been offered at bargain-counter figures. Little progress has been made in Ohio toward opening mines on a non-union basis. Pomeroy has curtailed output and the eastern Ohio operations venturing into the open-shop field have found it difficult to dispose of their product.

Such expansion in consumer demand as has come to the Pittsburgh market the past few weeks has been concentrated largely upon contract business. Concessions have been demanded by spot buyers who have been approached by producers carrying unbilled loads at the mines. Greater control over output, however, has had a healthy effect upon the slack market and prices were stiffer at the close of the month. There also has been a fairly active retail trade in the district.

CENTRAL Pennsylvania production held close to a weekly average of 15,000 carloads in January. The first week of the month loadings were reported as 14,128 cars; the week ended Jan. 14 the total rose to 15,757 cars, dropping back to 15,004 cars the following week and 15,125 cars the week ended Jan. 28. "No bills" at the end of the month exceed 2,100 cars and there was sharp competition for all the spot business available. Preliminary negotiations were started for the closing of contracts for the 1928-29 coal year.

For the most part the steam-coal situation in New England last month was only a continuation of the depressed market that prevailed during the closing weeks of 1927. Buyers were apathetic and spot sales were effected only under strong pressure. On the other hand a substantial tonnage has been closed for the coming coal year on price bases to be determined monthly by cost of production and general market conditions. Practically all of the coal which has been so sold is low volatile.

Until the last week in January the Hampton Roads f.o.b. market suffered seriously from the accumulations which had been permitted by most operating interests. Beginning with the final week of the month, however, curtailment again became the watchword and spot prices reacted to the stimulus of reduced offerings. The minimum on Navy Standard rose from $3.90 per gross ton f.o.b. vessels to $4 and closed the month at $4.20@$4.25, with an actual shortage of prompt coals.

FOR inland delivery at Providence and Boston current prices have shown a decided improvement. The market lagged until about the third week, when more seasonable weather gave rehandlers who have their own storage facilities an opening to mark up quotations. From a wobbly minimum of $5 f.o.b. Boston the price moved up to $5.40 with some sales as high as $5.50. Providence prices also have advanced. The spot market

all-rail coals from central Pennsylvania is still colorless.

Dullness was the lot of the bituminous market in New York last month. Buying was exceedingly quiet, with a large number of consumers still drawing upon stockpiles for their current requirements. Interest in new contracts and contract renewals was at a low ebb. Buyers wanted to sign up on the basis of current spot quotations and sellers declined to commit themselves to such an arrangement.

Open-market buying throughout the month was very uneven. Shipments to tidewater piers were curtailed because of this unsatisfactory state of demand. Most of the spot orders were for small lots. Low-volatile coals showed the most consistent strength; spurts in high-volatile demand were short-lived.

SOME signs of improvement over December were shown in the Philadelphia bituminous market last month. A number of contracts expired around the first of the year and several of these were renewed, but there was little interest in new commitments although some shippers were anxious to close business to April 1, 1929. Current contract quotations range from $2 to $2.50, depending upon grade and wage conditions.

In the spot market the disposition still is strong to buy only on a hand-to-mouth basis. Nevertheless there have been cases where consumers who have been drawing upon stockpiles have come into the market for tonnages somewhat in excess of actual current requirements. The higher grades of fuel are in the strongest position in the open market and some shippers report enough business booked to insure full-time operations. The tidewater market has been quiet. Bunkering has been normal; there has been little activity in exports. The Baltimore market has been featureless.

An early cold snap quickened the retail market in the Birmingham district and cleaned out the yard stocks of many distributors whose replacement orders gave the wholesalers the first active buying of the winter season. Intermittent cold spells later in the month also helped to put January ahead of the preceding month in the matter of retail demand.

STEAM coal, on the other hand, revealed no symptoms of recuperation. Spot demand was unusually light and contract consumers insisted that deliveries to them be cut to the minimum. Coking coals, however, enjoyed a normal demand as all byproduct ovens in the district were operating on regular schedules. Coke for domestic consumption moved freely during the periods of weather demand. Foundry sales were satisfactory when the state of the iron and steel industry was taken into account. Domestic coke held at $4@$4.50; foundry, $5, f.o.b. ovens.

The first month of the year was not a cheering one to the anthracite trade in New York territory. There was no steady retail demand and the bulk of the deliveries to the domestic consumer were for small lots. Egg was more active in the wholesale market the first fortnight while stove was hard to move. Chestnut held the lead. Dealers are not interested in increasing stocks and are beginning to discuss the possibility of spring discounts.

The lessened demand for domestic sizes, however, curtailed production sufficiently to strengthen the market in steam sizes. Rice and barley were the principal beneficiaries with free offerings scarce toward the close of the month. River barley commanded as high as $1 and $1.20. No. 1 buckwheat was readily obtainable from most shippers throughout the entire period.

PHILADELPHIA also reported an unsatisfactory anthracite market after the effects of an early weather demand had worn away. Demand followed the fluctuations of the thermometer, but mines were unable to change their production schedules fast enough so that there was no time during the month when there was tightness in any of the domestic sizes. Nut was the most active although there was a surplus available throughout the month. Stove was easy; the call for egg was indifferent. Pea was sluggish and some independents shaded prices 25c. to move surplus stocks.

As at New York the steam coal market was favorably affected by a reduction in operating time at the mines. Some difficulty was reported in certain quarters in meeting contract obligations. Under such conditions there naturally was little surplus coal to be dumped on the market. The Baltimore market was a creature of weather conditions and until the close of the month these conditions did not encourage heavy buying by domestic consumers.

Preliminary figures of the U. S. Bureau of Mines estimate the total bituminous coal production last month at 44,200,000 net tons, as compared with 41,277,000 tons the preceding month and 56,882,000 tons in January, 1927. The anthracite output last month was estimated at 5,683,000 net tons, as compared with 6,032,000 tons in December and 6,561,000 tons in January, 1927. Beehive coke output was 373,000 net tons, as compared with 377,000 tons in December and 787,000 tons in January, 1927.

BITUMINOUS exports in December, 1927—the latest month for which figures are available—were 832,408 gross tons as against 4,229,492 tons in December, 1926. The total bituminous exports for last year were 16,081,914 tons; in 1926 the total reached 31,492,801 tons. Anthracite exports for the year were 2,969,203 gross tons, as compared with 3,597,931 tons in 1926. Total coke exports dropped from 881,482 tons in 1926 to 720,236 tons.

During the year the United States imported 71,222 gross tons of duty-free bituminous coal and 470,073 tons upon which a duty was assessed. For 1926 the figures were 91,571 and 383,106 tons, respectively. Anthracite imports last year totaled 106,277 tons; in 1926 the total was 726,746 tons. Coke imports declined from 254,061 tons in 1926 to 150,767 tons in 1927. All of the dutiable coal last year came from Canada.

Aside from the possibility that the Midwest labor situation may stimulate storage buying, the outlook for spot business this month is not bright.

Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F. O. B. Mines

		Week Ending			
MIDDLE WEST	Market Quoted	Jan 7, 1928	Jan. 14, 1928	Jan. 21, 1928	Jan. 28, 1928
Franklin (Ill.) lump	Chicago	$2.75@$3.50	$2.75@$3.50	$2.75@$3.50	$2.75@$3.50
Franklin (Ill.) mine-run	Chicago	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
Franklin (Ill.) screenings	Chicago	1.45@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.85
Central (Ill.) lump	Chicago	2.25@ 3.00	2.25@ 3.00	2.25@ 3.00	2.25@ 3.00
Central (Ill.) mine-run	Chicago	2.10@ 2.25	2.10@ 2.25	2.10@ 2.25	2.10@ 2.25
Central (Ill.) screenings	Chicago	1.25@ 1.65	1.45@ 1.65	1.45@ 1.65	1.45@ 1.65
Ind. 4th Vein lump	Chicago	2.50@ 3.25	2.50@ 3.25	2.50@ 3.25	2.50@ 3.25
Ind. 4th Vein mine-run	Chicago	1.65@ 2.35	1.65@ 2.35	1.65@ 2.35	1.65@ 2.35
Ind. 4th Vein screenings	Chicago	1.65@ 1.85	1.65@ 1.85	1.65@ 1.85	1.65@ 1.85
Ind. 5th Vein lump	Chicago	2.25@ 2.75	2.25@ 2.75	2.25@ 2.75	2.25@ 2.75
Ind. 5th Vein mine-run	Chicago	1.65@ 2.10	1.65@ 2.10	1.40@ 2.10	1.40@ 2.10
Ind. 5th Vein screenings	Chicago	1.55@ 1.65	1.55@ 1.65	1.55@ 1.65	1.55@ 1.65
Mount Olive lump	St. Louis	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75
Mount Olive mine-run	St. Louis	2.00	2.00	2.00	2.00
Mount Olive screenings	St. Louis	1.35@ 1.50	1.50@ 1.60	1.50@ 1.60	1.40@ 1.50
Standard lump	St. Louis	2.50@ 2.60	2.50@ 2.60	2.35@ 2.50	2.35@ 2.50
Standard mine-run	St. Louis	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Standard screenings	St. Louis	.90@ .95	.95@ 1.00	.95@ 1.10	.95@ 1.00
West Ky. block	Louisville	1.75@ 2.10	1.75@ 2.10	1.75@ 2.00	1.75@ 2.00
West Ky. mine-run	Louisville	1.00@ 1.20	1.00@ 1.20	1.00@ 1.50	1.10@ 1.50
West Ky. screenings	Louisville	.85@ 1.00	.85@ 1.00	.85@ 1.00	.80@ 1.00
West Ky. lump	Chicago	1.50@ 2.10	1.50@ 2.10	1.50@ 1.90	1.50@ 1.90
West Ky. mine-run	Chicago	.90@ 1.15	1.00@ 1.35	1.00@ 1.35	1.00@ 1.35
West Ky. screenings	Chicago	.80@ 1.00	.85@ 1.00	.80@ 1.00	.80@ 1.00
SOUTH AND SOUTHWEST					
Big Seam lump	Birmingham	$2.25@$2.50	$2.25@$2.50	$2.00@$2.50	$2.00@$2.50
Big Seam mine-run	Birmingham	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00
Big Seam (washed)	Birmingham	1.75@ 2.00	1.50@ 2.00	1.75@ 2.00	1.75@ 2.00
S. E. Ky. block	Chicago	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75
S. E. Ky. mine-run	Chicago	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60
S. E. Ky. block	Louisville	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50
S. E. Ky. mine-run	Louisville	1.30@ 1.65	1.30@ 1.65	1.30@ 1.65	1.30@ 1.65
S. E. Ky. screenings	Louisville	.70@ 1.00	.70@ 1.00	.75@ 1.10	.50@ .95
S. E. Ky. block	Cincinnati	2.25@ 3.25	2.25@ 3.25	2.25@ 3.00	2.00@ 3.00
S. E. Ky. mine-run	Cincinnati	1.10@ 1.75	1.00@ 1.75	1.00@ 1.75	1.00@ 1.65
S. E. Ky. screenings	Cincinnati	.50@ 1.00	.50@ 1.10	.50@ 1.10	.50@ 1.00
Kansas shaft lump	Kansas City	4.50@ 4.75	4.50@ 4.75	4.50@ 4.75	4.50@ 4.75
Kansas strip lump	Kansas City	3.50@ 4.00	3.50@ 4.00	3.50@ 4.00	3.50@ 4.00
Kansas mine-run	Kansas City	3.00	3.00	3.00	3.00
Kansas screenings	Kansas City	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25

OPERATING IDEAS *from* Production, Electrical *and* Mechanical Men

Electric Cable Weighing Six Tons Is Lowered In 725-Foot Shaft in Eight Hours

ELECTRIC power for underground hoists, pumps and lights was required in a newly developed section of Mascot mine No. 2 of the American Zinc Company of Tennessee, Mascot, Tenn. This section was several thousand feet from the main shaft and power supply. Near it was a 5x10-ft. vertical shaft to the surface used only for ventilation. The shaft is timbered for a distance of about 25 ft. from the surface. The remaining 700 ft. is in solid rock and is not timbered. In the interest of economy, the electric cable was installed in the shaft instead of running it underground.

As the shaft was without hoisting equipment and supports to which the cable could be fastened, it was necessary to lower all of it into the mine from the surface and support its weight at the top. The cable weighs 15½ lb. per lineal foot; hence, the weight of the suspended section is 11,240 lb. It is a 400,000 circ.mill, 3 conductor, standard 4/64x4/64-in. varnished cambric, lead (⅛-in.) and jute cable armored with 30 No. 4 B.W.G. steel wires. It carries 2,300 volts.

The accompanying illustrations show various details of the lowering operation. A rough timber frame was erected over the shaft to support the sheave wheels. Two reels of ¾-in. galvanized stranded steel messenger cable were placed about midway between the shaft and the hoist. A short piece of cable was run around the sheave fastened to the lowering tackle, and the ends clamped to the messenger cables—this served to equalize the load on them.

$5 and More

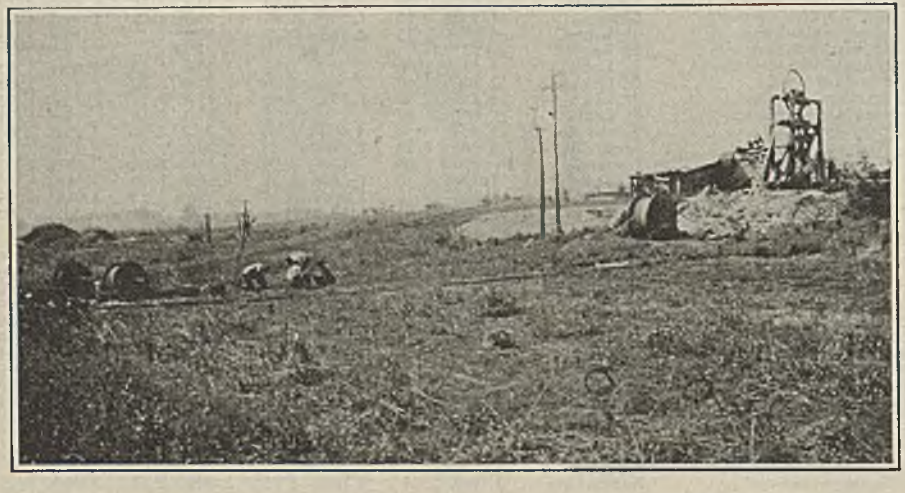
For practical ideas.

Operating men work out efficient methods for doing all sorts of jobs in and about the mines. Why not tell your friends about them through the pages of *Coal Age?* And at the same time get paid for it?

A brief description with a pencil sketch or, better still, a photograph will do. *Coal Age* editors, draftsmen and artists will do the rest.

Everybody gains by an exchange of ideas, and every one published herein is paid for.

General View of Lowering Operation

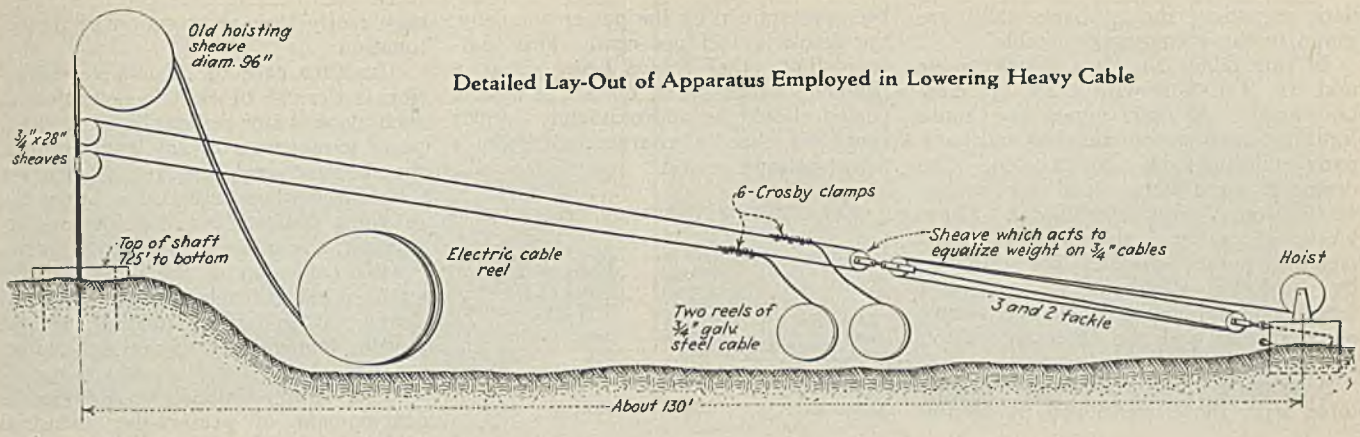


Close-Up of Sheave Wheels

The ¾-in. cables and the electric cable were fastened together with clamps which were attached at the shaft collar (at about 10 ft. intervals) as the cables were lowered.

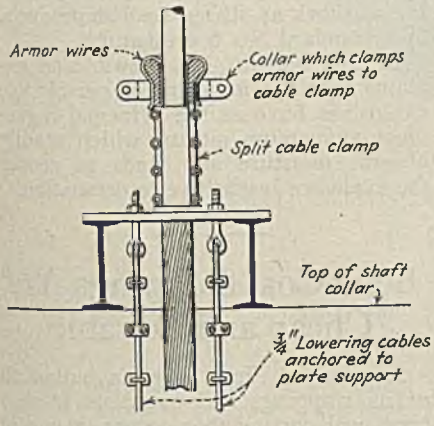
When nearly all of the tackle was run out, the ¾-in. cables were unreeled, doubled back to the hoist anchor and properly "snubbed" to it. The hoist was lowered until all of the weight was off the tackle and the equalizer fastenings were then removed. The tackle was pulled back close to the double block and the equalizer again clamped to the ¾-in. cables ahead of the anchor fastenings. The hoist was then pulled up (transferring the weight to the tackle) and the snub fastenings taken off. At this point, lowering operations began and 850 ft. of electric cable was payed into the mine in 8 hours by this method.

The method of permanently fastening the cable at the top is shown in another drawing. A split cast-iron collar,



Detailed Lay-Out of Apparatus Employed in Lowering Heavy Cable

held together with bolts, clamps the electric cable. The steel armor wires are broken and carefully bent to conform to the machined top of the collar. Another split collar or clamp serves to hold the 30 No. 4 B.W.G. steel armor wires. This fastening, of itself, is sufficient to support the weight of the electric cable. The two ¾-in. steel messenger



Details of Cable Suspension

cables are fastened to the supporting plate through eyebolts and, for the present, carry part of the weight. It is thought that the clamps eventually will rust out and all of the weight, therefore, be transferred to the armor wires.

Use Pulverized Fuel Ash For Rock-Dusting?

The ever-increasing number of pulverized fuel burners that are being installed in the power plants of coal mining companies in the United States causes J. W. Powell, Welch, W. Va., to ask why the fine impalpable ash that results from this system of combustion could not be utilized for rock-dusting. This ash is certain to contain little or no combustible matter and is of such fineness that it would be particularly adaptable to rock-dusting in that it would eliminate, in addition to the cost of material, the expense of crushing.

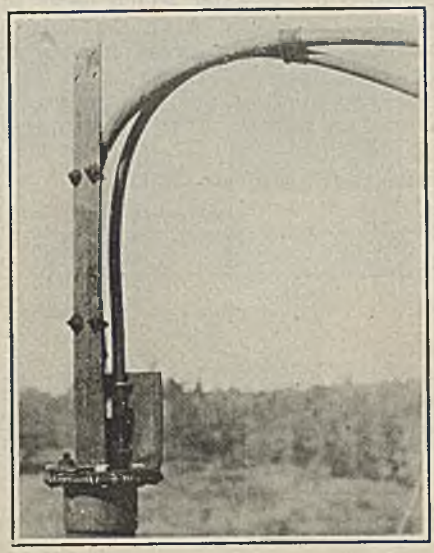
Surface Substation Has Novel Cable Support

Placing substations underground is not favored by officials of the West Kentucky Coal Co., which operates twenty mines in Union, Webster and Hopkins counties, Kentucky. Of the mines, nine are shaft, six are slope and five are drift. Even though the company owns but little of the surface, all substations are placed above ground.

One of the accompanying photographs shows a recently-completed 200-kw. substation supplying power to the Sunset mine, Madisonville. This substation is located about a mile from the tipple, where there is another machine with which it operates in parallel. The new unit is a synchronous motor generator with full automatic control including a stub multiple-feed reclosing breaker.

Another photograph shows a close-up of the direct-current feeder suspension at the borehole beside the substation. The spiral wire armor of the 750,000-circ. mil positive cable is cut and the ends of the wires turned out and clamped between two flanges resting on top of the casing. The cable is then clamped to a vertical support to prevent bending at the point where there is no armor. The rubber-covered double-braid negative cable of the same capacity is suspended by two U-bolt clamps. The borehole is 161 ft. deep.

"Close-Up" of Feeder Suspension



Inspecting the New Plant

Demand Rate Depends on Several Factors

To only state that the demand portion of a power rate schedule is, for instance, $1.75 per kilowatt per month, does not tell the whole story. It is also necessary to state whether the demand in kilowatts is determined by contract, by calculation from connected horsepower or by meter. If it is by meter, which is perhaps the fairest and now the most common method, then the interval for which the meter is set must be stated.

The shorter the time interval the greater is the maximum-demand indication and, therefore, the lower should be the rate per kilowatt per month, providing other things are equal. The ratio between five- and fifteen-minute demand readings depends, of course, upon the characteristics of the load at the particular mine.

A power company supplying a large group of bituminous mines found that a five-minute demand could be expected to be from 4 to 16 per cent greater than a fifteen-minute demand. Additional

data regarding the probable ratio are given in the accompanying table.

In this table, No. 1 is a drift mine and No. 2 a shaft with a 250-hp. electric hoist. At both mines the house lighting, town water pumping and company building loads are included. The demands were determined by an investigation of wattmeter charts. These were laid out on a table and all high-demand points checked for duration by using two dividers, one set for a length corresponding to five minutes on the chart and the other for fifteen minutes.

Averaging the percentages in the table with those mentioned as having been determined by the power company, the result is 14.1 per cent. This indicates that, other things being equal, a demand charge based on a five-minute period should be approximately 14 per cent less than a charge based on a fifteen-minute period.

RELATION OF MAXIMUM DEMANDS

	Fifteen-Minute Period Kw.	Five-Minute Period Kw.	Per Cent Greater Than Fifteen-Minute
Mine No. 1			
March	400	440	10.0
April	440	510	17.5
May	440	480	9.1
Mine No. 2			
December	230	285	24.0

Correct Handling of Permissible Explosives Essential to Successful Shooting

PERMISSIBLE explosives should be taken into the mine in a container designed to keep the powder dry. Powder left over from a previous day should be used first.

"Half cartridges or other fractional parts of cartridges should always be so placed in the borehole that the open end, which may have become insensitive through the absorption of moisture, will be next to the solid coal and thus will not prevent propagation of detonation through the rest of the charge. The improper location of part cartridges is, in my experience, the greatest single factor contributing to either imcomplete detonation or burning of a charge."

Thus Paul F. Lewis, in a recent issue of the *DuPont Explosives Service Bulletin,* discusses the proper use of permissible explosives to assure complete detonation. Furthermore, Mr. Lewis goes on to say:

"Before loading a borehole, particular care should be taken to see that the hole is scraped free of dust or borings. It is also advisable to make it a practice to push the entire charge to the back of the hole at one time in order to avoid getting borings between cartridges—something which is apt to occur and does occur when each stick is pushed back separately. Even a small quantity of dust is sufficient to form an obstruction which will prevent propagation. In some tests that were made along this line, one-half inch of coal dust between two cartridges caused the unprimed cartridge to fail in fifty per cent of the test shots. One inch of coal dust between the two cartridges caused failures of one hundred per cent of the test shots. This surely proves the desirability of scraping the hole and pushing the cartridge all back together.

"Some missed shots have been traced to the practice, on the part of some of the miners and shot firers, of cutting the paper off the ends of the cartridges and of rolling cartridges to make them soft, in the belief that by so doing they make the explosive more sensitive. Rolling is bad practice when applied to a normal cartridge for two reasons: In the first place, the powder is carefully packed at the plant to the density calculated to give best results; in the second place, in rolling the cartridge the crimped ends are opened and the powder is exposed.

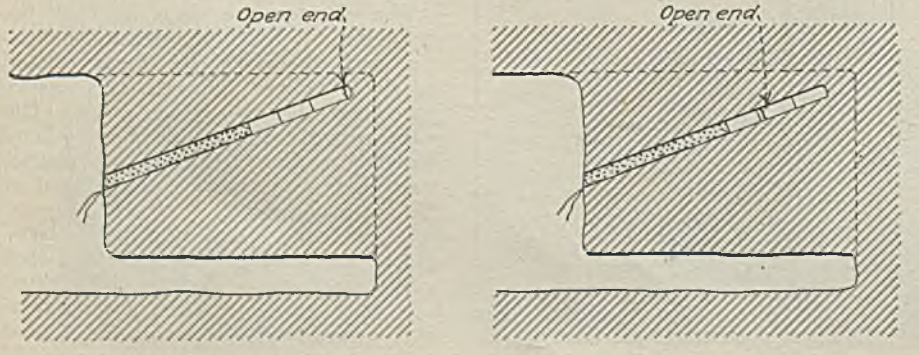
"If cartridges with open ends are placed in a wet hole—and many mines have wet holes—the powder is directly exposed to the water which backs up around the charge when the hole is tamped. The water, having free access, quickly enters the powder at the ends and desensitizes it. An inch or two of insensitive powder at the cartridge ends may easily stop propagation of the detonation.

"Another case of incomplete detonation is the use of electric detonators of such poor water-resistance that, if exposed to moisture for any length of time, they become weakened to a point where their force when exploded is below that set for a standard No. 6 detonator. As a result, the wave of detonation started by the explosion of the detonator dies out in what is termed a local or partial detonation, having exploded only the powder immediately adjacent to the detonator.

"One of the important steps in the development of present-day industrial explosives has been making them safer to use than were the earlier types by decreasing their sensitiveness to ordinary shocks of handling and transportation. Consequently, a powerful force is necessary to detonate them properly in the borehole. Especially with the increasing use of low-density explosives in small-diameter cartridges it is important that detonators be used which can be depended upon at all times to give an initial shock as strong as that produced by a standard No. 6 detonator."

In this bulletin Mr. Lewis also explains that the majority of permissible explosives have as the principal ingredient ammonium nitrate, which readily absorbs moisture and tends to render the explosive insensitive to detonation.

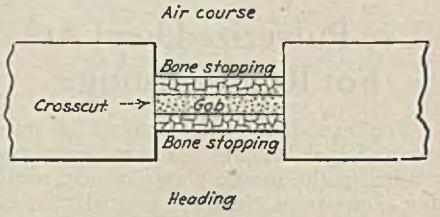
Correct and Incorrect Positions for Fractional Cartridges



Bone Coal Stoppings Are Cheap and Durable

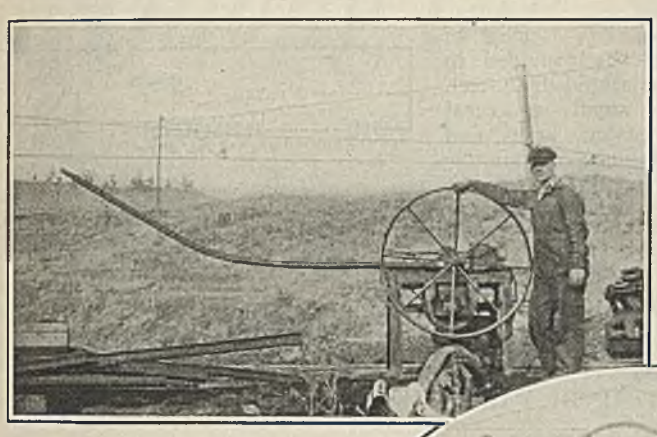
A mine in West Virginia builds all of its stoppings and overcasts from a bone coal parting that occurs in one of the seams. This construction is cheaper than any other permanent design and can be erected by one man in about five hours. The bone coal is laid in a concrete mortar and makes an economical and air-tight installation.

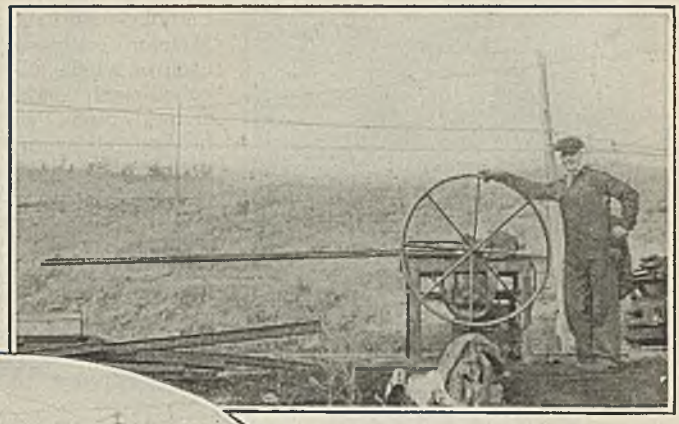
The life of such a stopping or overcast is the same as if it were built of



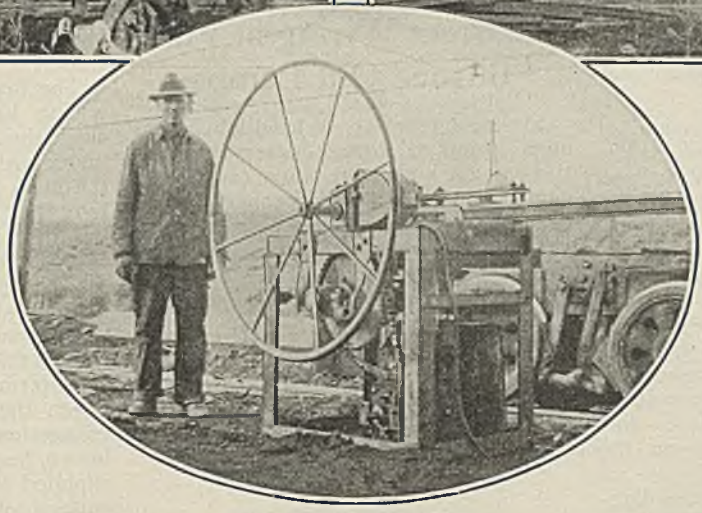
Permanent Though Economical

concrete. It will not slack on exposure to air, water has no effect and it has a higher crushing strength than concrete, brick or tile. The bone coal has a high content of ash and sulphur and is classed as an impurity at this mine.





How the Crooked Is Made Straight Is Shown in the Top Views



Oval at Left Presents a Close-up of Device That Straightens Bent Rails

Rail Straightening Machine, Simple and Efficient, Is Convenient and Economical

THE Sheridan-Wyoming Coal Co., which operates mines at Acme and Monarch, Wyo., found that it had a large quantity of curved 20- and 30-lb. track rails on hand. The straightening of these, in order to put them back into service, presented a rather serious problem, particularly if the work was to be done by hand at the usual wage scale.

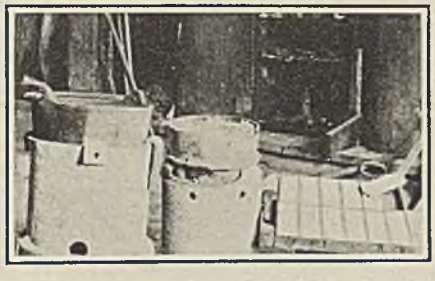
Through the efforts of C. F. Shott, master mechanic, and Charles McIntyre, machinist at the Acme mine, a rail-straightening device was built that is both simple and effective. This machine is driven by a 1-hp. back-geared 250-volt motor of the same type as those which are used to operate the cable reels on the gathering locomotives. Three rolls, shaped to accommodate the different sizes, engage the rails. The large wheel, 4 ft. in diameter and operated by hand, is attached to a 2-in. screw and provides the proper tension to the rolls. No doubt this large wheel could be operated by machinery. However, due to the difference in hardness of the rails, it is better to operate the tension-screw by hand.

By this device it is possible, with 3 men, to straighten a full-length 20-lb. rail of short radius in from 20 to 30 seconds. This time includes the removal of surface bends.

Recasting Babbitt Scrap Proves Economical

Babbitt metal and lead have a way of accumulating about many mine plants, and a suitable method of handling these materials has not always been employed. At the Library shops of the Pittsburgh Coal Co. all babbitt turnings and any scrap metal of this character are melted and cast into pigs.

These are approximately 6¼ in. long, 2½ in. wide on one face, 1½ in. wide on the other and 1⅛ in. thick. Each pig weighs about 5 lb. The molds in which they are formed are made of either cast iron or brass and each mold holds 12 pigs. As may be seen, the metal is melted in pots suspended in home-made furnaces fired by natural gas. From these pots it is dipped and poured into the molds with a suitable ladle. Treating such scrap material in this manner puts it into a convenient form for handling, avoids waste and facilitates its sale. Old lead cable and pipe is treated in a similar manner. Some time ago about nine tons of these metals was cast into pigs and sold.



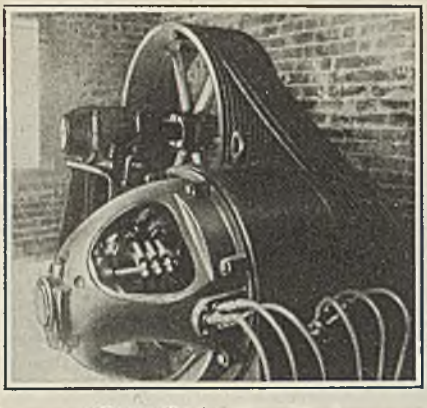
Avoids Waste and Saves Money

Fan Drive Provides for Increase of Speed

Most new fan installations should include a provision for increasing the speed at some later date. Even though a variable-speed motor is selected, it is usually a good plan to include a provision for a change in the driving ratio. This has been done with a fan recently installed by the American Rolling Mill Co. at the Nellis mine, Boone County, West Virginia.

The fan is at the top of a new 600-ft. 17-deg. air slope which is equipped with track and hoist. This slope also is used for bringing timber into the mine. A 150-hp. 440-volt variable-speed motor operates the fan through a Texrope drive.

Eight V-belts are now being used.



"Spares" of a New Kind

The motor pulley has a diameter of 12 in. and eight belt grooves. The diameter of the fan pulley is 56 in. and it has twelve grooves. When additional full-motor fan speed becomes necessary, a pulley of smaller diameter (but having twelve grooves) will be placed on the motor. There is sufficient slide-rail adjustment in the motor base to permit of the old belts being used with the smaller pulley. However, to take care of the additional power transmitted, four more belts will be applied—thus filling the remaining grooves on the fan pulley.

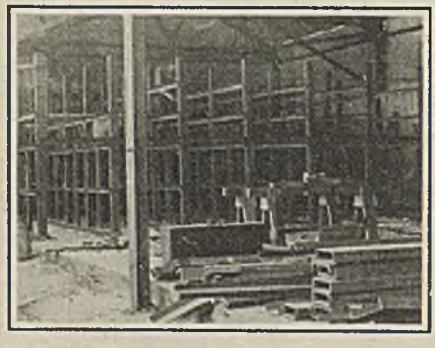
With the present pulleys the belt-center distance is but 66 in. This represents a considerable saving in the cost of the motor house over the space required for a long-center flat-belt drive.

Steel Racks Provide Ample Storage

Nearly every mine shop has the problem of storing stocks of the more or less bulky metallic shapes which are in almost daily demand. The usually accepted method of storing such material is in some form of covered rack.

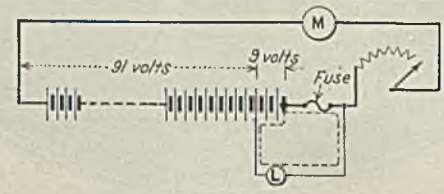
The illustration shows a rack for this purpose in the storage shed near the Pittsburgh Coal Co.'s Library shops. Built from small structural-steel shapes, riveted and bolted together, there is perhaps nothing unusual about this rack except its simple design and workmanlike construction. A series of skeleton compartments is provided in each of which may be stored drill steel, rolled-steel shafting, small structural shapes, pipes, well casing, brass and bronze rods or anything else of a similar nature that may be necessary for the operation of the shop. The stored material is readily accessible and is protected from the weather by the corrugated-iron shed, the framework of which forms an integral part of the rack itself.

Plenty of Room Here



Incorrect Wiring at Fuse Burned Out Lamps

Frequent renewals of headlight lamps on a group of storage-battery locomotives in an anthracite mine caused the chief electrician at this property much concern until he made a thorough investigation. From all appearances, he was receiving a poor quality of 9-volt headlight lamps for the locomotives.

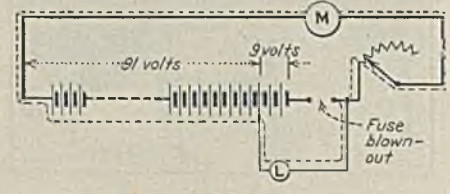


As Originally Wired

At first the chief electrician thought that the lamps were broken through mechanical causes. This assumption proved incorrect as samples of the discarded lamps distinctly indicated that they had been burned out.

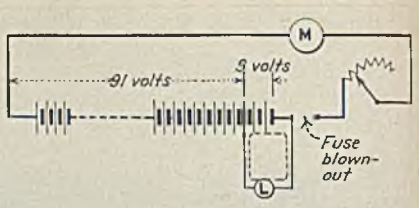
On more than one occasion the locomotive inspector personally put new lamps in the headlights, checked the voltage of the cells supplying the energy and rode around on the locomotives hoping to determine what was the cause of the trouble.

Time went on and no direct cause of the trouble could be ascertained. One day, while on another mission inside the mines, the electrician came upon a storage-battery locomotive which was standing without lights while a workman went to the shop for some new bulbs. Upon inquiry, the electrician learned that the headlights had gone out while the locomotive was making a heavy grade which blew the main motor fuses.



Lamps Burn Out if Fuse Blows

This was a clew, as it seemed certain that the frequent failure of the lamps was associated with the performance of the locomotive. A check of the locomotive wiring revealed the unexpected—the entire difficulty was due to the fact that one of the headlight wires was connected to the wrong side of the main fuse.



Protects Lamp Against Overvoltage

The first drawing shows the original wiring diagram. The dotted path indicates the circuit through the headlight under normal conditions. However, when the main fuse blows, and the controller is in the "on" position, the circuit to the headlight is as shown by the dotted path in the second sketch. It will be noticed that the potential across the lamp then is approximately 91 volts. This overvoltage naturally burned out the lamps.

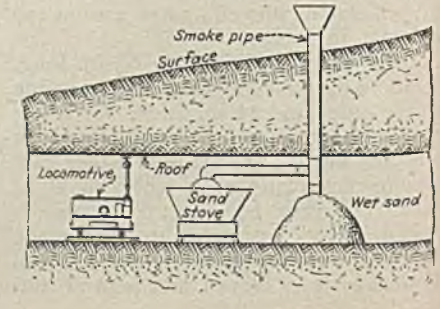
The third drawing shows the headlight terminal connected to a point between the battery and the fuse. This connection, even when the main fuse is blown, keeps the lamp lighted by energy supplied from the first few cells of the battery and eliminates the former difficulties.

Sand Stove in Mine Has Many Advantages

By locating the sand stove near the locomotive at the landing bottom, a mine in West Virginia has eliminated one day laborer. Previous to the adoption of the installation described below, one man was kept continuously busy carrying dry sand to the locomotive.

The sand is delivered on the surface by a teamster and is dropped into the mine through the smoke pipe before the stove is fired in the morning. In addition to the savings in labor, placing of the stove in the mine also has resulted in a substantial decrease in the quantity of sand used. The motorman, snapper or load-hitcher keeps the stove fired when the mine is in operation. All ribs around the stove are concreted.

Saves Labor and Material



Among the Manufacturers

FOUR new vice-presidents recently were appointed by the Link-Belt Co. They are George P. Torrence, in charge of Indianapolis plant operations and sales; George L. Morehead, Philadelphia, Pa., in charge of Eastern operations and sales; Frank B. Caldwell, in charge of the Chicago plant and tributary sales offices, and W. C. Carter, in general charge of production at all plants with headquarters at the Chicago office.

* * *

MERGER of the Andrews-Bradshaw Co., Pittsburgh, Pa., with the Blaw-Knox Co. recently was announced. The Andrews-Bradshaw Co. will operate as the Andrews-Bradshaw division of the Blaw-Knox Co. and its products will be manufactured in the main plant of the Blaw-Knox Co.

* * *

JAMES D. TEW has been placed in entire charge of all sales divisions of the B. F. Goodrich Rubber Co., Akron, Ohio. Mr. Tew's title will be first vice-president and general sales manager.

* * *

GEARS & FORGINGS, INC., is the name of a new company formed by the consolidation of the Van Dorn & Dutton Co., Cleveland, Ohio; Fawcus Machine Co., Pittsburgh, Pa.; William Ganschow Co., Chicago, and the Ohio Forge Co., Cleveland. F. W. Sinram, formerly president of the Van Dorn & Dutton Co., has been chosen president of the new company.

* * *

OFFICIALS of the Timken Roller Bearing Co. announce that an expenditure of $4,000,000 to be devoted to increasing the production facilities of the company has been authorized for this year. The greater part of this expansion program concerns the company's plant at Canton, Ohio, where both the steel mill and the bearing manufacturing plant proper will be considerably enlarged.

* * *

C. E. STUART, Massillon, Ohio, has resigned as president and treasurer and a director of the Central Alloy Steel Corporation of Canton and Massillon. F. J. Griffith, chairman of the board, announced that B. F. Fairless, Massillon, vice-president and general manager, had been elected president. He will continue as general manager.

* * *

THE WESTINGHOUSE ELECTRIC & MFG. CO. has purchased the Commercial Electric Supply Co. and the McGraw Electric Appliance Co., both of St. Louis, Mo. The two companies will be consolidated into a new concern to be known as the Commercial Electrical Supply Co.

THE NATIONAL CARBON CO., INC., Cleveland, Ohio, has opened four new branch offices. E. C. Friday is manager of the New York office, 357 West 36th St.; J. L. Green is in charge of the Chicago branch, 551 West Monroe St.; V. J. Nolan directs the Pittsburgh office, Arrott Power Building, and J. B. Collins manages the Birmingham (Ala.) office, 1824 Ninth Avenue North. J. A. Hammond has been made assistant manager in charge of carbon brush and specialty sales and E. R. Geib is assistant manager in charge of sales of illuminating carbons, both located at the main office.

* * *

THE OHIO BRASS CO., Mansfield, Ohio, has opened an office at 721 Healy Building, Atlanta, Ga. This will be used as headquarters by K. V. Farmer, H. H. Hoxie, J. A. Whatley and G. W. Willis, sales representatives of the company in the Southeast. Frank W. Gorman has been made sales representative at El Paso, Texas, relieving L. M. Keating, who has been transferred to the general sales department, Mansfield.

* * *

THE AMERICAN PULVERIZER CO., St. Louis, Mo., announces the appointment of the Kissick-Fenno Co., 9-15 Park Place, New York City, as sales representative in the metropolitan district.

* * *

THE AIR REDUCTION CO., INC., New York City, has acquired the assets and business of the Carolina Standard Gas Products Co., with an oxygen plant at Charlotte, N. C.

* * *

JOHN VAN HORNE has been transferred from the Atlanta (Ga.) office of the Lincoln Electric Co., Cleveland, Ohio, to Moline, Ill., where he will operate under the direction of R. D. Malm, Western manager at Chicago.

* * *

THE HENDRICK MFG. CO., Carbondale, Pa., has opened a Chicago office at 223 Railway Exchange Building, in charge of Lon Sloan.

* * *

H. F. T. ERBEN, assistant vice-president of the General Electric Co., has retired after more than 40 years of service with that company. B. L. Delack has been appointed manager of the Schenectady plant of the company and E. A. Wagner has been appointed manager of the Pittsfield (Mass.) plant.

* * *

IRES PROSSER has been appointed Southeastern representative by the Botfield Refractories Co., Philadelphia, Pa. His territory will embrace the entire Southeast from North Carolina to San Antonio, Texas, with headquarters in Atlanta, Ga.

A NEW DISTRICT SALES OFFICE has been opened by the Allis-Chalmers Mfg. Co., at 308 Heard Building, Phoenix, Ariz., with J. B. Cooper as manager. Earle R. Hury is in charge of a new branch at 619 Frost National Bank Building, San Antonio, Texas.

* * *

THE INDUSTRIAL EQUIPMENT CORPORATION was recently organized with offices and warehouses at Carnegie, Pa. This organization will market used and reconditioned machinery and equipment for manufacturers, mills, mines and contractors. L. A. Green, formerly of the L. A. Green Railway Equipment Co., is manager.

* * *

P. C. BROOKS was elected vice-president of Fairbanks, Morse & Co., Chicago, at a recent meeting of the board of directors. He also is president of E. & T. Fairbanks & Co., the scale subsidiary, and vice-president of the Canadian Fairbanks-Morse Co., Ltd.

* * *

THE CUTLER-HAMMER MFG. CO., Milwaukee, Wis., has appointed Fred H. Oberschmidt as manager of the Pacific Coast district, with headquarters in San Francisco. The company also has an office in Los Angeles.

* * *

GEORGE W. MCINTYRE has been named as New York representative of the Reed-Prentice Corporation, Worcester, Mass. His office will be at 75 West St.

* * *

THE OKONITE CO., Passaic, N. J., with sales offices at 501 Fifth Avenue, New York City, has purchased the insulated wire department of the Hazard Manufacturing Co. at Wilkes-Barre, Pa., which will be operated as the Hazard insulated wire works, a division of the Okonite Co.

* * *

GEORGE L. POLLOCK, vice-president and treasurer of the Burnside Steel Foundry Co., Chicago, since its organization, recently resigned to become vice-president of the Nugent Steel Castings Co., Chicago.

* * *

THE ROLLWAY BEARING CO., INC., Syracuse, N. Y., has opened a sales office at 614 Empire Building, Pittsburgh, Pa. Samuel Farrell, who has been affiliated with the company for a number of years with headquarters at Youngstown, Ohio, is in charge of the new office.

* * *

THE NAME of the Merrill-Ferguson Engineering Co., Beckley, W. Va., has been changed to the Ferguson-Gates Engineering Co.

WHAT'S NEW

In Coal-Mining  *Equipment*

Will Undercut, Centercut Or Shear from Track

A machine that it is claimed will put in a horizontal cut either at the bottom or in varying heights in the coal so as to take care of mining out dirt bands, etc., or will put in a vertical or shearing cut at different points of the face as required has been announced by the Sullivan Machinery Co., Chicago, Ill.

The manufacturer states that this machine can be used for entry driving or for use in rooms up to a width of 25 ft. The same machine may also be used for "slabbing" or pillar drawing, all of which is done from the track.

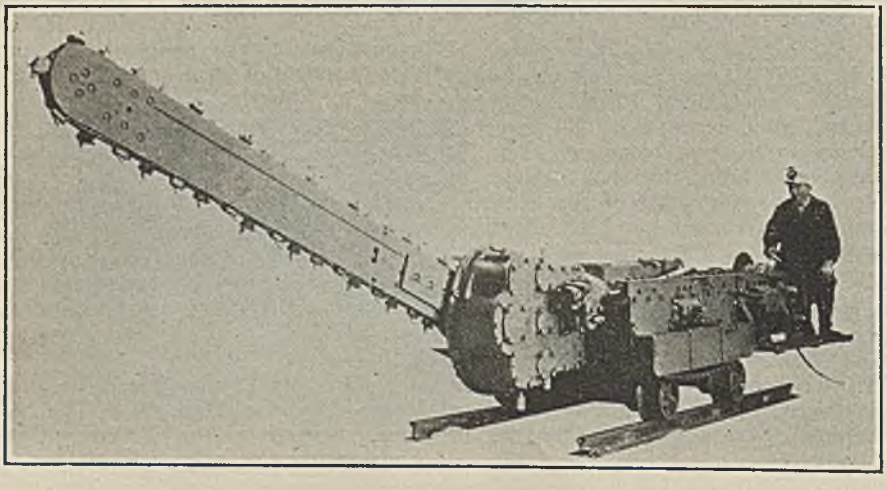
This machine is equipped with a 30-hp. motor similar to that used in the "Ironclad" room-and-pillar coal cutter, and performs all of its operations under its own power. All movements are controlled by friction clutches with the exception of the cutter-chain drive.

The cutter bar may be tilted downward to follow any irregularities of the bottom or it may be tilted upward to follow the unevenness of dirt bands or partings. In addition to this, the front end of the machine may be swung in a full circle to permit putting in a shearing cut on either side of the machine's center line. When desired to put in a center or a top cut this may be done by the proper adjustment.

This new machine weighs approximately 17,000 lb. and is 18 ft. 8 in. long without the cutter bar, which is 9 ft. in length. When at its low or normal position it is 33¾ in. high. Arms or cams are furnished on the axles by which the machine will lift itself. It may be locked at any point within the vertical range provided by these arms so that horizontal cuts may be put in the face at any desired height.

One man handles all the operations from a central point, from which all the controls are within easy reach. The control side of the cutter with the operator's platform is shown in the accompanying illustration at the bottom of this page. The manufacturer states that this machine travels at the rate of about 350 ft. per minute.

Cutter Bar Ready for Action



Heat-Resisting Cement Fortifies Furnaces

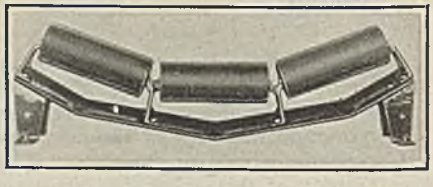
In metal-melting and heating furnaces, boiler furnaces, cement and lime kilns and other refractory structures the highly heated brickwork is subjected to the corrosive action of fuel ash and furnace products containing iron oxide, lime, magnesia, alkalies, etc. These basic oxides attack the siliceous firebrick and flux away their surfaces at temperatures far below the true softening point of the firebrick.

To resist this fluxing action and to prolong the life of fireclay brickwork Grefco, a true neutral material, a chrome-base cement free of silicate of soda and other acid fluxes, has been made. Grefco is exceptionally plastic and readily lends itself to either dipped or trowelled joints. Its softening point lies between 3,400 and 3,500 deg. F. After the firebrick has been laid up with this material the exposed surface of the brickwork should be covered with a plaster coating of the same cement either by trowelling or cement gun. Owing to its non-shrinking characteristics and ability to adhere to brickwork, the substance forms a working surface of chrome refractory which protects the brick against the fluxing action of basic substances and materially prolongs the life of the brickwork.

Refractory structures such as electric furnaces, combustion chambers in oil, gas and powdered-coal installations, coal-gas retorts, etc., which are subject to rapid failure, can be effectively repaired and kept in continuous operation by patching. The material is either rammed in place or preferably applied with a cement gun. This new cement is a product of the General Refractories Co., Philadelphia, Pa.

Build Conveyor Rollers For Rough Usage

A new anti-friction cast-iron pulley whose outer surface is made of chilled iron has been introduced by the Stearns Conveyor Co., Cleveland, Ohio. This surface is extremely hard and will stand the most severe wear under a wide range of conditions from extreme heat to cold. It has always been difficult to put a satisfactory chilled iron surface on a small casting, particularly a shell, but this company now manufactures an idler pulley having a good depth of chill. It has a denser and tougher material than a common chill, capable of receiving a high polish and contains the most wear-resisting material that is commercially practicable today.



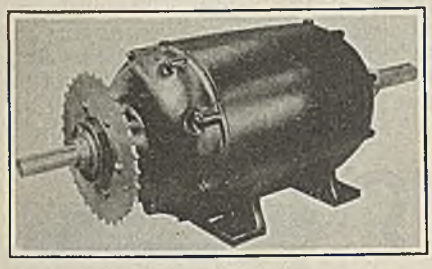
Hard Surface Resists Wear

The metal of these pulleys grades evenly to gray iron, giving a hard, smooth, wear-resisting surface with a relatively tough inside. The one-piece closed-end design makes these pulleys practically unbreakable even under the severest service. A combination grease seal keeps dirt out of the bearings and keeps the grease in, making lubrication and attention necessary only at long intervals. The Stearns Conveyor Co. is owned by the Chain Belt Co., in whose foundries the idlers are cast.

Special Speed Changers Operate Motors

Equipped with speed changers, high speed motors which are economical to purchase may be used to drive machinery. Variable operating speed may be obtained over a wide range by incorporating a variable-speed transmission in the drive.

The Stephens-Adamson Manufacturing Co., Aurora, Ill., has recently marketed a unit known as the JFS in which an entirely new principle of variable-speed transmission has been incorporated. The actual transmission of power is accomplished through the resulting action of genuine roller bearings revolving in polished races of submerged oil.



Transmission by Roller Bearings

The pressures between the rollers and races, sufficient to transmit rated horse powers, are only a fraction of the allowable unit pressures common to the usual ball and roller bearing loadings.

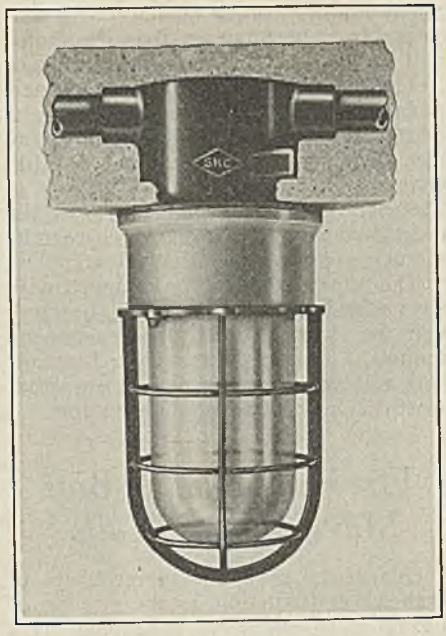
Variations in speed may be made without interruption while the machine is in motion. It may be driven in either clockwise or counter-clockwise direction with the same results. The standard outfit transmits from ½ to 15 hp. at the maximum reduction.

The first series of the JFS machines provides for a reduction of approximately 8 to 1 for the lowest speed. The second series manufactured cares for a reduction of about 40 to 1 for the lowest speed.

An interesting use of these machines is cited by the Stephens-Adamson Co. in describing the application of power to the shaft at the opposite end of the machine. The transmission is changed from a reducer to a machine which increases the input speed and transmits the power over a wide range of variation.

Vaporproof Fixtures Built To Exclude Dust and Gas

When laying out an electrical installation where vapors, fumes, gases or dust are present, it is imperative that they be excluded from the current-carrying parts and their insulation. While it is necessary to protect lamps from breakage in an atmosphere laden with explosive gases or dust, it is also necessary that the lamps or outlets be easily accessible for renewals or repairs.



An Aid to Safety

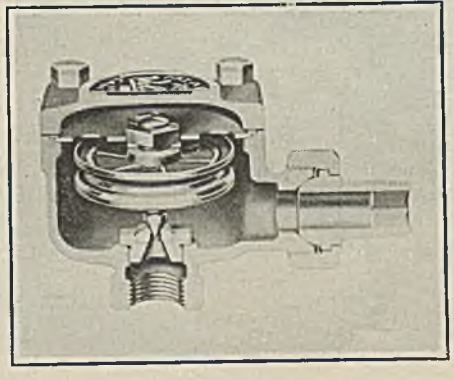
To meet the above requirements the Crouse-Hinds Co., Syracuse, N. Y., has perfected a series of vaporproof fixtures, one of which is shown here. The newest addition to this line is the type ARB. These are for 3½ or 4 in. outlet boxes or condulets of the SK series. They take 75-watt Mazda "C" lamps, 100-watt A23 lamps or other kinds not exceeding 2⅞x6⅛ in. The outfit is furnished with receptacle, gaskets, screws, and with or without globe and guard.

The condulet body affords ample space for mounting the receptacle and for the passage of additional circuits. The hubs are cast solid with the body, have an integral bushing and tapered thread. The globe is threaded and screws into the condulet, bottoming on a flat gasket. With this construction, removing or breaking the globes does not open the conduit system.

Thermostatic Traps Built For Process Steam Use

Designed to solve the problem of efficient discharge of air and water of condensation from equipment using pressures of from 10 lb. (or lower) to 100 lb. per sq.in., the Wester Series 78 Thermostatic Traps have been placed on the market by the Warren Webster & Co., Camden, N. J.

Meets Service Requirements

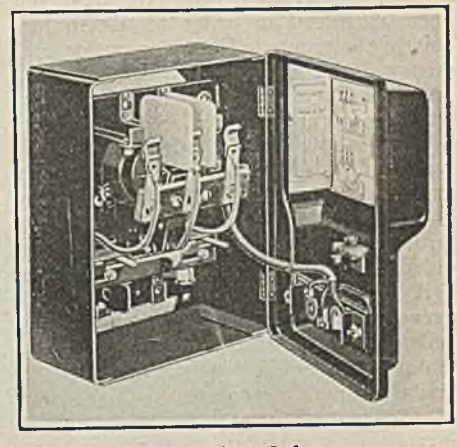


The body and cover of the trap are made of steam brass. The cover is fastened to the body by four Monel metal tap bolts with hexagon heads. A special copper-asbestos gasket fitting into a recess insures a tight joint. The expansion member is made of Monel metal heavily ribbed. It is held securely in position by means of a heavy gage brass circular plate to which it is bolted and which rests in a recess turned in the body.

A distance nut keeps the upper part of the diaphragm far enough away from the plate to permit steam to entirely surround the mechanism. This construction also allows the interior to be easily removed for blowing scale, sand, grease, etc., out of the piping when first starting up and also for later inspection and renewal of parts. The cone-shaped valve piece closes against a square-edged seat.

Protection at Low Cost Rules Switch Design

Frequently it is assumed that because a motor is only of small rating, an inclosed knife switch and fuses will provide adequate protection. Under certain operating conditions, however, experience has shown that fuses and knife switches are unreliable and often cause serious accident. The Allen-Bradley Co., manufacturer of electric controlling apparatus, Milwaukee, Wis., with this thought in mind has recently perfected its Type J-1552 Form B across-the-line-switch.



An Aid to Safety

The important features of this new piece of equipment as outlined by the manufacturer are as follows: Low-cost protection; a quick-acting magnetic switch; compactness (the switch measuring only 4½ in. in depth, 8 in. in height, and 6 in. in width); a no-

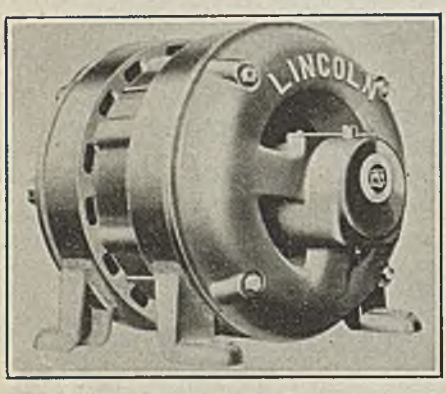
voltage protection arrangement; two thermal relays providing overload and phase failure protection; arrangements for resetting relays without opening the cabinet; push buttons that save wiring costs and space.

Switch-Start Motor Saves Power and Annoyance

A switch-start motor for which several advantages are claimed, built in sizes from ½ to 30 hp. and for either two- or three-phase, 60-cycle current, has been announced by the Lincoln Electric Co., Cleveland, Ohio.

This motor is so designed that it can be started directly across the line without the use of a starting compensator, starting resistance or other voltage-reducing mechanism, with starting current below the requirements of the National Electric Light Association.

The chief claim for the new motor is that operating characteristics, such



Starts by Itself

as power factor, efficiency, maximum torque, temperature rise, etc., have not been sacrificed in order to obtain low starting currents. Equal or better efficiency and power factor from 5 to 10 points higher than the ordinary self-start motor are claimed.

Tests show that starting torques of from full load to better than 250 per cent of full load, depending on the horsepower and speed, are possible without exceeding the N.E.L.A. requirements regarding starting currents.

A comparison of the speed torque curves of the motor with the ordinary self-start motors shows that this new motor has equal or slightly higher actual torque at zero speed. The curve of the motor then shows a gradually increasing torque up to the maximum torque point, whereas curves of the ordinary self-start motor decrease sharply to a low point which is only a small percentage over the full-load torque point and then increases to the maximum torque point. This gradually increasing torque of the switch-start motor is highly desirable for starting many types of machinery.

On sudden high overloads it is said that the motor also has a high or maximum pull-out torque which is of considerable importance in that the motor will not stall on sudden high overloads.

The temperature rise of the new motors under continuous full load, it is asserted, has been found to be quite low, giving a cool running and long life characteristic. This feature is due to the electrical design and also to the welded-steel construction which permits a much greater circulation of air.

The motor is normally equipped with sleeve bearings, although ball bearings will be furnished at the customer's request. Larger shafts, larger bearings and waterproofing insulation are other worthwhile features of these motors.

Firebrick Laid on Bias Make Strong Walls

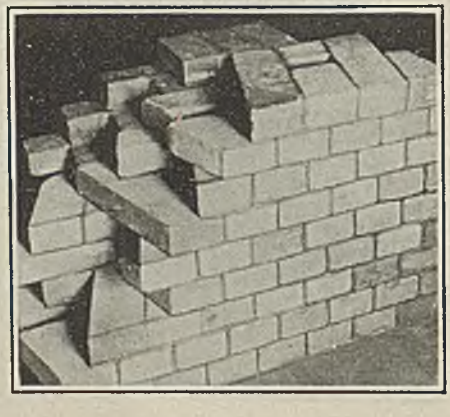
One of the most difficult problems of firebrick construction, in the opinion of a great many engineers, is to make brick stay put under the stress and strain of actual working conditions. There always is the tendency for walls to loosen up and joints to open, resulting in heat losses, slag penetration and eventual disintegration. This problem of making a stronger wall is said to have been solved by the development of Biasbrix.

As the name implies, Biasbrix are laid up on the bias, one brick overlapping and tying together three others in a natural, self-locking construction which gives exceptionally tight joints and a wall of great strength. Owing to this peculiar construction and interlocking feature, walls laid of this material do not loosen up, joints remain tight and heat losses and slag penetration are reduced to the minimum.

Although different in shape, Biasbrix lay up as readily as the ordinary straight brick in any thickness of wall from 4½ to 27 inches or more, and are equally well adapted to large or small installations. They are particularly well suited for hollow-wall construction, where a bond is of paramount importance.

This new brick is a product of the General Refractories Co., Philadelphia, Pa., and although radically different in shape from the conventional firebrick is available as regular stock.

Each Brick Interlocks

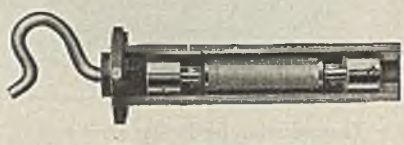


Trolley Tap Designed For Mine Service

A new trolley tap designed for the mining industry by the Ohio Brass Co. is said to have a number of new safety features which will recommend it strongly. It is a safety device for the company inasmuch as it insures protection against operating loss in mining routine and against physical injury to workmen.

The number of parts in the unit has been reduced to a minimum. Its construction is such that there is no chance for a man's hand to come into contact with a live hook and it is equipped with protective handguards. Furthermore, dowel pins on each terminal fit like a tongue in a groove which runs the length of the holder. Terminals and fuse element are kept from turning and twisting inside the case, and thus there is no chance for the contact lips of the fuse to get twisted off.

The fuse, which is renewable, also is



Handy Mine Tool

powder packed, hence the blow-out arc is smothered. Thick insulation provides maximum safety, and the tap is heavy enough, without being bulky or cumbersome, to stand up well under the hard treatment that equipment usually receives in the mine.

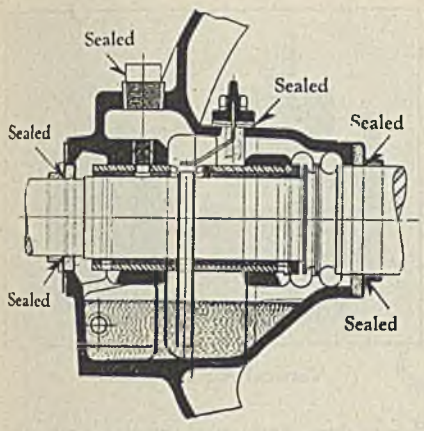
Motors Equipped With Sealed Bearings

Liberally designed sleeve bearings when kept clean and properly lubricated last many years. Their simplicity makes this type of bearing well adapted to all but a few special duties, particularly those where minimum starting friction is an important factor.

The Westinghouse Electric & Mfg. Co. has developed a "sealed sleeve" bearing for general-purpose motors. In this bearing the usual loose-fitting oiling cover is replaced by a pipe plug; the oil-ring opening is closed by a gasket-fitted cover that is bolted down, and improved felt washers are used around the shaft at the ends. This construction practically eliminates any chance for dust and grit to enter.

Other features consist of placing the dowel pin entirely inside the housing, so that oil pumping is harmless, and using a design which eliminates unbalanced air pressures in the housing and thus prevents oil vapor being forced or drawn out of the housing.

The manufacturer states that motors equipped with these bearings have been



Sealed Against Dust and Leakage

operating continuously for eighteen months without oil being added and without noticeable lowering of the oil level. The life of the bearing is unknown because some motors so equipped have been operating continuously for four years and yet show scarcely any appreciable wear.

Double Winding Assures Low Starting Current

Better running performance and lower starting current are the principal advantages claimed for the new variable-leakage double squirrel cage motors announced by the Fairbanks, Morse & Co., Chicago, Ill.

Up to the present time the disadvantage of the squirrel cage motor has been due to its high starting current. In the design of squirrel cage motors it is possible to use high resistance rotor bars in order to get a high starting torque with low starting current, but such a motor has comparatively low efficiency and poor factor at full load and normal. If the motor is designed with low resistance bars in the rotor then the starting torque is reduced and the starting current is increased.

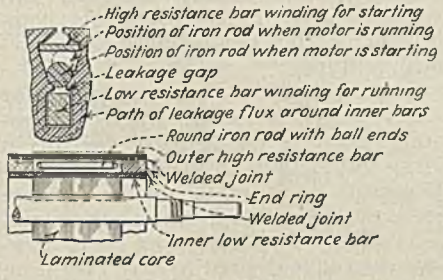
In the double squirrel cage type two sets of bars are placed in the rotor, each set being connected with its own end rings. The low resistance bars in this case are placed in deep slots in the rotor and the higher resistance bars in comparatively shallow slots. The inner low resistance winding in the iron rotor core chokes the current in this winding at starting and forces it to flow in the outer high resistance winding, thereby producing high starting torque with comparatively low starting current.

After the normal load has been reached the low resistance winding carries the greater portion of the current, but, due to its position in the rotor core, the power factor and the maximum torque are less than with a standard or single squirrel cage winding.

The advantages of the arrangement are as follows: the double squirrel cage type motor can be connected directly to the line without compensator or starter; there is ample starting torque to overcome the inertia of a load or static friction; control is simplified by using an ordinary starting switch or by using a magnetic contactor with push-button control.

The principal disadvantages are its low maximum output, which increases the power cost of operation, and low power factor, which is chiefly objectionable to the power company.

The accompanying illustration shows a section through the rotor slots of the new variable leakage double squirrel cage motor. In this motor the current in the inner winding at starting is choked by means of movable rods. These rods are placed in each rotor slot between the inner and outer bars. The instant the motor is connected to the line the iron rods are pulled down toward the inner bars, closing the small leakage gap in the rotor iron, which



Section of New Rotor

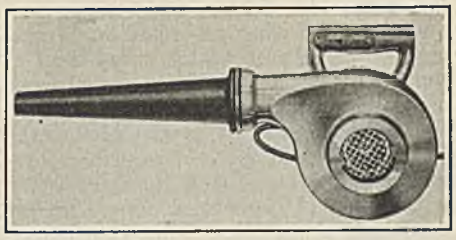
almost completely chokes the current in the inner low resistance winding by forming a complete iron circuit around each inner bar. This action forces all of the current to flow in the outer high resistance winding at starting, producing a high starting torque with a low starting current.

As the rotor accelerates the rods are thrown out of the leakage gaps by centrifugal force, which removes the choking effects from the inner winding when the motor is running. At starting there is a slight noise due to the rods changing position, but since this change takes place practically instantaneously the noise is not objectionable.

Blower or Suction Device Chases Dust

A combination blower and suction machine made by the Ideal Commutator Dresser Co., Sycamore, Ill., which provides ready and easy means for cleaning motors, switchboards, generators and shafting is now on the market.

With this machine such cleaning work can be done in much less time and at lower cost than by other means. The device can be put in operation by plugging its motor cord into an electric lamp socket. When used as a blower the device supplies a current of air traveling 180 miles an hour, and when



Gets Rid of Dust

used as a vacuum cleaner it is provided with a 4-ft. piece of 1¼-in. reinforced rubber hose and a dust bag. For this particular service it can be readily used for cleaning motors or generators.

The machine is equipped with a ⅓-hp. air-cooled universal motor which can be supplied for any voltage between 64 and 250. The machine itself is equipped with Norma ball bearings, which require no oiling.

Miners' Safety Lamps Made in Two Models

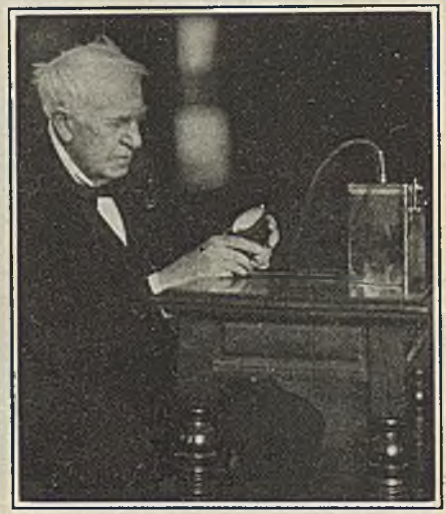
Two improved Edison miners' safety cap lamps known as models F and G were recently placed on the market by the Mine Safety Appliances Co., Pittsburgh, Pa. Model F comprises a rugged Bakelite headpiece, completely insulated, moisture-proof and dustproof, which is used with the model E battery. It is a 12 candlepower lamp.

The model G lamp comprises the new headpiece as well as a new battery of greatly enlarged capacity. This lamp furnishes 17 candlepower.

One of the outstanding features of both lamps is a two-filament gas-filled bulb. The major filament provides the maximum illumination for cleaning and loading coal, while the minor filament furnishes 5 candlepower for use in traveling or in an emergency. Both lamps are officially approved by the U. S. Bureau of Mines.

In commenting upon the battery of

The Wizard Inspects Cap Lamp



the lamp, Mr. Edison said: "I am frequently asked what prompted our grueling 10-year search which culminated in the discovery of the Edison nickel-iron-alkaline storage battery principle.

"In brief, it was the crying need of the industrial world for a dependable portable power unit—for a storage battery which would assure a long life of trouble-free service. This need motivated the efforts of my associates and myself, plunging us into a search for an ideal which took more than 50,000 individual experiments before the achievement of our goal."

One-Man Welding Outfit Serves Many Purposes

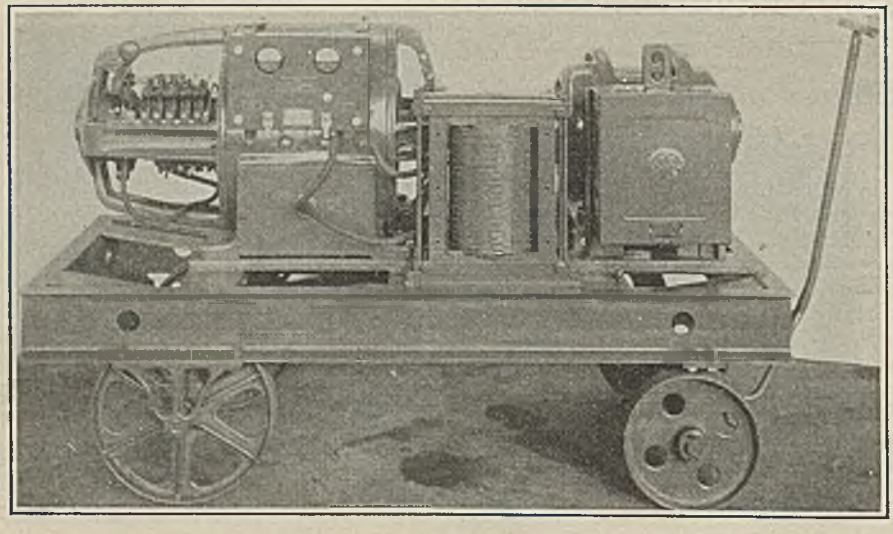
A new single-operator welder rated 300 amp., one hour, 50 deg. C. temperature rise, is announced by the General Electric Co. as the latest addition to its standard line of welding equipment. This machine includes a four-bearing, ball-bearing, motor-generator set with flexible coupling. With this equipment, the manufacturer asserts, a rapid and simple interchange of motors may be made by the user. As a result inspection, maintenance, renewals and changes caused by changes in the supply circuit may be simplified.

The driving motor is a 15-hp., 40 deg. C. continuous-rated unit. This conforms with the recent ruling of the National Electric Manufacturers' Association. The generator is so designed that field control is unnecessary and is eliminated. The generator panel includes an ammeter and a voltmeter, but not the customary field rheostat. The meters used have a metal front except for the glass over the scale, thus minimizing the possibility of breakage.

The motor starters for 60- and 50-cycle motors are of the inclosed magnetic type, while those for the 25-cycle motors are inclosed resistor starters. The direct-current motors use a simple resistance starter with a line switch.

The generator is designed to permit belt, motor or engine drive, and will be designed for either stationary or portable use. It can be used as both a manufacturing and a repair tool, for service in foundries, steel mills, locomotive and car shops, shipyards, marine repair yards, tank shops, general machine shops, pulp and paper mills and in any other field where iron or steel is used.

Portable Arc Welding Outfit Has Wide Range of Uses

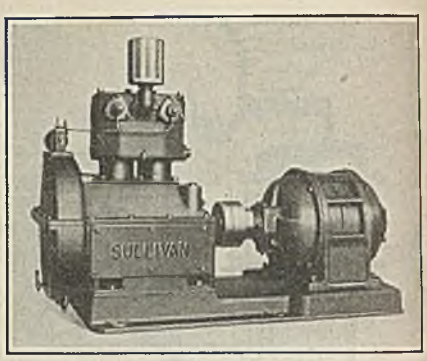


Compact Air Compressors For Limited Needs

For shop, power plant and miscellaneous industrial requirements in which a relatively small amount of compressed air is needed and where compactness, continuous operation and practically automatic control are important factors, the Sullivan Machinery Co., Chicago, Ill., recently designed two vertical direct motor-driven air compressors of the two-cylinder and four-cylinder types.

These machines are intended for small plants or shops where air requirements are not large or for use in large installations in which isolated departments need air, where the distance from the main compressor plant is considerable or for standby or night service when it is desired to save operating costs by shutting down the main compressor unit. Both machines are single acting and similar in design to the portable air-compressor units made by this company.

In the two-cylinder machine the cylinders are cast in one block and bolted to the crankcase, and the one-piece cylinder head is bolted to the top of the block. Baffles below the open end of the cylinder prevent oil from being thrown into the cylinder. The wafer valves for both inlet and discharge are placed in recesses of the cylinder head and are accessible by means of removable covers. To remove dust and solid matter from the air, a filter is attached to the intake opening.



Vertical Air Compressor

The still shaft has two cranks, 180 deg. apart, with opposed counterweights to balance the inertia effects of the reciprocating parts. For supplying oil to the crankcase a combination breather and strainer is mounted at one end of the case. It is provided with a spring hinge cover equipped with a valve, and opens to prevent accumulation of pressure in the case, but prevents any inward flow of air from the outside. The rim of the flywheel dips into the pool of oil in the well and by its rotation throws this oil upon the crankshaft bearing nearest to the wheel and into a channel in the crankcase above the wheel. From this channel the oil is conducted through a pipe to the crankshaft bearing nearest the motor. The excess oil flows through the splash pans under the cranks, maintaining an adequate supply for distribution to the crankpins and pistons.

The four-cylinder vertical compressor is a new departure in design. Instead of using two large cylinders this model employs four of a proportionately smaller size. The cylinders are placed in pairs at an angle of 90 deg. with each other, forming the V-type arrangement. As the two connecting rods for opposite cylinders attach side by side on one crankpin, only two cranks are required for the four cylinders.

The shaft is but slightly longer than that used in a conventional two-cylinder machine and requires the same number of bearings for its support. The light weight of the reciprocating parts and the V-type arrangement has reduced to a minimum the forces causing vibration. Other features of the design are similar to those of the two-cylinder compressor. The speeds of the two machines are the same, and the capacities 120 and 240 cu.ft. of free air per minute, respectively.

One of the outstanding features of these units is elimination of vibration. The crankshaft is counterbalanced, and to insure even running a flywheel is placed at the outside end of the compressor crankshaft, and the compressor flywheel and crankshaft assembly are balanced both statically and dynamically.