COAL AGE

A McGraw-Hill Publication — Established 1911

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

New York, October, 1929

Volume 34....Number 10

The Anthracite Heritage

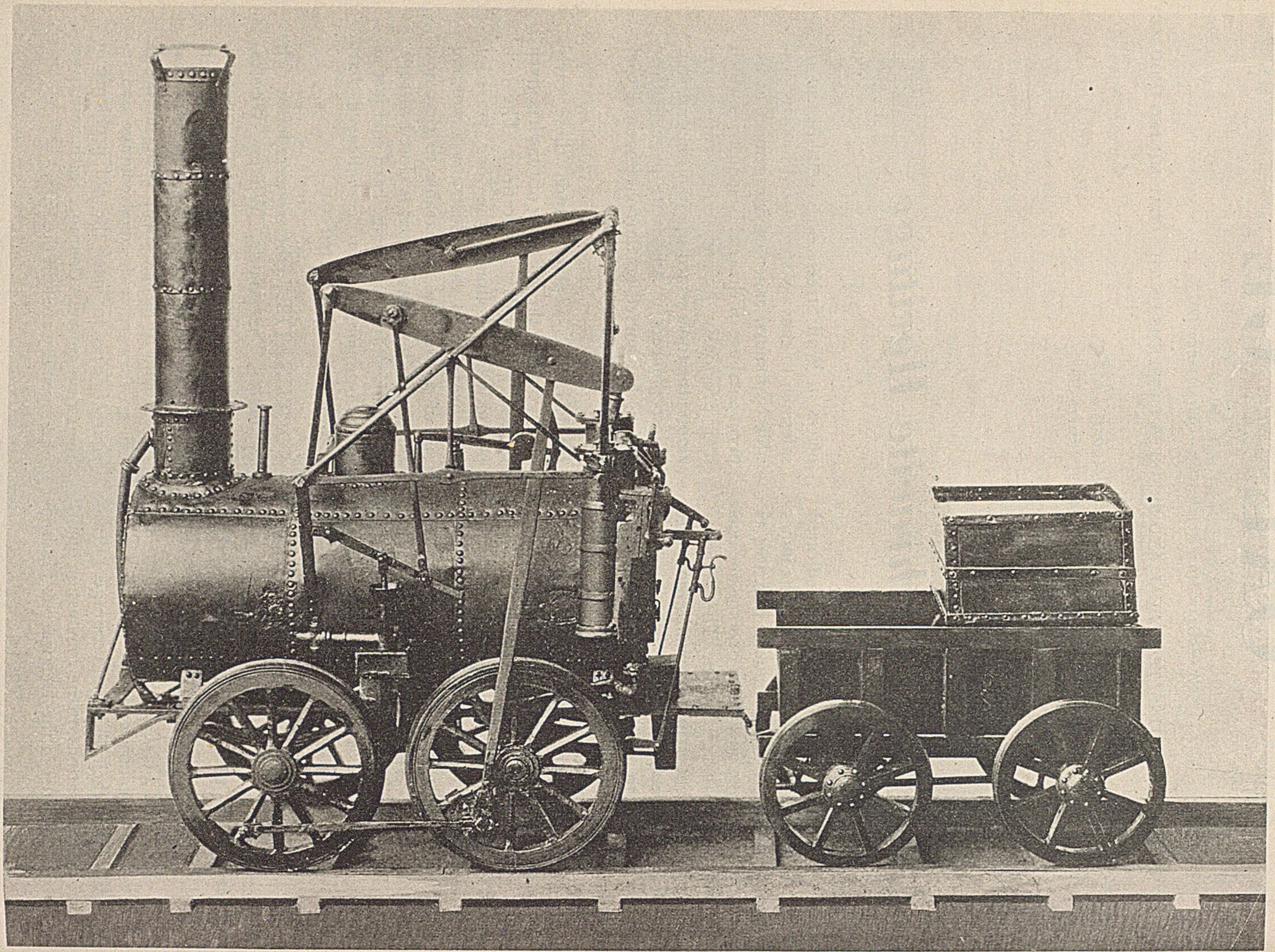
SINCE 1921, *Coal Age* has dedicated the major portion of one of its issues each year to a review of mining practices as exemplified in the operations of some one outstanding company or district. The sweep of the editorial content has grown continuously with the increasing willingness of progressive managements to welcome a more complete and intimate analysis. This issue—the Ninth Model Mining Number—is built around the activities of The Hudson Coal Co., the second oldest producing unit in the anthracite region.

LIKE ALL great enterprises, the anthracite industry started with a vision—dreamed by men with the faith and courage to follow their dreams. William Wurts, prospecting the Lackawanna Valley in his search for stone coal, and his fellow pioneers exploring areas farther south, were daunted neither by the difficulties in bringing the coal to the market nor the resistance encountered in its merchandising. They and their successors created both the necessary transportation agencies and the machinery for selling.

IN PERFECTING the latter, they displayed an ingenuity and a persistence which matched well their vision and courage. Practical demonstrations of the combustion qualities of their fuel in the Delaware & Hudson offices in Wall Street, early employment of salesmen to canvass specialized lines of possible customers, eager encouragement of experimental use of the coal by industries which had previously burned other fuels were among the tools seized to establish a market. These pioneers in anthracite pursued their visions but nursed no illusions that the coal would sell itself.

EMPHASIS is placed upon these early efforts because the whirligig of time has given them a present-day application. The lush period which followed the long years of heartbreak when the industry was working out of a situation comparable to that now existing in bituminous coal is closed history. Competitive fuels challenge hard coal just as in the beginning anthracite challenged charcoal, wood, and imported coal.

FORTUNATELY, the pioneers left a rich heritage. The Wurts, Whites, Weisses, Hazards and Shoemakers showed a resourcefulness and a courage which successfully overcame the barriers of their age. With that background to inspire them, their successors can go forward with equal courage and resourcefulness to meet the old problems in their new guises. Courage, faith, initiative, and ingenuity are still the keys.



The Stourbridge Lion

The first steam locomotive ever operated in the United

Visions of 1814

. . . and . . .

REALITIES OF 1929

[SNAPSHOTS IN THE HISTORY OF THE HUDSON COAL CO.]

BALD legal chronology sometimes misses the facts as well as the romance of industrial development. This is notably true in the case of The Hudson Coal Co. As a legal entity that corporation sprang into being June 2, 1871, when it received a charter to do business from the Commonwealth of Pennsylvania, but the roots of the organization which now bears that name go back to the early days of the nineteenth century and feed in the same soil that gave birth to the Delaware & Hudson Canal Co. Indeed, until little more than a score of years ago the real history of what is now The Hudson Coal Co. was the story of the Delaware & Hudson company and that history "is the story of certain anthracite mines and the avenues by which the product of those mines have been brought to market."

The genesis of the organization was a dream—the dream of two Philadelphia drygoods merchants of Swiss strain who had visions of the possibilities of supplying Eastern seaboard communities with the stone coal of northeastern Pennsylvania. The War of 1812 seemed to give body to their visions. Although some anthracite had been used at the Carlisle arsenal during the struggle for American independence, and a few ark-loads had been floated down the turbulent streams after the Revolution, the infant manufacturing industry of the United States looked to imports of bituminous coal and native wood and charcoal for its fuel supply, and wood logs in the fireplaces were the mainstay in home heating. By temporarily checking the flow of foreign coal, the second war with Great Britain quickened interest in American resources.

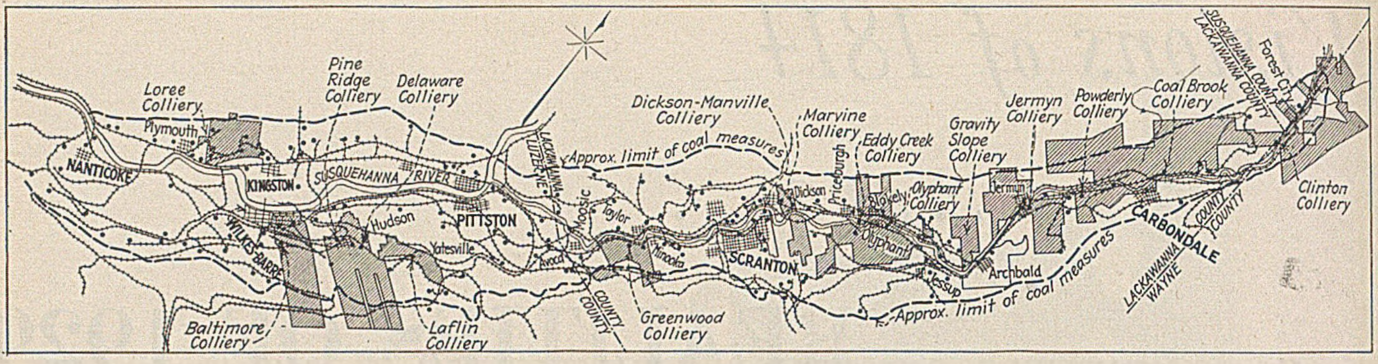
In pursuance of their dream, William Wurts penetrated the wildernesses of the Lackawanna Valley, and he and his brother Maurice began to purchase coal lands in that region at 50c. to $3 per acre. There is a legend, not wholly without support, that the Wurts brothers mined a small quantity of coal as early as 1816, but were unable to sell it. Six years later they had reached the site of Carbondale, named it, brought supplies by wagon from Philadelphia, 143 miles away, and opened up their first primitive mine. By late autumn in 1822 they had mined about 1,000 tons. Today The Hudson Coal Co. has 22 mines scattered between Plymouth and Forest City, with 5,000 working places, and employs approximately 20,000 men at these mines and in its eleven breakers. In 1928 the company produced nearly 6,000,000 tons.

Coming from Philadelphia, it was only natural that the Wurts brothers should have thought of that city first as a market for their coal, and in the beginning of their venture they did sell a small tonnage there. But parallel pioneering in the Lehigh and Schuylkill fields, and the difficulties of transportation to Philadelphia from the Wyoming field, turned their eyes more and more to New York, and the decision was reached to open up a route to Manhattan. On March 13, 1823, the Pennsylvania Legislature authorized Maurice Wurts to improve navigation on the Lackawaxen River to the Delaware; on April 23, 1823, the New York Legislature passed a special act to incorporate "The President, Managers and Company of the Delaware & Hudson Canal Co." with authorization to open water communication between the Delaware and Hudson rivers, to purchase coal lands and to transport stone coal.

A year later the act of incorporation was amended to authorize an extension of the canalization which would make a direct connection with the Lackawaxen River project of Maurice Wurts and his associates; in 1825 the Pennsylvania Legislature gave the Wurts interests authority to transfer their rights to improve the Lackwaxen to the Canal company. A complete merger of mining and transportation interests was effected on July 2, 1825, when the board of managers of the Canal company agreed to pay $40,000 in cash and $200,000 in stock for the mining properties and privileges in Pennsylvania of the Lackawaxen Coal Mine & Navigation Co., organized a short time previously by the Wurts brothers and their associates in the anthracite region.

This union of coal and transportation interests remained unbroken until June 1, 1909, when the first step in the segregation, which resulted two years ago in the transfer of title to all coal properties of the railroad to The Hudson Coal Co., was taken. There were both justification and necessity for the fusion. Without adequate transportation facilities the exploitation of the Wurts anthracite holdings was hopeless; without a firm promise of substantial traffic the project of the canal company could not hope to succeed.

So it was only natural and logical that, to quote the Centennial History of the Delaware & Hudson Co., "during all its earlier years the business of the company had been primarily that of a producer of fuel, and its railway lines were acquired, expanded and utilized mainly as an agency for marketing its anthracite."



In the Territory Where Hudson Operates

It was because of that that the Wurts brothers, even before the merger, were active in selling New York the anthracite idea and the advantages of the canal company. It was because of that that a 16-mile gravity railroad was built between Carbondale and Honesdale, where the canal took up the burden of transportation to Rondout, on the Hudson River, 107 miles distant. And this union also was responsible for bringing over from England the Stourbridge Lion, the first steam locomotive operated in the Western Hemisphere; true, the Lion made only two short trial trips in the Pennsylvania wilderness, because rail and roadbed were not up to the standards demanded by this new form of transportation, but its coming paved the way for the Age of Steam and 65,000 locomotives rushing and shuttling over American rails today pay tribute to it.

The panorama of the long years which record this close association is crowded with virile figures and dramatic episodes. Silk stocking and cotton hose play their parts; men whose names are a common household heritage pass by linked with men unknown except to the special student: De Witt Clinton, thrice Mayor of New York and thrice Governor of the state, who campaigned for the canal project; Philip Hone, diarist, Tammany sachem, who was the first president of the Delaware & Hudson Canal Co., resigning that post to become Mayor of New York; John Wurts, younger brother of the Philadelphia pioneers and third president of the company; the Olyphant brothers, George Talbot and Robert M., who brought to the presidency a broad background of commercial experience; Thomas Dickson, first head of the coal department when that division was established in 1860, ardent advocate of abandonment of canal transportation and railroad expansionist, active in increasing coal-land holdings and president for 15 years; Benjamin Wright and John B. Jervis, engineers who did much to crystallize opinion in favor of railroads when rail transportation was an untried experiment.

Sales problems were very much to the front in the early days of the industry; operating problems appeared relatively simple. In 1829, the board of managers authorized the installation of a cook stove in the offices of the company to show doubters that the coal could be burned. But the early drive was on industrial business. Bunker trade was one of the first objectives. Nathan Smith was hired in 1831 "to introduce the use of coal in manufacturies and all establishments using steam engines," and R. Smith "for introducing the use of coal to blacksmiths, etc." The ironmaster was brought into the picture late in this decade. Experiments in the use of anthracite for the manufacture of salt were made in 1848. More than fifty years have elapsed since an attempt to briquet fine coal was made.

Today the sales problems are still with the industry and operating problems have increased in complexity since 1859, when the company felt impelled by competitive pressure to install its first breaker. The modest acreage acquired by the Wurts brothers at prices per acre less than the average cost of producing a single ton today has grown enormously since the late '50s, when an expansion program which broadened materially in the 30 years which followed, was undertaken. Back in 1831 the canal company boasted of owning between 3,000 and 4,000 acres; seventeen years later it was picking up small areas at less than $100 per acre; today The Hudson Coal Co. owns over 21,000 acres in fee in Lackawanna, Luzerne, Schuylkill, Susquehanna and Wayne counties, with acreage in the Southern field still virgin. What these changed conditions mean in management, mining, preparation and sales is told in the articles which follow.

In the illustration at the top of the page the general outlines of the coal field from Nanticoke to Forest City and beyond can be seen, with the properties of The Hudson Coal Co. hatched to bring them into prominence. The various spots on the map show breakers, slopes and tunnels, both of The Hudson Coal Co. and other corporations. The collieries named, however, are those of The Hudson Coal Co. alone.

FOR THE SECOND TIME *since the Annual Model Mining Number was established,* COAL AGE *has selected a major anthracite operation for editorial treatment. The Hudson Coal Co. organization is the second oldest in the field. The present review covers the salient features of management, production and sales, and was made possible by the generous and whole-hearted co-operation of the officials of The Hudson Coal Co. with the editorial staff of* COAL AGE.

Folds and Cross Folds Saved
NORTHERN ANTHRACITE FIELD
From Glacial Erosion

By R. Dawson Hall
Engineering Editor, Coal Age

ABOUT a year ago I described the geology of the Alabama coal field in the pages of *Coal Age*. That field lies at the southernmost tip of the Appalachian coal province. Today, the purpose is to set down facts relating to the geology of the northernmost tip of that province, to wit, the Northern Field of the anthracite region.

In contradistinction to the Alabama coal region which contains only the lower part of the Pottsville Conglomerate measures, the anthracite region has possibly representation of all the Carboniferous series including the Pottsville Conglomerate, but, as is perhaps well understood, this latter horizon is much less productive in Pennsylvania than in Alabama. It is a question still debated whether the anthracite region has any Pottsville Conglomerate coals. Some would place the Lykens Valley coal in that category.

Another difference of importance, one which contrasts the Appalachian province in general and Alabama in particular with the anthracite region is in the direction of the folding of the measures into anticlines and synclines. With a few and trifling exceptions the folding of the Appalachian province is quite simple until the anthracite region is reached. All the anticlines and synclines run in the main northeast as if folded by a mountain-forming stress that pushed the measures toward the northwest. In the Pennsylvania anthracite region the line of folding apparently hooks around the end of, or makes a turn with, the area of disturbance, and the coal basins which in the south have run in the main as much north as east now run almost due east, roughly about 15 or 20 deg. north of that direction. The result of this can be seen in the shape of the coal areas. They lie, in general, as will be noted in Fig. 1, rather east and west than half way between north and east.

Evidently, the stress received by the Northern Field was transmitted from the south through the Southern and Middle Anthracite Fields, but its force was greatly diminished by the mammoth folds which those buffer fields developed. Accordingly, it is less crumpled than those other fields, the shape of the folds approximating that of a cultivable river valley with steepish side slopes and here and there a roll running more or less in parallelism with general direction of the stream. Then also the coal of the Northern Field has more volatile matter than that of either the Middle or Southern Fields, being less altered by the heat generated by pressure.

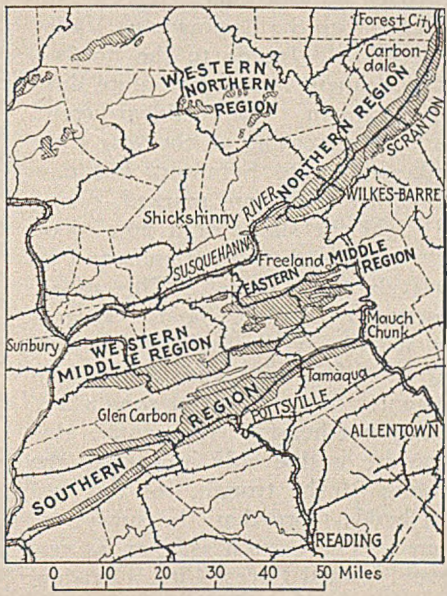


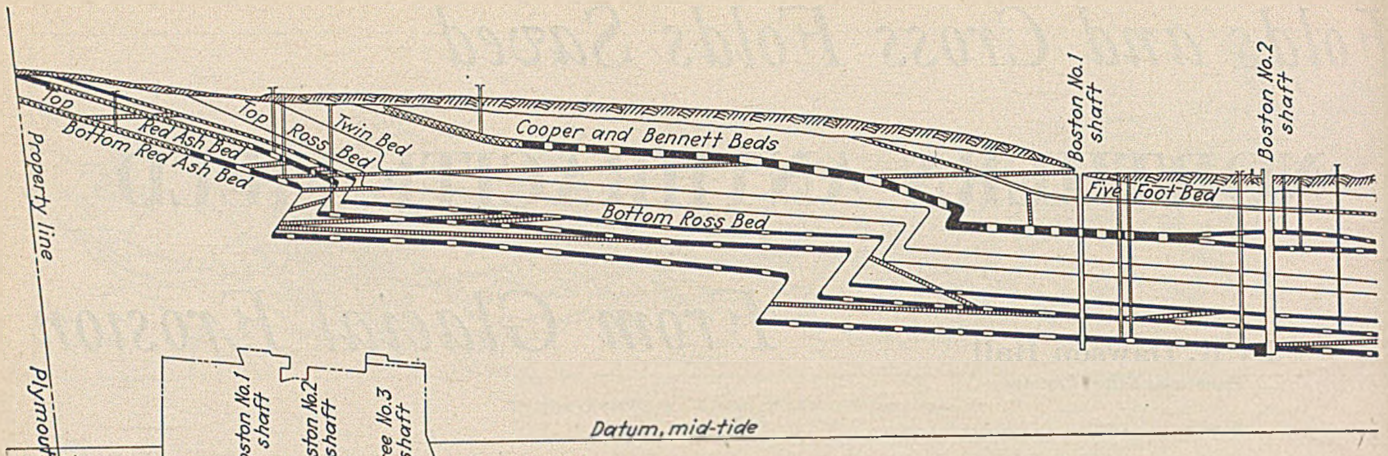
Fig. 1—Anthracite Coal Field; Southern and Two Middle Regions Acted as Buffer to Pressure from South

The latter have, in common with all fields that have been greatly folded, outcrops that lie in straight lines. If a measure comes vertically to the surface the line of its outcrop is perfectly straight and parallel to the direction of its basin regardless of the roughness of the contouring of the surface. Where the beds are level, however, or nearly so, the streams cut deeply into the outcrops. Merely by looking at a map showing the outlines of a coal field it is possible to judge the inclination of the measures by the degree of irregularity of the lines of outcrop, provided there are no large subsidiary folds.

In the section of the Northern Field that lies southwest of Wilkes-Barre more of the synclinal fold has been preserved than in the section to the northeast and in consequence the inclination of the bottom beds at the outcrop is around 40 or 50 deg. For this reason also the outcrops on both sides of the basin are so straight that they appear to have been drawn by a ruler. Only where such a mammoth contouring agent as the Susquehanna River crosses the contours of the coal beds and leaves the basin as it does near Nanticoke is there any evidence of irregularity in the outcrop and even there it is small.

Throughout the Northern Field there is but one main basin. There are other wrinkles, it is true, within this major fold, but as these are plainly subsidiary to it, though they are sometimes at an angle to the field, they never bring the coal out beyond the regular lines of the field as in the Southern and Middle regions, where there are frequently flexures of quite large importance, adjacent, and in part subsidiary, to the greater fold.

So great are these folds sometimes in the latter fields that glacial erosion has rubbed off the tops of their anticlines and separated some of the coal from the main body, at least in part; giving that fingered appearance to the coal area that is so characteristic of all the anthracite fields in the United



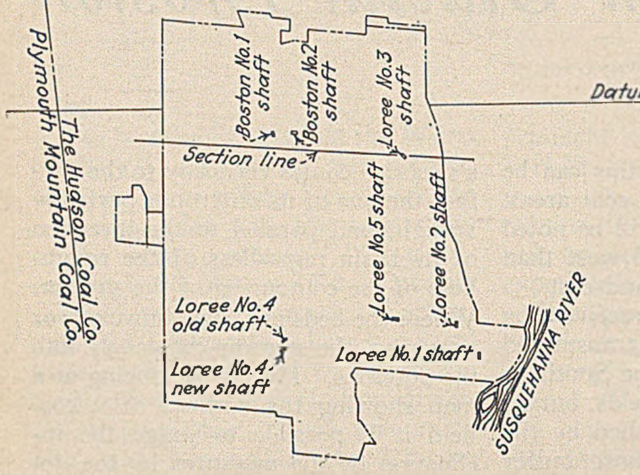


Fig. 2—Cross-Section of Northern Half of Northern Anthracite Field at Loree Colliery

States except the Northern. The area between Wilkes-Barre and Nanticoke, and indeed further southwest, has neither the finger basins typical of the southern part of the anthracite region, nor those rough outcrop indentations so usual in areas where the coal is relatively level. Its outcrop follows almost unbroken lines.

The section beneath Wilkes-Barre has a profound dip. Though the Red Ash coal bed, which is the lowest seam of any of the many found, is in places at a level of 1,200 ft. above tide, it reaches in the bottom of the basin at Auchincloss, a profundity of more than 1,000 ft. below tide in a basin only 5 miles wide. This has given the Wilkes-Barre region some of the most gassy mines in the country, for it is a strange fact that though there is less volatile matter in anthracite than in bituminous, it will often emit more gas. The main basin contains many folds of varying length. Some even tilt the coal up vertically; one, the Franklin, even overturns it, but none has any great significance. They disturb operation and make mining a matter of "cut and try" but many are so unimportant that they have received no name, and those that have names interest only two or three collieries.

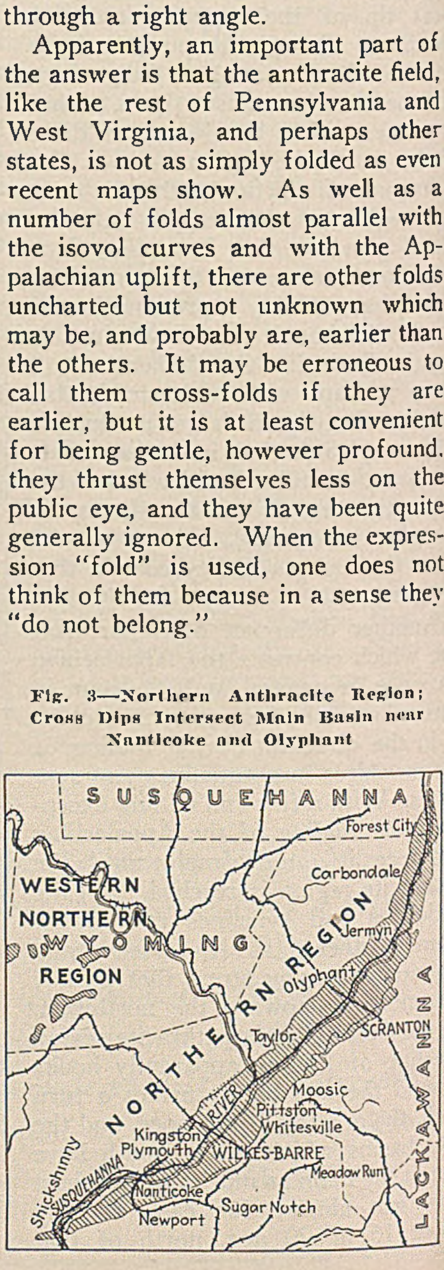
Between Wilkes-Barre and Scranton the folding decreases. The main basin becomes less profound, and the subsidiary folds are not so well marked and are fewer. At Scranton the southern lip of the basin has become so gentle in upturn that even Roaring Brook in crossing it to get into the Lackawanna River has cut quite a gap in the measures and destroyed no little coal.

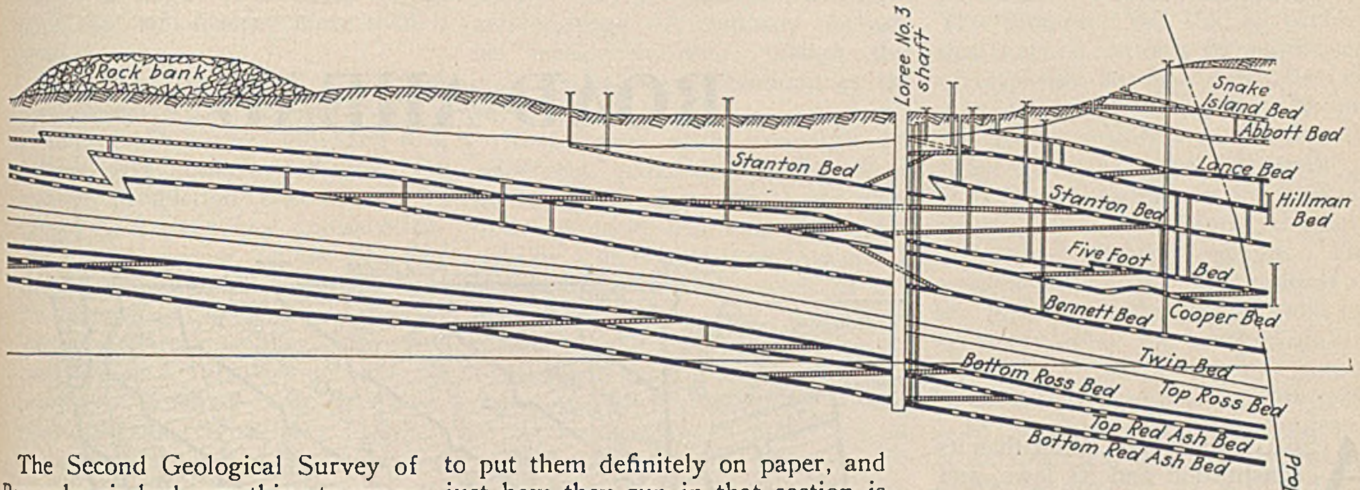
Further up the Lackawanna Valley the coal field trends to the north—a development that seems quite difficult to explain. The northward trend has been increasing all the way from Wilkes-Barre to Scranton, but now it becomes still more marked, giving the Field the shape of a new moon with its delicate pointed ends and its relatively thick center. This moon, as seen on the map, "holds," as gossips would say, "rain in the bowl"; that is, it has a crescent shape with the center of the crescent somewhere to the northeast. Apparently, this curvature is due only in part to the bending of the trough, for the coal area bends more than the subsidiary basins. There is, it is true, as one travels toward Forest City, a gradual reversion in these basins to the due northeast course; that is, from N. 70 deg. E. to N. 45 deg. E. The Brace Brook anticline in the extreme north and others further south have the latter direction.

However, the coal area has swung much more than 25 deg., which the anticlines would indicate. Yet the subsidiary basins do not carry the coal beyond the general lines of the coal field even when it ceases to travel their way, and that is the perplexing problem. Every eroded coal field with steep folding tends to follow its basin. To that basin it owes its life, for the basin protected it from erosion; but this Northern Field in the face of erosion turns north, leaving the protection of its synclinal folds. In its entire course it turns almost through a right angle.

Apparently, an important part of the answer is that the anthracite field, like the rest of Pennsylvania and West Virginia, and perhaps other states, is not as simply folded as even recent maps show. As well as a number of folds almost parallel with the isovol curves and with the Appalachian uplift, there are other folds uncharted but not unknown which may be, and probably are, earlier than the others. It may be erroneous to call them cross-folds if they are earlier, but it is at least convenient for being gentle, however profound, they thrust themselves less on the public eye, and they have been quite generally ignored. When the expression "fold" is used, one does not think of them because in a sense they "do not belong."

Fig. 3—Northern Anthracite Region; Cross Dips Intersect Main Basin near Nanticoke and Olyphant

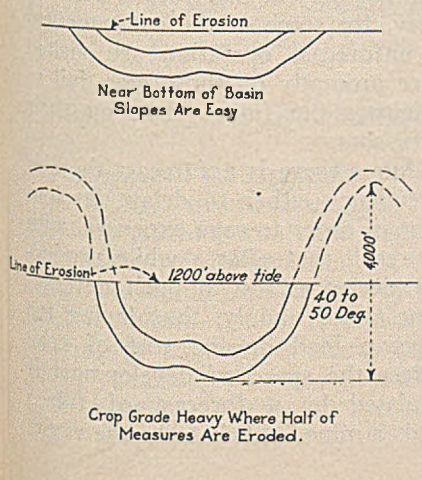




The Second Geological Survey of Pennsylvania had something to say as to these cross-folds which thus cut off and distorted basins and incidentally lifted the state near its northern boundary so high that it lost all its coal in that section by glacial action, except a little of the almost unworkable Alton beds near the base of the coal measures. Incidentally, the State of New York probably lost all its coal for the same reason. The U. S. Geological Survey also has referred to these cross-folds and to their effects but failed to lay them out plainly on the map. They remain suggested by the canoe-shaped ends of coal basins but that is all. They are probably older than the folds that have absorbed the greater degree of interest, for, where they are synclines, the coal usually thickens, which is always a sign that the cross-fold preceded, or was coeval with, deposition, probably the latter. Near Wilkes-Barre is such a syncline and there the coal reaches its maximum thickness.

In the Northern Anthracite Field there is evidence of these cross-folds, but no one has yet had the temerity

Fig. 4—Ideograph of a Basin Eroded in Different Degrees



to put them definitely on paper, and just how they run in that section is doubtful. No one seems to know. It may be that they run almost at right angles to the other folds or roughly due north and south, and there are not a few reasons for thinking so. Least of these, however, is the view that cross-folds should be at right angles to folds like the bars of a gridiron or as the central Pennsylvania folds and cross-folds.

In central Pennsylvania where the other system of folds runs N. 45 deg. E. in a different direction from that in the anthracite region, this system of cross-folds has a trend—namely, southeast and northwest. If these cross-folds in the anthracite region should run S. 45 deg. E., as in central Pennsylvania and other folds N. 70 deg. E., the angle between the two lines of folds would be 65 deg. There is, indeed, no reason to believe that the cross-folds of the anthracite region are of the same system as those in central Pennsylvania even though they may be coeval.

That there are such folds is clearly evidenced by the fact that along the northern edge of the city of Wilkes-Barre, the lowest point in the lowest bed of coal, the Red Ash in the Auchincloss mine, can be found, as already said, over 1,000 ft. below mean tide at Sandy Hook. West of that point the measures rise considerably toward the west.

Northeast of Auchincloss mine the coal lifts itself so steadily that at Old Forge, between Pittston and Scranton, the lowest point in the lowest bed, again the Red Ash, or Dunmore No. 4, is at an elevation of about 500 ft. above the sea, a cross-fold of 1,453 ft., which really compares in importance with the deepest trough in the other series of folds where the difference in elevation exceeds 2,200 ft. However, it must be recalled that Old Forge is on the anticline of the cross-fold, whereas the elevation of 1,200 ft. above sea level found in the Red Ash near Wilkes-Barre is still on the slope between the syncline and anticline of a main-fold. The full height of the top of the anticline of this fold before it was eroded was probably over 4,000 ft. above the bottom of the syncline. Thus the cross-folds are not as sharply accentuated as the other folds. (See Fig. 4.)

Beyond Old Forge the coal dips to Olyphant, which lies between Scranton and Carbondale. There the Red Ash, or Dunmore No. 3, at the lowest point is just about at sea level. Beyond Olyphant the coal rises again and continues that rise to Forest City and beyond.

It may be surmised that this Olyphant basin was the protective agent which prevented what coal remains north of Carbondale from being eroded in the passage of time. All the coal that lay along a line not too greatly lifted by the other series of folds escaped the glacial and the stream erosion that followed. That which aligned itself near or along the line of pitch which led straight up the slope to the nearest cross anticline was so high when the glaciers arrived from the north that it was eroded. Moreover, it suffered later from the eroding influence of the Lackawanna River. Above Carbondale that stream is no longer a sort of dividing line between the coal masses but is over on the eastern side. It forms the eastern border of the field, though it is true small patches of coal can be found near the east bank.

Keeping an Eye on the ROAD AHEAD

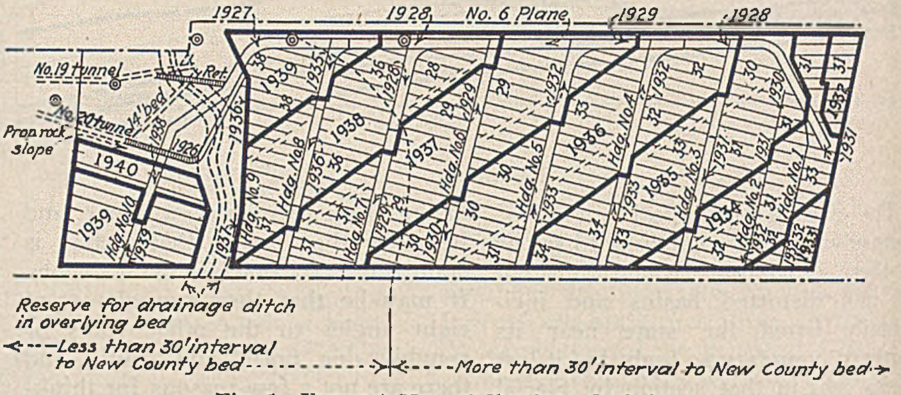


Fig. 1—Forecast Map of Unmined Coal Area

A COUNTRY is no better than its constitution and its laws, and a company no better than its management permits it to be. There are countries with great resources and no governance that drift along, unable to use their natural wealth to advantage. So with companies; unless they have a good co-ordinating, energizing managerial system, they are like ships without a compass and can arrive nowhere. The Hudson Coal Co. has, for this reason, given much study to its organization, management and control, so that good policies may be devised in time to meet changing conditions and so that the staff may be able to put these policies into operation and recognize promptly whether the standards set are being attained.

One of the great sources of loss at some mines has been imperfect recovery of coal. The problem is not without complications even when a single bed of reasonable thickness has to be removed and where there are no obligations to preserve the integrity of the surface These are not the conditions in general where anthracite is being mined. In the anthracite regions are many beds, one over the other, with relatively thin rock intervals and occasionally with obligations to sustain the surface which may be legal or may be accepted only out of a sense of consideration for the occupants of houses on overlying property. Then there are pitches, dips, faults, and rolls. To all these must be added the difficulties arising from the faulty extraction of earlier years. The complications therefore are many.

No wonder that The Hudson Coal Co. has decided that there shall be no haphazard development of its properties, that the question asked shall not be, how can the coal in any one section be mined at the lowest cost but how the whole of the coal in that mine—yes, in all the mines—can be operated so as to produce the largest quantity of coal and the biggest economic return. From this decision has come the forecasting department under the vice-president. Founded in 1920, it has established working methods and obtained data that enable it today to forecast with much assurance.

With its forecasting department to survey the ground The Hudson Coal Co. does not travel along the road without a clear idea of where it is leading. It is not enough that the "going is good"; it is necessary to know just how good it will be later when the road in plain sight is replaced by the road around the bend.

Its forecasts are being made as painstakingly as those of the automobile companies. They extend over five or more years in advance of actual mining, and they provide plans for development, transportation, ventilation, and drainage, with the future always in mind. The engineers of the forecast division study the physical condition of the various strata and make their plans so as to insure maximum production, continuous operation, greater safety, and increased efficiency.

Too often in the past the best beds of coal have been mined first, those acreages which had impurities were left and only the better coal areas mined, with the result that much coal only slightly inferior was either ruined or made unrecoverable except at far greater cost than necessary. Areas have been mined out of order and when the remaining coal was finally taken squeezes occurred, lives were put in jeopardy and men were injured and killed with incidental loss of much coal. All this, largely for the lack of a definitely forecast program

Even where the spirit of "Let tomorrow pay the bill" was absent, if no study was made and if the future did not have a director at the board to present its claims, the operation of one year or decade disastrously affected the operations of another. Yet how often has it been found that to clean up methodically as one goes along, to develop according to consistent principles, to view the present through the spectacles of the future pays not only at that future date but today, for some of the consequences of unforecast operation are visited more promptly on those who fail to anticipate the future than on their successors.

Unless there is a forecast there is a tendency either to delay development in order to save expenses, with the result that after a while production decreases, or to push development ahead unduly, thus laying too heavy a load on the cost of coal. Unless the speed of development is regulated by a forecast of future needs a mine is likely to be the victim alternately of a frenzy on the one hand for tonnage regardless of cost and of an urge for economy on the other that will destroy more than it saves.

Whenever, because of insufficient development, a company suffers a loss of tonnage, it is then subjected to a further loss because with that decreased production over which to spread it, it must face excessive development expense unless the cost can be made a capital charge. Thus the company's prosperity suffers at least an apparent decline. A prudent company will always develop its property to accord with its future needs and so have neither a feast nor a famine of output facilities and neither an excessively low nor an unduly high development charge.

Most companies have some realization of these facts and in a degree provide against them; some bituminous companies with easily forecast conditions meet the situation fairly well by the rough calculations which are all that are needed, but no one can forecast the requirements in an anthracite mine with the irregularities due to earlier operation without a detailed forecast, by whomsoever made.

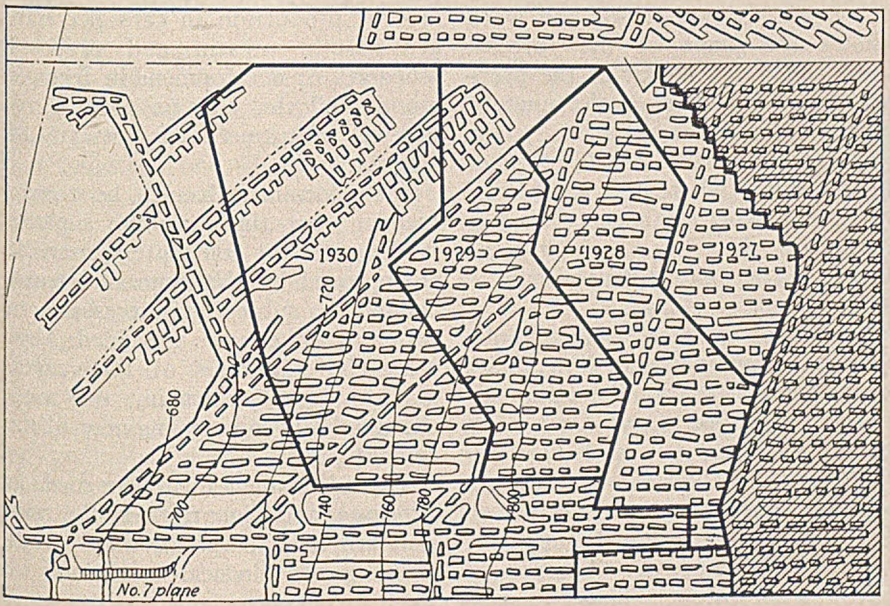


Fig. 2—Forecast for Area Where Original Pillars Still Remain

Furthermore with gangways which have a high maintenance cost, because of crushing roof and heaving floor, excessive development not only brings an undue interest loss by expending money before it is needed but adds to maintenance charges also. Every gangway driven needlessly soon becomes a burden to the company finances, for it reduces the bank balance and so absorbs interest; it has to be retimbered; it constitutes a hazard, and it requires ventilation and drainage. A company can well be development-poor, though this condition is not so common as the reverse.

Nevertheless such excessive development sometimes is found in mines which on the whole are short of development, and it can be avoided only by a system of operation which is based on the actual needs of any one section of the mine or mines as related to the whole production of the needs of the company. The forecast plots a definite, detailed picture of the operating requirements and the program that follows gives a well-balanced method by which the needs can be met.

This methodical system takes the place of rough calculations based on a cheerful optimism, which later have to be sustained by some pillar-robbing operation which everyone would condemn as unworkmanlike but which is dictated either by the necessities of the market situation or by the need on the part of the management to justify its estimates, which were based originally on vague hopes rather than on careful studies and correct deductions. Unfortunately, such temporary expedients are only too common, and the results of them are lost coal, accidents and costly operation.

In some ways the forecast board might be appropriately termed the planning board but that it lays stress above and before all else on its fact-finding purpose. Too much of the planning of mine managements is little more than intuition and "castles in Spain." The board appointed by The Hudson Coal Co. to perform this function not only forecasts needs of operation but lays down the program by which these may be met and then it watches to see that the program is followed. It must go with all due caution as its forecasts are of record in the form of charts, tables and detailed reports. This assures that it will inform itself of the features of the problem and unsparingly study the bearing of each one.

Ventilation and drainage are problems that the forecast board takes up in detail with a calm serenity that can never be attained by a department which is cumbered and harassed with insistent operating details. Some try to attain this end solely with temporarily engaged consultants, but, while they have their place in this connection, the problem is one that can be met satisfactorily only by long-time surveys.

Consultants given facts thus ascertained can assist, of course, in framing the final conclusions, but the data must be determined, plotted, tabulated and arranged, even digested, as a preliminary to any final decision; otherwise the judgment of the consultant may be rather a guess than a scientific conclusion. To get these facts takes a definite set-up for their study and also time in which to conduct it, and for this the operating forces have no opportunity.

In mines with many beds there are ways of getting around the sags and the hills in the various measures by transferring the water from bed to bed through boreholes and tunnels, and consequently the whole drainage system can be concentrated and the pumping costs reduced. A few pumps can do the work of many. The mining operations can be conducted so as not to cut off any area from its natural drainage-way, and such ways can be kept open and in operative condition until the purpose of the construction has been wholly served. All these provisions usually can be made without involving any problems from uncontrolled roof. In those areas mined by The Hudson Coal Co. which are drained by the Lackawanna and its tributaries the coal in general dips down toward the river. Consequently allowing the water to run down the beds does not much increase the final pump lift, if at all.

Where the future mining is not

planned, the sales department will be in doubt always as to whether it is safe to make contracts for future delivery of coal and the wholesaler will question whether the coal for which he contracts will be delivered. No sales department should be in doubt as to the quantity of coal it will have for sale and be required to sell. It needs this information to regulate its own operations. Why should it build up a market in any city if the forecast board cannot assure it that it will have coal to supply the market thus secured either for a long time or indefinitely?

In planning the mine development the forecast board makes possible a planning of all the other functions of management and operation. It gives the data on which solutions of the financial and marketing problems can be based. The forecast board in a sense is the bedrock on which the other departments rest. It replaces "We think" or "We would like to believe" by "We know."

Tonnage in the anthracite region cannot readily be increased. A few years back it was generally understood that the annual output of the region was likely to be curtailed by difficulties in development. At best it was hoped that by herculean efforts it might be maintained at existing figures. Then came a falling market, and the subject was not so frequently discussed. Nevertheless development used to be, and often is still, a nightmare of management and operating officials, for the obtaining of large tonnages is getting increasingly difficult.

Nearly all the mining work to be performed consists of the removal of pillars, some of which are blocked by falls which must be loaded out or skirted by skipping the coal ribs. Timbering troubles also delay operation. However, granted that the pillars are or have been exposed at their end and are ready for mining, they can be removed safely and completely only along these same ends, all of which must be worked off so as to lie in a line 45 to 60 deg. off the chamber courses. In consequence with chambers 300 ft. long only seven or eight working places can be maintained, and these pillar faces must not be advanced in one bed ahead of those in other beds above them.

In Fig. 1 is to be seen a sample of a definite plan of mining such as this. First of all, it gives the mining layout with the boreholes that have established the coal levels, its thickness and quality, the gangways and chambers, and the reservations for drainage ditches and tunnels. On these gangways and chambers, as represented in the map, are marked in abbreviated form the respective years in which they are to be driven. Lines show the position of these working faces at the end of each year.

Finally, there are lines drawn diagonally across those by which the chambers are represented to show the areas that are to be de-pillared during the years with which those areas are labeled. This map was made before 1927, when probably most of the coal in this section of the Clark bed was still virgin. Consequently the work follows the plans of the forecast board and is as regular as the property lines will permit. Unfortunately, much of the forecasting has to be done regarding areas already first or second mined where the pillars and the layout generally are not so regular. Of this Fig. 2 is typical, though it is more regular than in some colliery workings.

Production and development tabulations are maintained that show, under the heading "Location," mining-section number, bed (say, Dunmore), section (28 Slope), and roadway (51 Plane). Thus defined the tonnage per start as forecast is set on the production chart on the upper of the two lines alongside. The revised figure is set below. These tonnage figures are given for each month of each year and for the year itself. The development table is similar. From these tables the forecast board can check its constants for progress, can correct the forecasts already made if necessary and can ascertain whether the mine is being developed in accordance with the schedule.

The forecast being made to aid operation and not operation to justify the forecast, the latter is changed whenever it is clear that the forecast results can be bettered or cannot be attained, and for this a form is provided entitled "Adjustment of Forecast." This includes an authority number and date, the name of colliery, tract and bed, a full description showing ownership of surface or right of support, physical surface conditions and improvements, probable effect of pillar removal on surface and improvements, depth of surface wash, degree to which it is water-bearing and the probable additional inflow of water from any source, probable effect of overlying beds, showing position, thickness and state of mining in each, proposed method of removing pillars, present and proposed schedules of production in cars per start per month, present and proposed schedules of development in feet per month and the reasons for the requested adjustment or revision of forecast.

This document has to be recommended by the colliery superintendent and the colliery engineer. It is approved by the general forecast committee, subject, if necessary, to restrictions thereunto appended. Then come the signatures of the general manager and chairman, the vice-chairman and mining engineer of the committee.

The adjustment forms are made in triplicate, and blueprints of the revision are attached to it, these prints showing the physical conditions set

(*Turn to page* 599)

Fig. 3—Form for Comparing Performance with Forecast

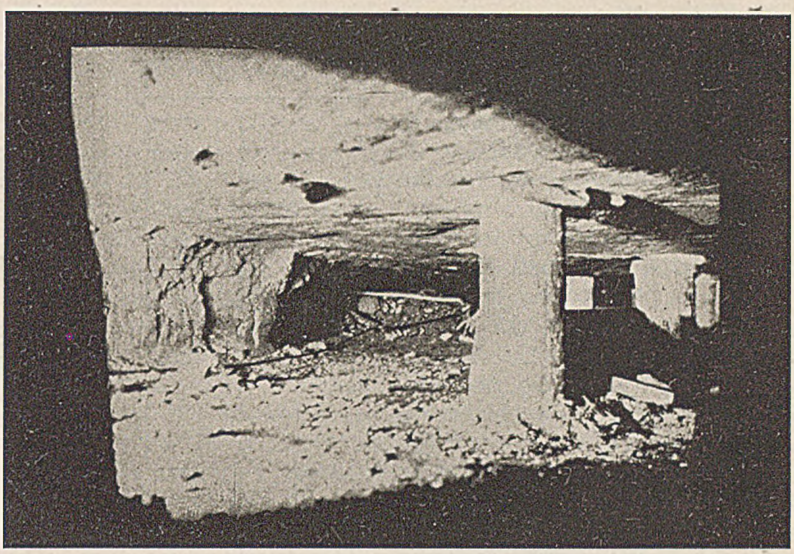
PRODUCTION

.................Colliery

Location					1926													
Mining Section No	Bed	Section	Roadway		J	F	M	A	M	J	J	A	S	O	N	D		J
	Dun.No. 4	23 Slope	51 Plane	Forecast	10	10	4										24	
				Revised														
			Heading 1	Forecast							8	8	8	8	8	8	48	
				Revised														
			" 2	Forecast	6	4											10	
				Revised														
			" 3	Forecast														
				Revised														
			51 Slope	Forecast	7	7	7	7	7	7	7	7	7	7	7	7	84	7

..............Opening

Roadway			1930												
			J	F	M	A	M	J	J	A	S	O	N	D	
51 Plane	Forecast														
	Revised														
Heading 1	Forecast	419	54	54	54	54	54	54	52	52	52	52	52	52	636
	Revised														
" 2	Forecast	95	30	30	30	30	30	30	30	30	30	30	30	30	360
	Revised														
" 3	Forecast														
	Revised														
51 Slope	Forecast														



Scraper on a Longface

MACHINES Extend Economic Limits of Thin-Coal Mining

By Alphonse F. Brosky
Associate Editor, Coal Age

LAST year The Hudson Coal Co. produced over six million gross tons of anthracite at its fifteen collieries, one of which, Baltimore, was in operation only a short part of that twelve-month period. Considering that this great property was opened more than a century ago, the production today of so large a tonnage as this—representing about 10 per cent of the combined output of all the producers of anthracite—is most creditable, in view of the limiting conditions that the wise foresight of the company has imposed. It insists that no coal shall be mined today in a manner that will result in the destruction of the coal needed to supply tomorrow's markets.

This, indeed, is a major policy of the company and on it is predicated all production procedure. That fact is plainly reflected in every item of the present methods of working. No block or pillar of coal is withdrawn without advance consideration as to the effect of its removal on future accessibility of coal bodies above, below or on any side of it. To the accomplishment of this purpose, mechanization equipment, handled with due regard to modern methods of management and operation, have contributed much.

Though The Hudson Coal Co. in a sense is fortunate in holding coal property in that portion of the Northern Field which has suffered least from folding and faulting, it is faced with perplexing problems nevertheless, for what, offhand, might be expected to assist in the mining of the coal proves to be in some respects detrimental to simplicity of operation. With rare exceptions the coal beds lie so flat that though chutes be provided, the coal will not flow by gravity from the face to waiting cars; and yet the pitch and thinness of some beds or sections thereof frequently are such as to make transportation from the face by mine cars impracticable.

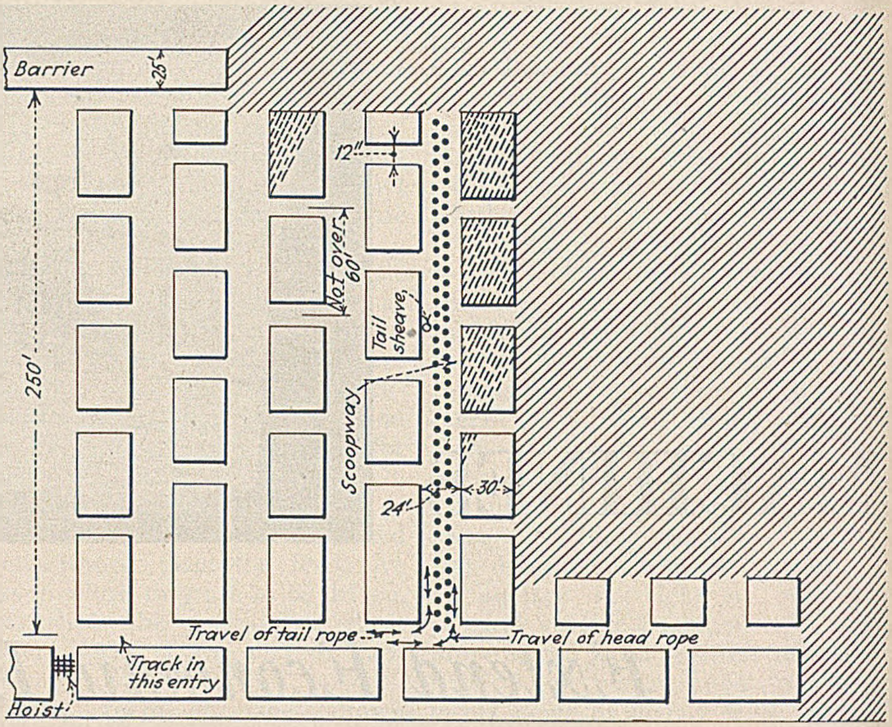
It is to problems such as these that mechanized mining methods are being applied. To the production of coal by machinery this article is largely confined, not that the writer fails to appreciate those time-tried methods by which the bulk of production is derived but because the success obtained by these newer methods is significant of their further development and relative importance. Thin seams aplenty have to be mined; the thick coal that can be extracted by older methods is rapidly being exhausted, and on the newer ways that substitute machines electrically and pneumatically operated for implements laboriously wielded by human muscle the future in the main must depend.

When the first wave of face mechanization swept over the industry, loading devices were no new conception to this company, for it was largely in these mines that the practical use of scraper loaders was developed. The first scraper was installed in 1916 and now 151 such units are in operation, in 23 beds and 12 mines. In 1928 these loaders produced 14.33 per cent of the company's output for the year.

Scrapers in these mines are confined as a rule to beds so thin as not to be minable by hand methods at a profit. Though they are being used in the mining of some moderately thick coal, most of them are at work in coal 3 ft. thick or less. The minimum limit is about 20 in.; but where the coal thins out, due to undulations over relatively small areas, coal of much less thickness is taken. In such areas the workable thickness is limited by the height necessary for the successful operation of the machines. Particularly is this true in longface layouts, as in the workings of the Jermyn mines, where a 14-in. longwall cutter is in operation.

Though scrapers have many inherent advantages, when they are used in thin beds the reduction of deadwork they effect is by far the most important. Under ordinary conditions of mining large tonnages of rock must be taken with the coal and packed in places away from the point of excavation or else transported to the surface.

Rock disposal is a big problem. Any scheme that reduces this deadwork is distinctly desirable. The removal of material from roof or bottom also diminishes the columnar strength of those pillars which for a time must be left standing and may appreciably weaken the structural strength of strata above and below the bed, the interval between beds in places being a matter of a few feet. For these reasons only with the scraper or some similar devices, such as conveyors, can the thinner anthracite beds be worked.



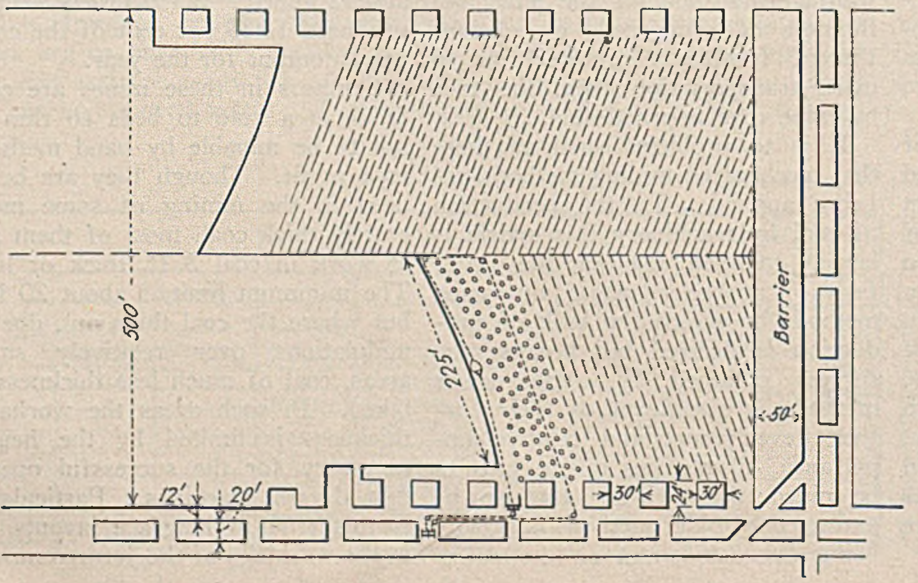
Pillar Mining With Scraper

In these mines scrapers are applied to three main classes of mining layouts: (1) to longface recovery; (2) to chamber extraction, and (3) to pillar removal. Seldom do chamber mining and pillar mining follow each other without an interval of time between them. The pillars formed by the removal of chamber coal are usually left standing for months and in some instances for years in order to protect partially extracted beds above or below by columnar alignment of the pillars.

Few of the workings are so disposed as to allow complete reduction from solid block to goaf areas in one sweeping operation. It is for these reasons that the company does not think it well to undertake longwall methods with their completeness of extraction where more than one bed is involved. In consequence longwall work is restricted to relatively small areas.

A plan of the layout followed in the Top Clark bed at the Jermyn mine, which is typical of longface practice in the Hudson mines, is displayed in these pages. As indicated, a longface is established on each side of a gangway and a companion airway, in a panel 598 ft. wide, which means that two such faces are worked from each pair of entries. Though the body of solid coal between these entries is 500 ft. wide, the actual length of faces is only 225 ft. as protecting stumps are left along the entries. These stumps are 30 ft. long and 24 ft. wide. They are developed by places driven 30 ft. wide on 60-ft. centers, which are connected by cut-throughs parallel to the gangway or airway.

Entries are driven by hand. In these about 3 ft. of bottom is lifted. On the other hand, the longface places are driven in the coal only and are developed entirely by scraper. The stumps are withdrawn by hand work. As a rule, wherever longfaces are turned from the gangway only, no bottom rock is lifted in the airway. At the end of the panel from which the longfaces are started, a 50-ft. barrier pillar is left to protect the cross heading or counter. Stumps and chain pillars are taken by hand.

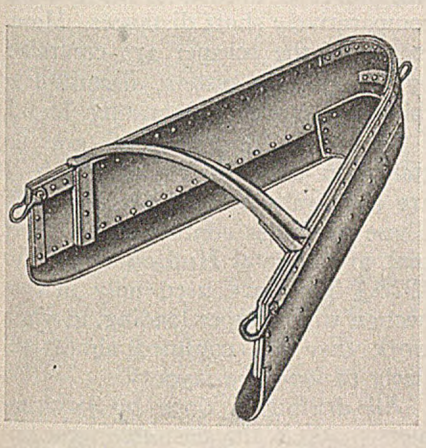
Longface Mining With Scraper


A longface is not exactly straight nor is it normal to the entry. It is maintained slightly convex and somewhat inclined in order to enable the scraper to hug the rib, thus facilitating its loading. The arrangement also allows timbers to be set closer to the face than if the latter were straight without danger of their being pulled out by the scraper. Where two longfaces are turned from one pair of entries, one scraper unit is used for both of them.

Having set up the scraper hoist in a crosscut between a gangway and an airway, it is possible to leave it there until the longface has moved through a stretch extending 300 ft. on either side of the hoist as measured along the entry. Though this is sometimes the practice followed, usually it is found advisable to shift the scraper to the longface on the airway side after the 300 ft. of the face on the gangway side has been mined out. The ropes of the scraper pass around that stump which is nearest to, and yet in the wake of, the face.

In the Top Clark bed at Jermyn the roof is a good sandstone and the bottom a comparatively hard shale. The bed is about 170 ft. below the surface, is fairly level and has an average thickness of 3 ft. with a minimum of 20 in. Adjacent to the faces the roof is supported by 6-in. round props on 5-ft. centers. The row nearest the face is rarely more than 10 ft. from solid coal.

Wherever possible this system of supporting the roof is maintained, it



Perspective Sketch of Scraper

being the simplest and most economical. But on occasion it has been necessary to use timber cribs. Where used alone the cribs are set 5 ft. apart, and where they are used in combination with props they are placed 10 ft. apart. Neither props nor cribs are recovered. Packwalls have been tried in longwall mining and have been found in general to be too costly.

Wherever feasible, longfaces are triple-shifted. In the workings under consideration the operation is merely double-shifted. The tonnage which a day and a night crew jointly can produce, with the aid of a scraper unit, a cutting machine and a jackhammer, is equal to the coal yielded by a 5½-ft. cut along half the length of a 225-ft. face. Consequently the practice is to prepare and load out about 115 ft. of the face each day.

The night crew is composed of four men, who cut, drill, blast and, if time permits, timber. Otherwise timbering is done by the day crew. The latter numbers six men: one is a hoist runner, two are car trimmers and three work at the face attending and guiding the scraper, loosening and cleaning coal, propping, and otherwise facilitating the loading operation.

Six hundred tons is produced daily from the Top Clark bed at the Jermyn mine, of which 90 per cent or 540 tons comes from eleven scrapers. Each unit, therefore, produces 49 tons per day.

In the Grassy Island mine, Olyphant colliery, eighteen scrapers are installed in four of the twelve beds being worked. The lowest bed is the Dunmore No. 4, which lies about 750 ft. below the surface, and the shallowest is the No. 1, which is under only 40 ft. of cover. Most of the scraper mining is in the Top Clark bed, 20 to 36 in. thick, under cover of about 300 ft.

Owing to the multiplicity of these beds and the dependence of one on another for support, it is necessary to columnize meticulously the workings of the several measures. This is the more obligatory in view of the fact that the interval between certain of the beds is comparatively thin. For example, the interval between the Top and Bottom Clark beds varies from 8 to 50 ft. The thickness of the strata intervening between the Top Clark bed and the New County bed above it ranges from 50 to 90 ft.

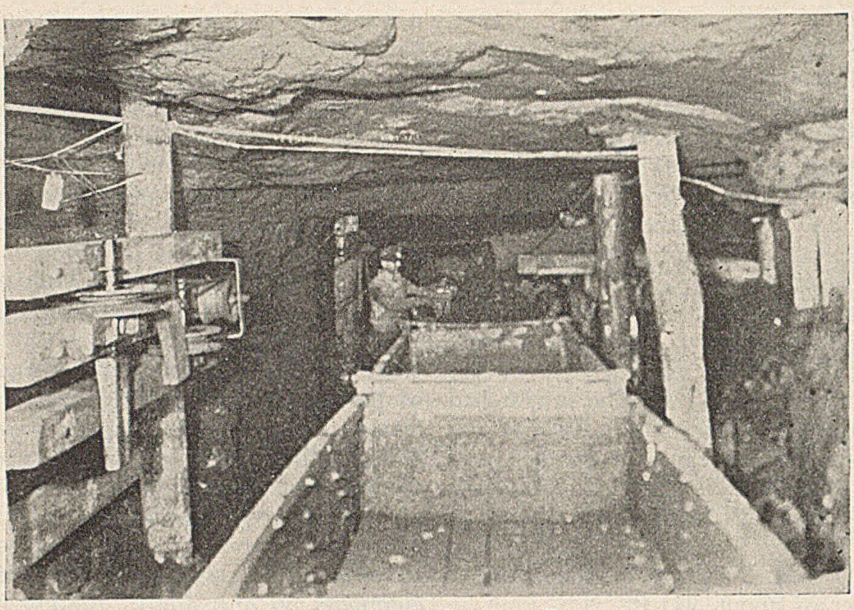
Chamber-and-pillar mining is practically universal in the beds of this mine. In the Top Clark bed ten scrapers are being operated in the mining of chambers and, where allowable, in the extraction of pillars. The roof is a bony and, therefore, not as sound as the sandstone which is found above this bed in the Jermyn mine. The bottom is a fairly hard shale. A unit working area is a panel through the center of which is a gangway and an airway, as indicated by an accompanying plan. Rooms are turned right and left from these entries. They are 24 to 30 ft. wide on centers of 54 to 60 ft.; their length is 225 to 250 ft.

As in the Jermyn mine, 3 ft. of bottom rock is taken along the entries, but usually none is removed in the chambers. However, it is often necessary to handle portions of the roof. In this case the material is gobbed between two or three rows of posts in the middle of the rooms, leaving on one side a scraperway and on the other side a sufficiently wide alley for ventilation and for the travel of the tail rope of the scraper.

Two scraper units are assigned to each panel, one working in the chambers on one side of the entries and one in the chambers on the opposite side. It is customary to allocate a single unit of four chambers to a scraper. While one of these is being loaded out, another is being prepared for the scraper. As an aid to loading, chamber faces are advanced at a slight angle with respect to the ribs, the obtuse angle being made with the rib flanking the scraperway. All shotholes are drilled with jackhammers. A few of the scraper units load chamber coal which has been machine-cut, but for the most part here, and almost altogether elsewhere, chamber coal, even when mechanically loaded, is shot off the solid.

Where coal is shot from the solid and loaded by scrapers in chambers, the opening or breaker shotholes are placed in line with the scraper roadway. This causes subsequent shots to throw the coal toward the opening thus formed and not into the gob. In consequence the scraper loads

Mining Out a Chamber



Scraper Discharging Into Cars

with greater facility and less coal is lost.

Where scrapers are worked in chambers without the assistance of cutting machines they are single-shifted. The crew normally is composed of eight men, two of whom attend to preparation of a chamber face while the other face is being loaded out by the remaining six men. The usual production per shift with solid shooting is about 45 tons. Where chamber coal is undercut a crew of nine and sometimes ten men is required. Three of these men cut and otherwise prepare the coal. In some cases the preparation crew works during the night and in other cases by day with the loading crew. Production from scrapers when the coal is undercut is about 50 tons per day.

Pillars are extracted by establishing an open-end face which may be longitudinal, that is parallel with the pillar or inclined at any angle to it up to 45 deg. depending on roof conditions. An attempt is made to work the coal at a gentle angle with the pillar, as this arrangement provides the longest face which can be worked effectively. The number of men on a scraper crew and the tonnage yield in pillar work are about equal to those for chamber mining.

Production figures given for scrapers operating in the Top Clark bed, both in longface and in chamber-and-pillar mining, are considerably higher than the average per unit for all the scrapers on the property. Conditions in this bed are highly favorable for this type of mechanical mining. By and large, conditions in the other beds are not conducive to so great a yield as is obtained from this one. The expected average yield per scraper for a year of 276 working days is 10,000 tons or 36.2 tons per day.

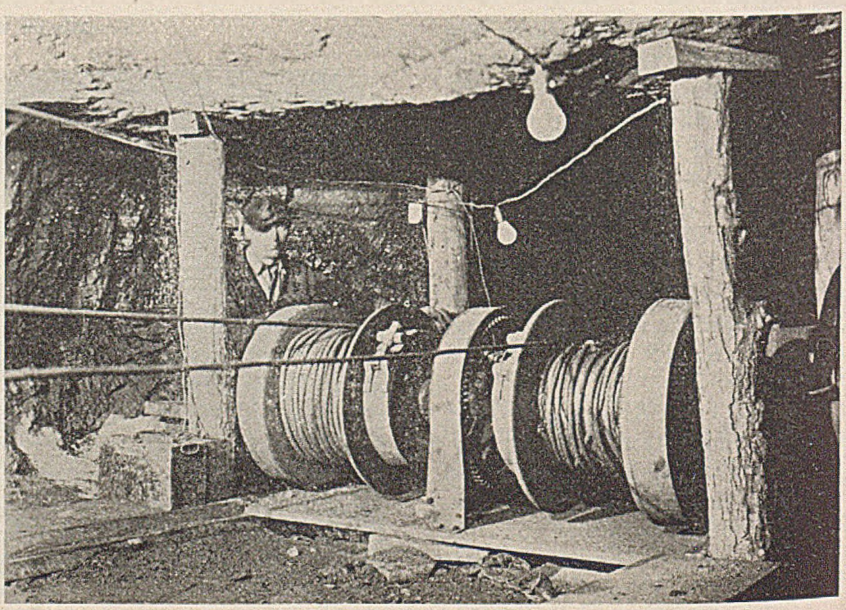
The scrapers used were developed by experience in the Hudson mines and are built by the company. The hoists, however, are purchased. As illustrated by the accompanying perspective sketch, the scraper in outline resembles an old-fashioned snow plow. It is built up of steel plates, $\frac{1}{4}$ to $\frac{3}{8}$ in. thick, which are shaped and reinforced by heavier sections. The bottom side plates are curved inward and are braced with channel sections. The brace bar, or stiffener, which spans the top of the scoop at the wide end is of wrought iron. This scoop is made in three sizes, 16, 18 and 20 in. high. The biggest unit is about 4 ft. wide and 5 ft. long. It will carry about half a ton of coal. and the smallest scoop will handle slightly more than a quarter ton.

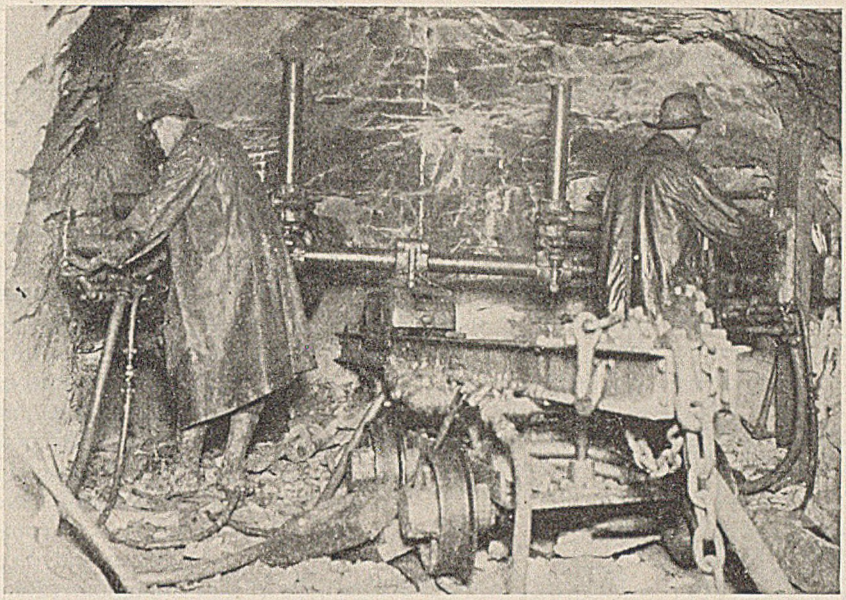
A two-drum hoist, usually equipped with a 25-hp. motor, actuates the scoop. The drums are 30 x 16 in. and hold as much as 1,000 ft. of $\frac{1}{2}$-in. rope. The average life of the wire rope, is six months. In earlier years a four-drum hoist was tried, two of the drums being intended for moving and spotting the mine cars. This type was found to be too cumbersome and complicated and is no longer used. The two-drum unit is adequate. Trips of eight mine cars are delivered to the scrapers and in general are spotted by gravity. A special hitching is linked between the rope and the mine car when mechanical power is needed to move a trip comparatively short distances. Movements of the scraper are controlled by a signaling system, described in this issue under "Operating Ideas."

Forty-five undercutters are installed in these mines, of which 23 are shortwalls and 22 are longwalls. These machines contributed 4.73 per cent of the total Hudson output for 1928. They are used only in connection with scraper loading, in which work they are confined almost entirely to longface layouts.

All drilling is done by jackhammers. As is the custom in the anthracite region, these drills are owned by the miners. The company promotes the purchase of them by offering a partial-payment plan. Air is furnished at a working pressure of 80 lb. by 63 compressors with a combined capacity of 69,041 cu.ft. per minute. The smallest unit provides 110 cu.ft. of air per minute and the largest 5,000.

Two-Drum Scraper Hoist





Speedy Drilling, Machine-Wise

RE-MINING OLD WORKINGS

Where Roof Is Crushed

MORE than a century ago, when other parties were mining the coal now worked by The Hudson Coal Co., the system adopted could hardly be designated the "chamber-and-pillar method," for the chamber was taken and the pillar left. Recovery of the pillar was not even considered, but when there came a desire to get a portion of the pillar by what was then designated second mining, only a part of the coal was removed and then only in some of the beds. In consequence millions of tons of anthracite remained in pillars.

To effect its recovery with minimum cost is the task to which The Hudson Coal Co. has devoted its technical and managerial energies. Complete recovery is the aim of the company, and how sincere it is in the prosecution of that purpose is manifested by the great pains and the devious methods taken to recover the coal which a previous generation left behind and believed was lost forever.

To mine a solid bed of coal completely is at best not a simple matter; to complete the mining of one already first mined is still more trying, but the difficulty in returning a third time to get what was left in the other two endeavors is yet more perplexing. Still more harassing is it to mine not one but three beds of coal separated from each other by thin rock measures, the entire mass badly crushed as the result of previous operation. Such are the conditions with which the management has had to cope in the final recovery of the skeleton bodies of coal in the Powderly slope mine.

This mine was in its heyday more than half a century ago. No reflections need be cast on the men of that date. They served the needs and made good use of the facilities of their day. Nevertheless the present work of recovery is creditable to the policies and the inventive genius of those who are now operating this half-century-old mine.

From top to bottom the beds mined are: the Top Clark, 7 ft. thick; the Bottom Clark, 6½ ft. thick and the Third Bed, which is 5½ ft. thick. The intervals between the center bed and the beds above and below vary from a meager 3 in. to a maximum of 2 ft. The dividing material is a bony shale. The beds lie at an average depth of 100 ft. below the surface and the overlying strata are of sandstone which is badly fractured as a result of earlier mining. In the southern portion of the mine the Third Bed is missing.

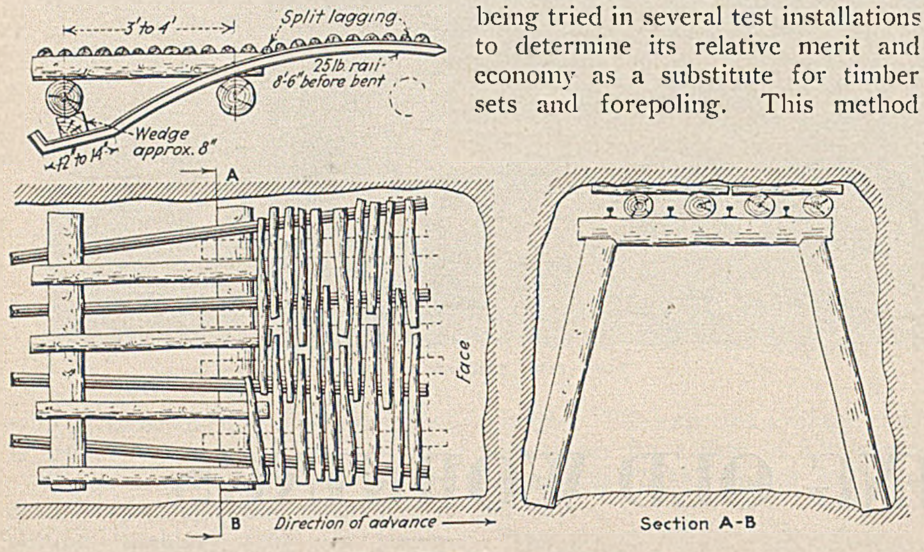
Preliminary extraction and development, of course, are conducted in the lowest bed. Coal from the upper bed or beds is removed in the retreat by displacing two or three timber sets at a time, allowing the coal to come down of its own accord or bringing it down by the assistance of explosives. All places are driven uniformly 12 ft. wide. In the driving of chambers it is customary to keep alongside a pillar whenever one is conveniently available. In that case wherever the pillar and the roof above it are sufficiently sound, a skip of 2 to 3 ft. is taken along the rib and the excavation thus made is utilized for the stowing of rock.

Successful mining of coal in caved areas is largely dependent on the system of timbering used. In the Powderly mine great care and precision are necessary in the setting of timbers. The system followed is that of forepoling over timber sets on 3- to 4-ft. centers. Thus, sufficient space is left between these sets to allow convenient and safe placing of an additional set to replace one that has broken. The standard set is a 10-ft. collar supported by 8-ft. legs, which are spread to a 2-in. pitch. No less a diameter than 10 in. is allowed in the timbers from which the sets are framed. Six sprags are set between each two sets, two to each member. Frequently it is necessary to place lagging behind the legs of the sets, but, where conditions will allow, a rock wall is built between the legs.

In recent months a new system of forepoling, involving the use of removable forepoles made of scrap rail, has been tried. This system, which was adapted from somewhat similar methods used in Germany, promises to be superior to the old method, because it reduces considerably the material necessary to make a safe roof in crushed ground.

The steel rails are shaped as shown above and are driven ahead over the farthest timber set. They are blocked down underneath the second set of timber. With three or more of these steel forepoles in place a wooden roof is constructed of split lagging which is made of scrap timber.

After this covering has been constructed, sufficient excavation is made so that the next timber set can be placed, and when this is done horizontal stringer pieces are placed beneath the steel forepoles with blocking between the horizontal stringers and the split lagging. After this is accomplished the wedges which have been placed between the steel lagging and the timber sets are removed and the steel forepoles entirely withdrawn, allowing the roof load to rest upon the horizontal stringers and the split lagging.



Track-Rail Forepoles

This system has been underway but a few months and so far is entirely experimental; but it seems to be quite successful. Steel forepoles rarely become "jammed" and so incapable of removal.

Schaefer precast concrete lining, described elsewhere in this issue, is being tried in several test installations to determine its relative merit and economy as a substitute for timber sets and forepoling. This method of holding broken ground, if practicable, would be particularly valuable for the support of gangways, many of which must be maintained for years.

Though tunneling the rock under coal beds for the ultimate removal of coal in workings subject to large-scale earth movements is costly in some places it may be the cheapest and most practicable method. That, at least, is proving to be the case in the winning of anthracite from the Top and Bottom Red Ash beds in the No. 6 Tunnel workings of Loree No. 4 colliery at Larksville, Pa.

Here the upper of these two beds, the Top Red Ash, which is 4 to 10 ft. thick, lies about 300 ft. below the surface. It is separated from the Bottom Red Ash bed which is 18 ft. thick by a rock interval of 4 to 10 ft. About 50 per cent of the original deposit in these beds still remains in pillars, which for the most part are not columnized.

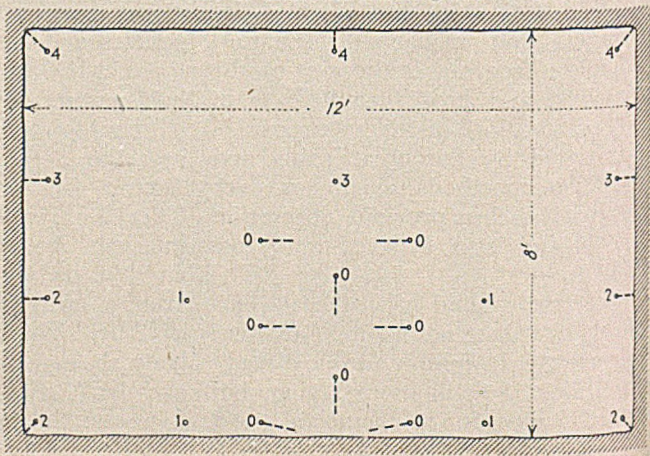
Earlier attempts to remove this coal through gangways in the beds and through planes from a higher level were futile. Three attempts at this mode of mining were made and these signally failed. These planes were driven from the shaft level of the Ross bed, which occurs 50 ft. above the workings now under consideration. In each case shortly after the completion of the plane and connecting gangways, and before much coal had been removed, mining was abandoned owing to the intensity of squeezing action.

Recovery by tunnels beneath the beds, an anthracite practice not altogether uncommon, was the only alternative left for retrieving this coal. Accordingly, these beds are being tapped from tunnels 20 ft. below the lower bed, which are being driven through a micaceous sandstone and directly over the top of a conglomerate. These are connected with haulage roads in the Ross bed by a heading with an adverse grade of 3 per cent. The main tunnel is driven across the heavy pitch of the conglomerate so as to be on a grade of 6 per cent in favor of the loads and from it lateral tunnels are driven at intervals of 200 ft.

From the lateral tunnels, in turn, rockholes are being raised to the lower of the two coal beds. These holes are 8 ft. wide, 6 ft. high and inclined on a slope of 16 deg. from the vertical. Each is divided by a timber bulkhead into two compartments—a coal chute which is 5 ft. and a manway which is 3 ft. wide. The holes are being connected by gangways in the lower bed. Coal will be transported by buggies from the working faces to the rockholes, where it will be dumped and drawn into mine cars spotted on the lateral tunnels.

Pillars in the lower bed will be attacked by driving a skip in the flank of each pillar 8 ft. wide. Then in the retreat the remainder of the coal in the pillar will be taken and, concurrently, coal in the top bed and

Placement of Holes in Blasting Tunnel Rock



the intervening stratum will be blasted and withdrawn. In the skipping of pillars, sets of 8- to 10-in. diameter timbers will be placed on 5-ft. centers. They will consist of 6-ft. collars and 6-ft. legs spread to 8 ft. at the bottom, covered with lagging where necessary.

Should a territory start to squeeze, mining will be discontinued in that area until the movement ceases, the objective, during the retreat, being to make orderly and uniform caves.

The rock tunnels in this mine are driven mechanically and advance with rapidity. Each day a single battery of machines and three crews in three shifts take three 6-ft. cuts from each of two tunnels, a combined advance of 36 lin. ft.

As already indicated, the tunnels are being driven through a micaceous sandstone, which is of a massive nature. The tunnel section is 12 ft. wide and 8 ft. high. The rock is drilled with Ingersoll N-75 drifters mounted on a Denver rig. To blast the cut, 22 holes are drilled and charged with 100 lb. of straight dynamite. The arrangement of holes and the sequence in which they should be fired are indicated in the drawing at the foot of the opposite page. All are fired by one impulse from a battery in a delay circuit. Those marked *O* are fired instantaneously and the others are discharged in groups in the sequence indicated by Nos. 1, 2, 3 and 4. Drill steel $1\frac{1}{4}$-in. round is used. The lengths and bit gages respectively are as follows: 2 ft. x $2\frac{3}{8}$ in.; 4 ft. x $2\frac{1}{4}$ in.; 6 ft. x $1\frac{7}{8}$ in.; 8 ft. x $1\frac{5}{8}$ in. and 10 ft. x $1\frac{3}{8}$ in. The drills are sharpened by two men with an Ingersoll-Rand Leyner Drill Sharpening machine, a shop being devoted to that purpose.

The two tunnels are not companions, and so the distance between faces is a factor in shifting from one to another. While one face is being drilled, rock is being loaded from the other by a Butler shovel. The tunnels are ventilated by blowers and tubing.

A crew consists of a drilling, a loading and a transportation gang. The first of these comprises four men who operate the drifters, one man who passes steel and one boss or chargeman. The loading gang consists of a shovel runner and two men who trim and make temporary track extensions. On the transportation gang are two haulage men and two trackmen who lay permanent track. All gangs are supervised by a rock foreman.

Forepoling in Loose Ground

Since the introduction of mechanical methods in the anthracite region voids have been more often backfilled than in earlier days, the purpose being to support travelways and airways in nearby overlying beds or to maintain the surface. The old method of stowing rock by hand is too costly to justify its use on a large scale. But shaking conveyors, which are coming into use for the purpose, increase the productivity of a man on this job from four to twelve times and sometimes more. The practice of rockfilling will doubtless increase as the cost of the work declines.

The Hudson Coal Co. uses shaking conveyors for backfilling with rock in several of its mines at a considerable saving over hand methods. At the Boston colliery of the Loree division, at Larksville, Pa., this method is being used effectively in supporting an area of valuable surface land measuring, roughly, 350 x 800 ft. Two beds of coal are involved, one being the Cooper, 12 ft. thick, lying at a depth of 175 ft.. below which and separated by an interval of about 4 ft. is the 14-ft. Bennett bed. The pillars of these beds are not columnized and many of them are small in the area in which surface support is required. In places portions of pillars in the upper bed have been crushed down into the workings of the lower bed.

IN BACKFILLING under such conditions two methods may be adopted. The conveyor may be installed in the upper bed so as to discharge rock from it to the lower bed through holes in the stratum intervening between the two. Where this is done a conveyor and three men, which is the usual crew, have stowed in one 8-hr. shift 52 cars of rock, each with a capacity of 70 cu.ft. Naturally, this crew has nothing to do with the transportation of rock by mine car to the conveyor. One man loads and controls the conveyor and the remaining two men are stationed at the discharge end.

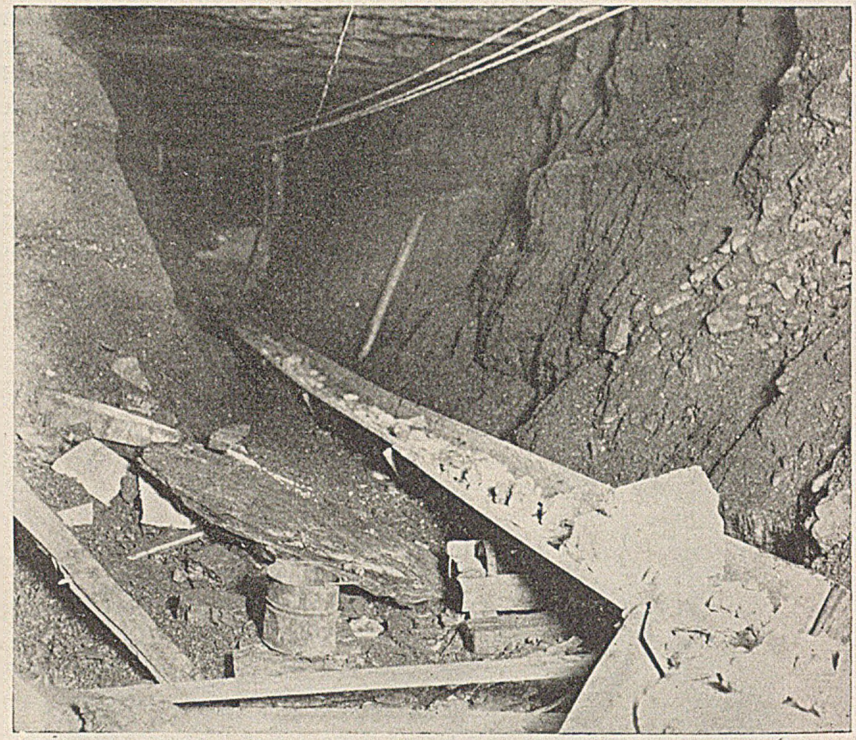
Sometimes, however, the rock is stowed in the bed in which the conveyor is installed and in that event the productivity of the men is reduced as much as 50 per cent. In this case more of the rock must be stowed by hand and the setting up of the conveyor is more laborious, for it must be operated on top of the rock pile which it is building. In this plan of backfilling both an advancing and a retreating operation are involved. In the advance the rock bank is built up over the width of the chamber to within about 4 ft. of the roof. Simultaneously, rock is packed to the roof on both sides of the conveyor by hand. In the retreat only the opening along the conveyor remains to be handpacked. This is usually about 12 ft. wide. Three men will stow 25 cars of rock in the advance and pack 14 cars of rock in the retreat daily.

Local officials of this mine suggest the possibility of using this method in combination with silting. They advocate that on the retreat the conveyorway be silted, thus providing an ideal fill.

A Mavor & Coulson conveyor, equipped with a 15-hp. motor drive of the side type, is used in this work. On this job this drive was mounted on a concrete pier 10 ft. deep, in which were embedded four 1-in. anchor bolts. The drive was further held rigidly in place by four 3-in. jack pipes which were fitted between the base plates of the drive and the roof. It has been found that rigid anchorage of the drive eliminates much trouble. Furthermore the effectiveness of the conveyor stroke is increased, but not always is there enough filling in one setup to warrant the expense.

The pans are 9-ft. long, 26 in. wide at the top of the flare, 16 in. wide at the bottom of the trough and 8 in. deep. In rockfilling the conveyor is never extended more than 320 ft. It is loaded by a "Jigger-Digger," a shovel feeder of the rack type which is extensible to a limit of 9 ft. This digger moves over a heavy plank floor and rides on the web of two track rails which guide it in a straight path. These rails are spiked in a normal position to the floor, which also forms the bottom of a receiving hopper. Rock is discharged into the latter from mine cars by an end dump. Backfilling material consists of shales, bony and sandstone; light is furnished by a line of electric lamps and the conveyor is started and stopped by an electric signaling circuit.

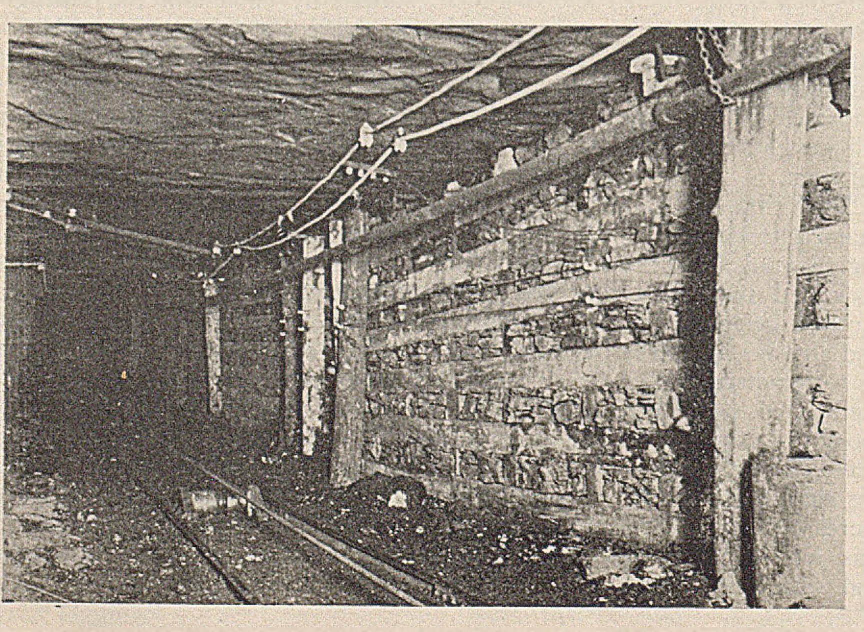
In the 2-Plane district of Loree No. 5, mine rock for backfilling for the protection of a haulage road is being handled by a Vulcan shaking conveyor with swivel joints. Rock is taken from the Five Foot and lowered in mine cars to the Cooper bed where it is being packed. This conveyor is driven by a 5-hp. motor and is made up of pans which are 18 in. wide. The maximum length of the conveyor line is 300 ft. Here, three men normally handle about fifty 70-cu. ft. cars of rock in eight hours.



Conveyors Handle Rock at a Big Saving

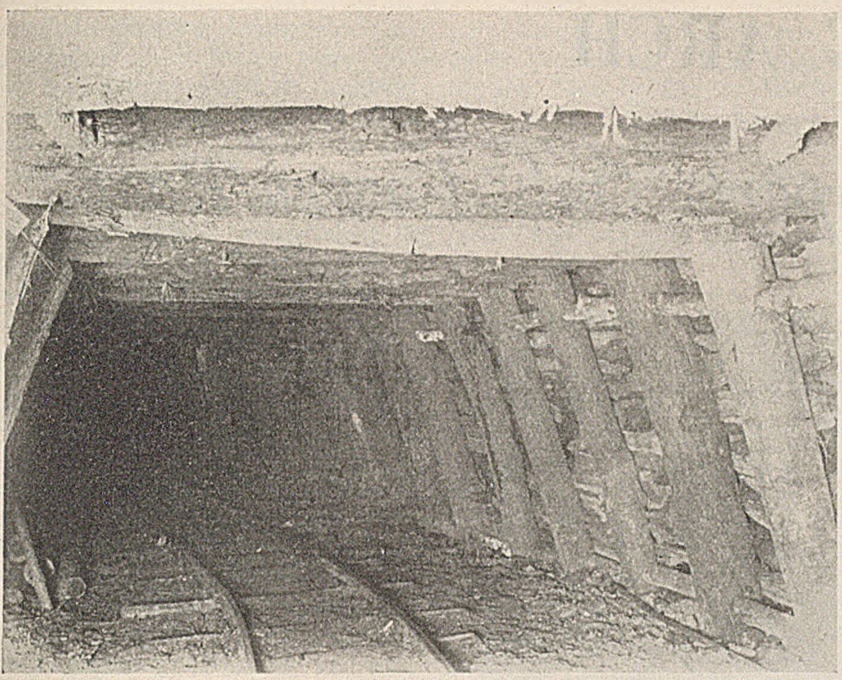
The rock is fed to the shaker conveyor in this case by a method somewhat different from that already described. The hopper, into which an end dump discharges rock from mine cars, is flared inwardly in a downward direction and is constructed of lumber lined with 20-gage galvanized sheeting. Rock is fed from the hopper by a flared, downwardly inclined chute which leads from the feed gate of the hopper and overlaps the end of the conveyor. The rock is, therefore, fed from the hopper to the conveyor automatically.

A Neat Packwall



Recognizing the influence of blasting on the outcome of operating efficiency, its effect on preparation procedure and its rôle in sales realization, the Hudson company some years ago initiated, and has since continued, a vigorous drive toward better blasting methods. The outcome has been the development of manuals describing best-practice methods for every major grouping of conditions.

These manuals are based on exhaustive tests made by practical mining men appointed by the company. The tests are made not in a single working place, but in several places in each of the mines. Changes were made gradually in order to arrive at the best practices. Furthermore, comparisons were made with the results of former practices. Throughout the experimentation detailed records have been kept of procedure and results. Best-practice manuals, one for each grouping of conditions, have been published by the company and distributed to the miners. The latter are urged to follow as closely as feasible the in-



Supporting Moderately Loose Ground

structions appearing in the manuals and to seek the aid of underground company officials in applying or modifying them.

What the best-practice method means to the miner is clearly presented in each manual. A comparison is made of the old method with the new from the standpoint of labor and money cost, and savings are emphasized. Thus, in the manual devoted to shooting of chamber coal in the Top Clark bed, Olyphant colliery, Grassy Island No. 2 shaft, possible savings of 3.1 c. in powder per ton of coal mined, or $323.40 a year, is given. The tests show a saving of labor equal to that required in drilling 2,625 lin.ft. of holes per year.

As to general blasting practices, the depth, angle and number of holes, whether black powder or permissible shall be used, whether the charges shall be fired simultaneously, in rounds or in a delay circuit must necessarily depend entirely on local conditions. Where the coal is thick it is sometimes advisable to shoot and mine it in two benches and in sections progressively across the face.

Most of the shooting is done electrically. A feature of Hudson blasting practice which might well be followed by others is the system of establishing a secret break in the lead wire of a blasting circuit, the location of which is known only to the miner who makes it. Having completed the charging of the holes, the miner proceeds to the break in the circuit and closes it before retreating to a refuge or shelter point where he operates the battery and fires the shots.

◆

Keeping an Eye on Road Ahead

At Hudson Coal

(*Continued from page* 590)

forth in the description but in greater detail. It is provided that under no condition can an adjustment or revision be made without it being first put on paper and approved by the general forecast committee. This includes not only development in virgin coal but skips, counters, pillar robbing, rock roads—everything.

Before any area can be mined or re-mined a "Mining Permit" must be obtained, even though the forecast has already detailed the manner in which the work shall be conducted. This permit is recommended by the colliery engineer or foreman and the colliery superintendent. To this the mining engineer appends his restrictions and the whole is signed by the general manager.

Clearly it is always well to have a schedule, for then the failure of any part of it will announce or at least suggest the ultimate failure of the project as a whole. This will make everyone brace up and seek some countervailing measure or measures to fill in the gap. Suppose a train had a definite time of travel from New York to Chicago on the New York Central R.R. but no schedule time for passing through Poughkeepsie, Albany, Schenectady, Syracuse, Buffalo and other points along the road. The conductor and engineer on that train would never know whether on any trip they were going to bring their passengers into the Chicago terminal in time.

So with any colliery or company; if there is no schedule no one knows whether the speed in development is such as will produce the required tonnage and whether the tonnage can be maintained. Operating results may be satisfactory during a year when gangways can be driven in all directions and coal can be obtained to advantage from every gangway. They may be good while the percentage of virgin coal is large, but in the year following the coal areas available may demand a greater yardage of slopes and planes, the old gangways may produce less or may supply nothing except a few stumps, the roadways may have to be driven over a long and circuitous route and some may have to run through caved material, thus grievously curtailing development and lowering tonnage.

In short, many a mining operation has a wall ahead and low visibility. The work of a forecast committee is to scout ahead, find the wall and guide the operating department past it. The future with a busy operating man is likely to be forgotten in the pressing necessities of the present and he is therefore in need of scouts who will advise him of the actual situation.

YIELDING ARCH

Supports Only Lower Roof

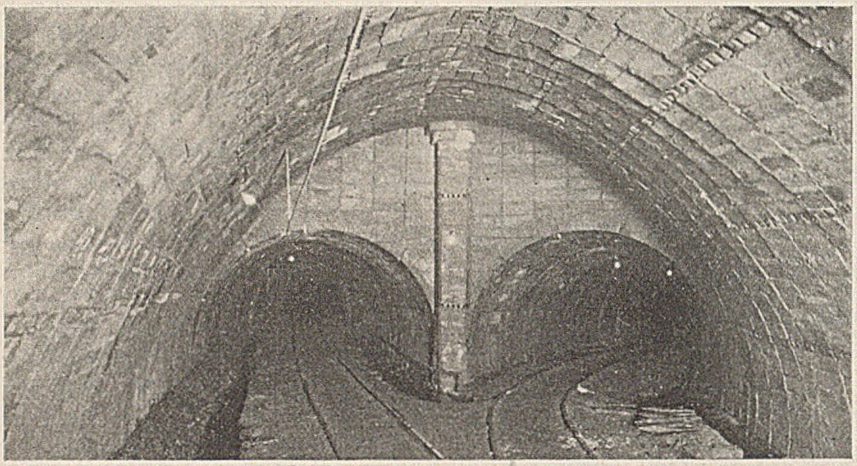


Fig. 1—At Angle of Turnout

AT Powderly mine of The Hudson Coal Co., Carbondale, Pa., is much crushed ground and, to keep some of the roadways in the mine open and free from caving and closing, the Schaefer lining, a recent development from Essen, Germany, has been introduced with much success. It replaces timber sets, which in places have been found inadequate.

In nearly every mine the roof may be divided into two parts: (1) Rock material which supports itself on the pillars, pack walls and fallen rock, either by its unbroken strength or by choking on itself, and (2) other rock material which must be supported over open spaces by artificial aids if it is to be kept from falling. The two classes of roof might be termed the upper and the nether, the upper being that first described.

The dividing line between the upper and nether groups of layers will vary greatly. In some the nether roof is a drawslate of no great thickness. In others, the roof being extensively fractured, the nether roof is quite thick. Where the roof is what is known as "crushed ground," the nether roof becomes extremely thick, heavy and menacing, and quite a problem arises to provide for its support with such means as have hitherto been available.

More rigid and less broken, the upper group of layers descends less readily than the lower group, which, as already said, is more fragmentary and will fall between supports even when the latter are closely set.

Because the weight of the upper roof aided by that of the nether roof is overwhelming, the function of artificial supports must be conceived as: (1) To give way without any, or at least without much, resistance to the movements of the upper roof, and (2) to resist all movements of the nether roof that are not transmitted movements of the upper roof. To prevent the lower roof from moving would be to deprive the upper layers of their natural motion and thus to take up the entire weight of the roof, an effort manifestly too great for artificial supports.

Where mine pillars become weak and more or less incapable of support and even where they have been drawn, the upper roof has still some strength, for no matter how much it may be creviced there is still a crowding or arching effect which prevents such rock from falling. The nether rock also crowds on itself, thus assisting in its own support, though by no means is this arching action as effectual as in the upper roof. When timbers are removed some of the key rocks fall out, and if new timbers are put in, new movement will occur. It is better, therefore, to use some permanent material.

Most timbering in the crushed ground at Powderly is installed skin to skin, though sometimes steel sets are used. Others have used solid concrete and arched brick to hold the broken ground. But these are all relatively rigid supports, especially concrete and brick, and as the upper layers adjust themselves from time to time they bring on the artificial supports an almost irresistible stress that cannot be forborne. To provide a flexible or yielding support, Hanns Schaefer, an Essen mining engineer,

Fig. 2—Intrados of Completed Arch

designed a gangway lining which has been in use in Germany since 1920 and for several years in England. One German mine was said some time back to have in use no less than 510,000 lin.ft. of such lining. It will be recalled that in Germany many seams are worked concurrently at depth and that the cover is heavily loaded with weak material ill suited for self support.

Herr Schaefer made an arch of permanent, fireproof, non-corrosive concrete slabs put together so that they would yield slightly under pressure without breaking, thus permitting movement of the upper roof, a movement that cannot be safely resisted. The shapes of these slabs are shown in Fig. 3. They are made at the mines by a patented process that insures that they will be of uniform size and have smooth surfaces.

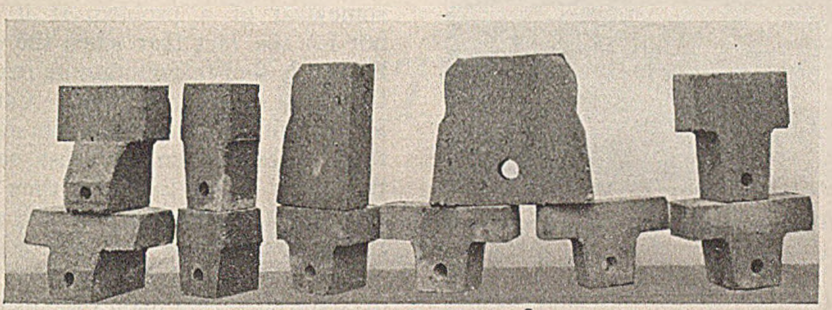


Fig. 3—Shapes Used in Lining

Each slab weighs about 75 lb. and can be handled both in construction and erection by one man.

Laid up in a series of independent rings, as measured along the gangway, equal to the length of the face of the slabs, or 18 in., the latter are nowhere cemented with mortar either in the construction of the arches or between the several rings. To use mortar would destroy the flexibility, for the arch rings would not give until the mortar was broken. This flexibility is in all directions; the arch rings can be distorted from right to left or left to right, downward or longitudinally.

Creosoted yellow-pine wooden blocks, 2 in. square, and held in place by being nailed to ½-in. boards, are placed longitudinally in the lining. These "compression blocks," as they are termed, will give way under heavy pressure, thus easing the roof down without breaking the arch.

Circular holes, which can be seen in Fig. 3, are made in the slabs as they are cast, and during the erection of the arch short lengths of rope are placed in the holes, the slabs being erected so that the holes are in a line paralleling the ring of the arch. The ropes pass from slab to slab, connecting four or five of them, and grout is run in to keep the rope from corrosive acids.

At one place in the Powderly mine the heavy timber sets formerly used lasted only about 6 months because of the heavy pressure. This was at a turnout. Here it was decided to experiment on the value of the Schaefer lining. As the size of the gangways at the turnout varies, it is best to define the size of the roadways by the dimensions they assumed after lining. The straight gangway beyond the turnout and the turnout itself were each 12 ft. wide and 6½ ft. high. At the point of juncture the arch was 25 ft. wide and 12½ ft. high and it tapered both in width and height until it became 12 ft. wide and 6½ ft. high at the point where it connected with the unlined part of the gangway.

The arch is built up on channel-steel rings which later are removed. The voids are carefully filled with broken rock, ashes and other waste material, for the gangway lining is not designed to resist dynamic stresses. E. C. Weichel at the Scranton Engineers' Society's meeting at Wilkes-Barre, Pa., on May 23, said that the lining installed in a gangway of average size (6½ x 12 ft.) costs about $100 per yard. Prior to the installation of the lining, twelve sets of heavy timber were placed along this gangway for every 10 yd. of its length. They cost $17 per set in place. The cost of Schaefer lining is as in the accompanying table.

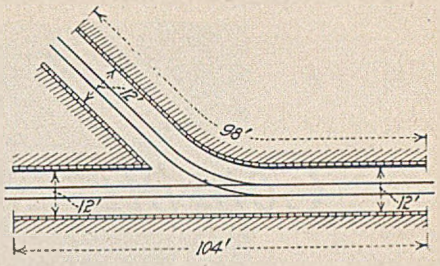


Fig. 5—Lined Gangway at Powderly

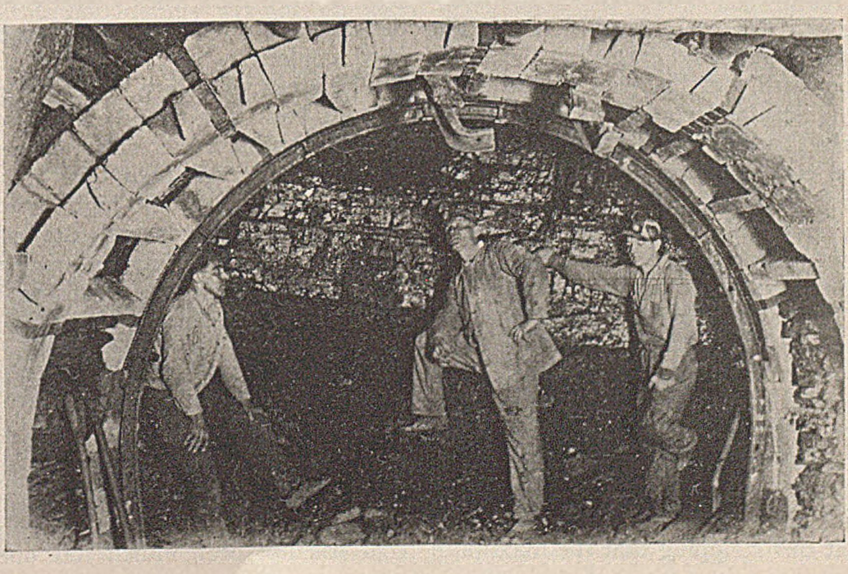
Annual Cost of Lining Ten Yards of Gangway

Ten yards @ $100 per yard	$1,000
Annual interest	60
Annual depreciation, 5 per cent	50
Cost of lining (10 yd.)	$1,110

With timber sets of 18-in. diameter the cost of twelve sets, the number needed for 10 yd., would be, at $17 per set, $204. Even if this timber, said Mr. Weichel, would last one year the annual cost for 10 yd. of Schaefer lining would be only $110, or about half as much.

Some sections of the lining at Powderly have been slightly distorted, as was expected. This is evidence that it is not resisting the larger movements and thus subjecting itself to the major strains. There is no sign of a break. Tests are being made into the possibility of building the arch as gangways are driven.

Fig. 4—Laying the Arch



STRIPPING

Completes Recovery of Deep And Already Mined Beds

Loading Overburden at Plymouth Stripping

STRIPPING is a recognized part of the mining methods of The Hudson Coal Co., and has been carried on in the past at several localities where the beds outcrop. Two pits, Plymouth and Olyphant, are working at the present time, and one, that at Baltimore colliery, has been temporarily stopped. The total overburden removed to date at these three operations is 2,740,000 cu.yd. Four hundred thousand tons of coal have been recovered at Plymouth.

As the seams occur in the form of basins, the method of attack consists in removing the overburden and loading out the coal, starting where the cover is light and extending the stripping until the thickness of the overlying strata becomes so great as to make further advance unprofitable. The coal company does none of the work itself but lets the jobs to contractors who furnish all the equipment, excavate the overburden, load the coal and haul it to the breaker.

The ratio of overburden to coal varies from 4½ to one to as high as eight to one. At Plymouth, the Cooper and Bennett beds are being stripped, with a total maximum thickness of 26 ft. The interval between the beds varies from 8 in. to 15 ft., and the maximum thickness of overburden is 85 ft. It is at this stripping that the maximum ratio of overburden to coal reaches in places eight to one.

The Baltimore bed, which is from 12 to 16 ft. thick, is mined near Baltimore colliery. With a maximum cover of 60 ft., the ratio of overburden to coal is about 4½ to one. At Olyphant operations the Grassy or 14-ft. bed is being stripped. Here the cover is 40 to 45 ft. thick and the ratio of overburden to coal is seven to one. At Plymouth, 20 ft. of glacial drift overlies a stratum of hard rock. Glacial drift also is the preponderant material at the Olyphant stripping, with a little hard rock directly over the coal. The cover at Baltimore is hard sandstone.

The areas which are being stripped contain both virgin and mined coal. At Plymouth, in particular, some of the area has even been third-mined, which accounts for the high ratio of overburden to coal, and the other strippings also include, to a greater or less extent, areas where mining has been done. As a rule, about 50 per cent of the bed still remains in the areas before stripping. The earlier mining operations included both the driving of chambers about 40 ft. wide and the robbing of pillars.

Railroad-type steam shovels remove the overburden. Where the coal has not been mined this operation consists merely in loading the overburden into cars and transporting it to the dumping point. When working over partially mined areas, however, the problem is complicated by the necessity of taking the shovels across open or caved chambers.

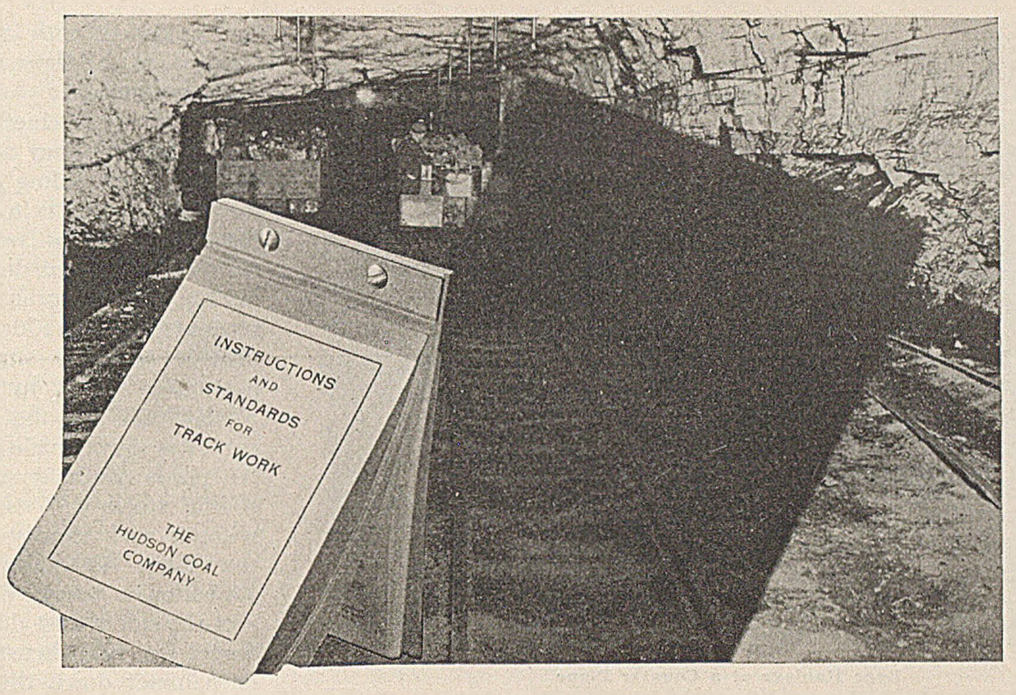
Open chambers would present somewhat of a problem if it were not for the fact that when the overburden is shot to facilitate its removal the open spaces are filled. Caution in operating and moving the shovels then enables them to cross safely, though in a few instances they have settled in the chamber or, still more rarely, overturned.

The practice of leaving roof coal over the chambers makes the measure appear unbroken to the men who are stripping it wherever the chambers have not caved. However, if no opening is discovered, the stripping crew will drop the bucket on the coal in the course of their work and if a chamber already has been excavated below it the slab will break out and disclose that fact. The machine operative continues to break down the coal slab as he advances and fills up the chamber so as to make his advance safe.

Fortunately, the bucket in loading spoil into dump cars needs to revolve through only a small angle and not 180 deg. as is the usual practice in casting stripping. Consequently, the bucket is well ahead of the caterpillars and can sound the floor, break down any coal slab it may encounter and fill the chamber in sufficient time to prepare a roadway on which the caterpillars can travel with safety.

After the overburden has been removed by the stripping shovel the coal shovel follows behind it and places the coal in coal cars and the refuse into cars provided for that purpose. Stripped coal in The Hudson Coal Co.'s pits and in all the pits in the anthracite region goes to breakers for careful preparation.

(Turn to page 606)



In Mine Transportation

GOOD TRACK+PLANNED HAULAGE=

Safety and Efficiency

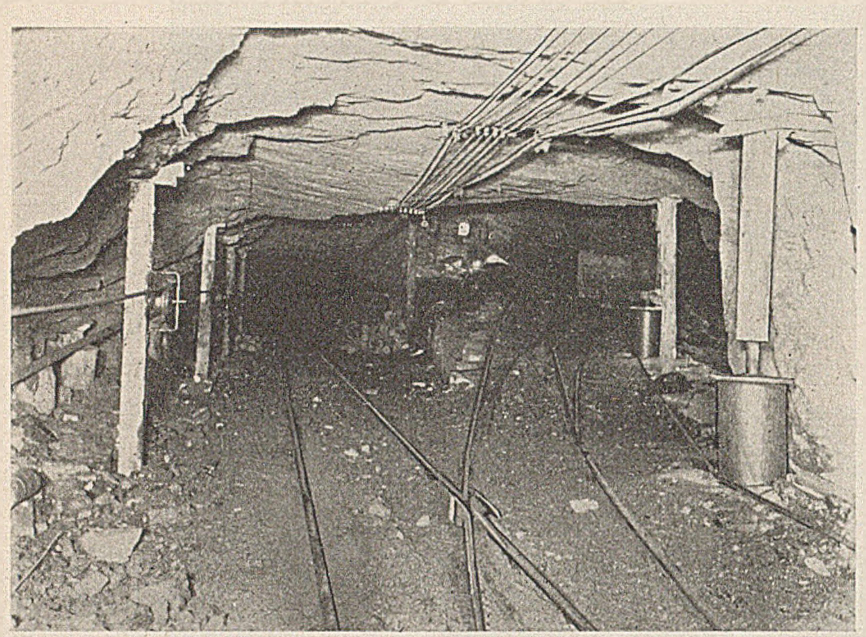
ENGINEERING studies and good management have reduced transportation failures to a minimum in the workings of The Hudson Coal Co., thus decreasing one of the important handicaps to mine operation. Track is laid and thereafter is maintained according to carefully determined standards. The rolling stock is kept in a condition to match the service performance of the steel on which it runs with the result that transportation is comparatively free from derailment delays. Railroad practice is followed as far as conditions will permit, for the transportation system in these mines in its length, intensity of traffic and manner of construction is indeed a railroad.

An appreciation of the importance of this haulage system is best given by a brief survey of the mileage and equipment involved. On June 1, 1929, the length of narrow-gage track aggregated 769 miles. In addition the company maintained and operated 40 miles of track of standard gage. Transportation of coal from working faces to breakers requires some 26,000 mine cars which are drawn by 263 electric and 40 steam locomotives, with the supplementary assistance of 1,100 animals and numerous hoists on planes and slopes. The human organization in this system numbers 1,900 men.

Back in 1916 the management made a survey of haulage with particular emphasis on methods and equipment to determine where money spent on this phase of operation was going and what results were being obtained. This survey was followed by a study of track from the standpoint of standardization by a committee appointed from the operating and engineering departments, assisted by several engineers with railroad experience. This study was concluded in 1920. Thereupon a program of improvement was begun. A direct outcome of the study is a book of standards for trackwork, which is revised and improved as occasion demands and which is used as a guide by tracklayers and all others who are concerned with the construction and maintenance of mine roads.

Main-Line Tandem Locomotives At Coal Brook Colliery

One of the major achievements of the study pertains to frogs and switches, individually and in assembled turnouts. Standardization permits the transfer of these track



Rope Haulage at a Counter Plane

elements from mine to mine and cuts down supply stocks. Before the revision, parts when transferred had to be altered to fit their new location, for the layouts were by no means uniform. The number of frog sizes for ordinary purposes has been reduced from eight to three, with a fourth size for special application. All frogs used underground are of Graham cast-steel, shrouded type, which, acting on the face of the wheels of rolling stock, prevents their flanges from climbing.

A number of benefits are derived from this feature of interchangeability. Of major importance is the fact that laying of a turnout is reduced almost entirely to an assembly job, all parts having previously been formed and prepared in mine shop or factory. The management is in the position of not having to rely upon the manufacturer's standards, which, generally, do not meet all requirements in detail; rather, the manufacturer is required to follow standards set by the company in making equipment for the latter's use.

Time studies have proved that to have the manufacturer cut and drill rails for the closure rails of turnouts is an economy. These studies showed a saving not only in labor cost but also through elimination of waste due to breaking of rails in cutting them. The practice, furthermore, eliminates danger of the closure rails being laid without being drilled and bolted. As to actual savings, it was found that drilling and cutting two 25-lb. closure rails for a No. 3 turnout at the mine cost $1.41 whereas the manufacturer could do this at the factory for 35c., a saving of $1.06 for each turnout.

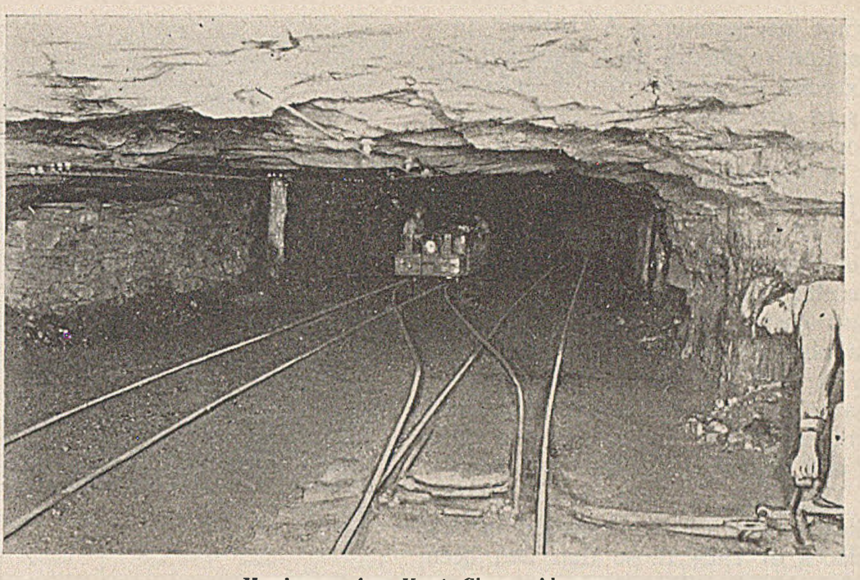
Mine-car wheels are made of cast iron and of 16-in. diameter. Although wheel treads of two widths, 3½ and 4 in., are used, the smaller tread has been adopted as standard and wheels of that size are supplied whenever wheels are replaced. Where this replacement process is in progress guard rails are used to guide wheels of 3½-in. tread over frogs intended to accommodate wheels of the larger tread. When wheel replacement is complete, frogs designed for wheels of the larger tread will be replaced as mining activity shifts and subsequently they will be rebuilt by welding to the 3½-in. standard tread. Mine-car wheels have in recent years been replaced at the rate of 10,000 to 13,000 annually. All new mine cars are provided with roller bearings; about 3,000 of those now in use are thus equipped.

Track ties are chiefly of oak, locust and hickory. They are never placed on centers exceeding 2 ft. In laying ties the practice is to align them on the ditch side of entries, with the ends at a uniform distance from the ditch. The lengths of ties under turnouts are graduated, so as to provide adequate support under all portions of track junctions.

Elevation of the outer rail on curves is never made more than 1 in. At speeds customary in mine haulage, rolling stock will stay on the track without such elevation granting that the latter is in good condition. Elevation is provided merely to correct the side thrust due to centrifugal force, for side thrust tends to drive or hammer down the outer rail and thus increases maintenance costs. If the outer rail is too greatly elevated, a slow-speed locomotive running on it will sway from side to side, for the wheels will hit slight tangents in the curve of the outer rail, only to slide toward the inner rail. This action is not manifest, however, when locomotives are traveling at comparatively high speeds.

In addition to elevating outside rails and, incidentally, widening the gage slightly, elevated guard rails are used on curves in some instances, notably on the outside of the outer rail at the foot of a steep grade and on the outside of the inner rail in rope-haulage systems. The guard rail is usually laid 1 in. higher than the track rail. Inside guard rails have been found to be of little or no value where mine cars are equipped

Guard Rail on a Plane Branch

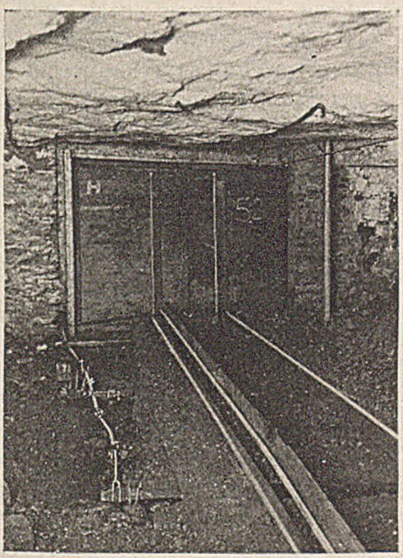


Haulways Are Kept Clean, Always

with loose wheels or with loose axles.

Mine track is grouped into three classes on the basis of adequate transportation service at minimum cost. Track in the first class comprises that of 40-lb. unit weight and heavier underground and more than 40-lb. weight on the surface. Such track is used on permanent haulways, slopes and planes. Track of the second class is of the same unit rail weight as that of the first, from which it differs mainly in the quality and spacing of the ties and, to a lesser degree, in the manner in which it is laid.

Track laid in gangways, counters and bypasses inside and in branches and bypasses outside falls into this class. Third-class track consists of 25-lb. rails in chambers, animal-haulage roads and for temporary purposes, inside and outside. Track of 40-lb rails for steam-locomotive haulage outside also is relegated to this class. Of the narrow-gage track



Automatic Doors on Main Hauls—140 of These Are in Use

installed as of June 1, this year, 40 per cent was of 25-lb. unit rail weight, 52 per cent of 35- and 40-lb., 6 per cent of 60-lb. and 2 per cent of 80- and 90-lb. Track gages are 28, 30 and 36 in., the predominating gage being 30 in.

Track-curvature standards are given only as minimums; recommendations are made that radius curves be made as large as feasible. Where chambers are at right angles to gangways, 30-ft. radius curves are used in branches; but where they are turned at a lesser angle, so as to compensate for a heavy pitch, the radius of branch curves is usually increased. In this case, however, the radius in the turnout itself is kept to a standard of 30 ft. The minimum curve radius for branches off slopes or planes is 50 ft., off main roads for locomotive haulage 150 ft., on main roads for rope haulage 100 ft., on counter roads for rope haulage 75 ft., and on outside roads for steam-locomotive haulage 200 ft. in main track and 100 ft. in side tracks.

Standards regarding gradients are only approximate. Exceptions are permitted by the general manager in consultation with the mining engineer, where such exceptions aid in meeting conditions from the standpoint of expected output. Gangways on line are driven in a direction that will give a 1-per cent rising grade, which provides an even balance between the power required to haul a fixed number of empties in the opposite direction. This grade also gives a satisfactory pitch to drainage ditches.

Planes and slopes in coal are driven with the pitch up to a maximum of 20 per cent. But this limitation may be exceeded if the small tonnage to be handled and other limiting factors make it ill-advised. In some cases the inclination may be made as much as 30 per cent.

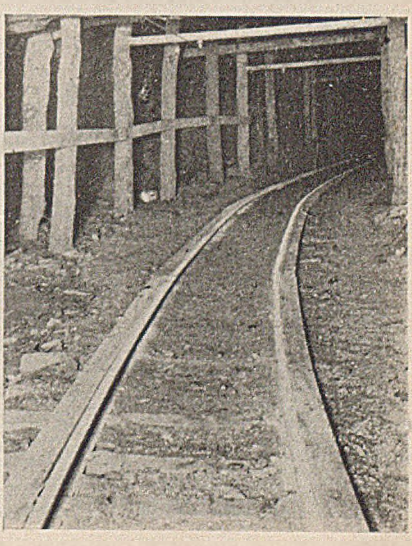
Planes and slopes in rock are driven on a maximum grade of 20 per cent unless the tonnage expected is small, in which case the grade may be greater. Where the tonnage is large the preferred grade is 12 per cent or less. Rock tunnels are usually driven on a grade of 1 per cent rising. Uniformity of grades in haulways is emphasized for the obvious reasons that a succession of small hills in a stretch of track makes maintenance of the road bed difficult, causes damage to rolling stock and contributes to spillage of coal.

On steep grades underground, where haulage duty is heavy and locomotives are used, steel rails are supplemented by wooden "sand" rails which are anchored flush and in contact with the balls of the steel rails. As the braking friction on wood is about 2½ times that on steel, this practice adds safety to the control of trips. Here it might be said that these "sand" rails can be used with advantage in bituminous mines.

Mine shales and harder rock, where the latter is available, are used as ballast underground except in wet places on main haulways, where cinders are substituted. Great stress is laid on the importance of thorough tamping of ballast, particularly under ties, because the way in which this phase of the work is done contributes much to the success or failure of track.

Care is taken to insure well-lined rail joints. One of the rules is that two rails forming a joint on a curve must be of uniform curvature at the

On Heavy Grades Braking Friction Is Increased by Sand Rails

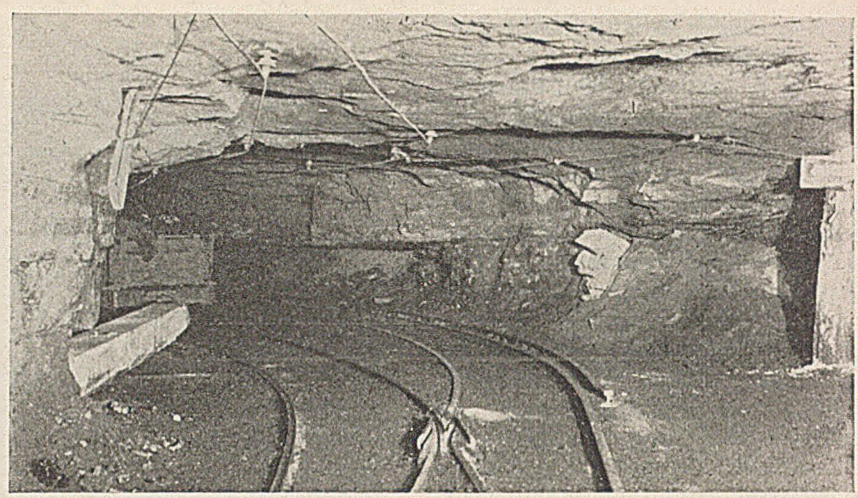


point of joining. A further precaution to insure good joints is the exercise of special care in selecting, as to size and quality, ties intended for use at joints.

A comparative study is being made of ties of wood, treated and untreated, and of steel to determine under what conditions one type is preferable to another from the standpoint of service and cost. Since April of 1924 a number of track ties, treated some with salts and some with creosote, have been installed alongside selected untreated ties. In each treated tie is a nail bearing the year of installation.

Observations have thus far indicated that of ties installed in dry places in 1924 those that had been treated are still sound while those untreated show evidences of fungus growth. In wet places treated ties show no economy over untreated ties. Investigation has verified the general contention that treating of ties lowers resistance to mechanical wear; untreated ties wear best, ties treated with salts next and creosoted ties least. Expected service from, and the practicability of, manufactured steel ties and also ties fabricated from scrap rails are being studied.

This company finds it economical to take under its own care the maintenance of the spurs of standard-gage track that lead from railroad lines to its several breakers. At many of the collieries a crew must be provided in any event for the maintenance of outside narrow-gage track, and these men with assistance from such underground trackmen as can be spared, can conveniently maintain the surface tracks. If railroad track crews were employed in this job, their working time would begin on their leaving their headquarters which might be some miles away. Colliery tracklayers are immediately available.



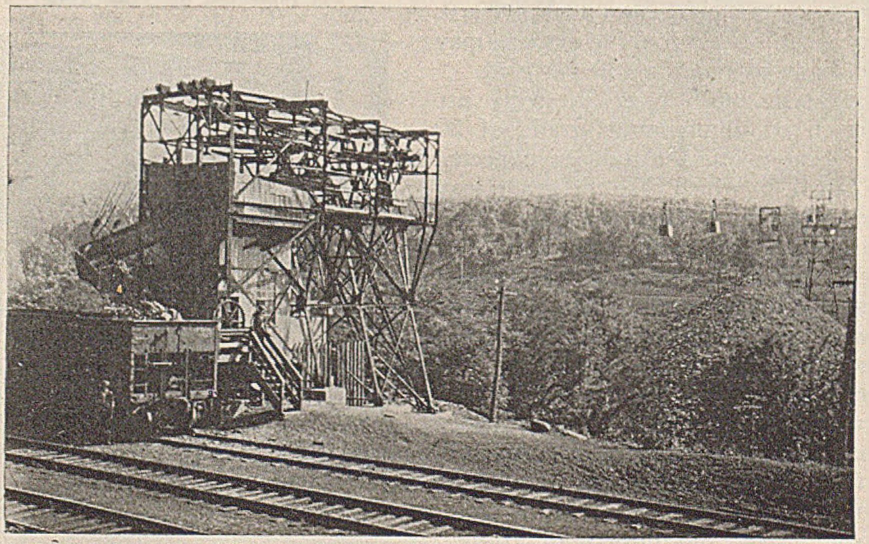
Buffer Block Prevents Runaways

Track bonds are installed and maintained by the electrical department. When rails are relaid or turnouts renewed, the track crew must notify the colliery electrician in advance in order that he may arrange for bonding concurrently with the laying or repairing of track. When track men damage bonds during track-repair work, they are required to make temporary bond repairs and immediately notify the colliery electrician of the need for a more permanent bonding job at the point or points where the return circuit has been damaged.

Gaging is considered a necessary phase of track maintenance and is done when minor repairs are made or rails and ties replaced. Where this precaution in itself is not sufficient to maintain the gage, track is gaged periodically, irrespective of repairs, and tie plates are installed.

Maintenance of track is under the jurisdiction of the operating department, subject to inspection, however, by the engineering department. Depending on its mileage and the number of turnouts in it, track in each section is maintained by one tracklayer or more, each with a helper. Haulage men are instructed to watch for faulty track and to notify the section foreman about it, who, in turn, gives instructions to the tracklayers as to when and how to correct it. Track on main roads is cleaned by the regular road-cleaning force and that on planes and slopes by men enlisted from the transportation crews. Road cleaners keep ditches open and switches clean and well lubricated.

Aerial Tramway at Stillwater, a Transportation Link



Stripping Completes Recovery Of Deep And Already Mined Beds

(Continued from page 602)

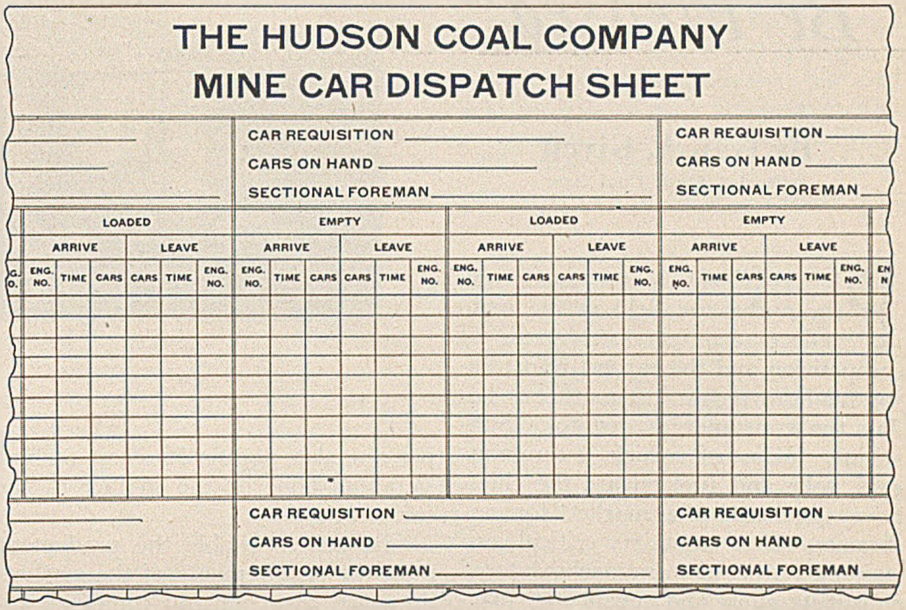
Much coal has been lost by the driving of chambers under shallow cover. It is perhaps economical to work the beds in this manner, so far as the coal actually removed by first mining is concerned, but the mining of the pillars is accomplished with difficulty and much coal is left in the ground both as top coal and pillars. For this reason all coal that can be stripped should be thus recovered, even if the cost be a little higher than the first mining of coal by chamber methods.

The capacity of the stripping shovels usually is 2½ cu.yd., although a contractor at the Plymouth stripping has used one with a bucket of 4-cu.yd. capacity. Where it is necessary to blast the rock overlying the

(Turn to page 613)

Haulage Traffic Expedited by

DISPATCHING



THE HUDSON COAL COMPANY
MINE CAR DISPATCH SHEET

CAR REQUISITION ____ CARS ON HAND ____ SECTIONAL FOREMAN ____

CAR REQUISITION ____ CARS ON HAND ____ SECTIONAL FOREMAN ____

LOADED						EMPTY						LOADED						EMPTY					
ARRIVE			LEAVE			ARRIVE			LEAVE			ARRIVE			LEAVE			ARRIVE			LEAVE		
ENG. NO.	TIME	CARS	CARS	TIME	ENG. NO.	ENG. NO.	TIME	CARS	CARS	TIME	ENG. NO.	ENG. NO.	TIME	CARS	CARS	TIME	ENG. NO.	ENG. NO.	TIME	CARS	CARS	TIME	ENG. NO.

CAR REQUISITION ____ CARS ON HAND ____ SECTIONAL FOREMAN ____

CAR REQUISITION ____ CARS ON HAND ____ SECTIONAL FOREMAN ____

IN THE Northern Anthracite Field the minable beds are many and uneven in character, necessitating the use of a system of inclined haulages interconnected by electric locomotive hauls in each active working bed, all leading to shaft landings or main hauls to the surface. Direction of traffic, therefore, is more difficult than in bituminous mines, and more needed. Moreover, anthracite collieries rarely have the concentration found in bituminous mines. Consequently, co-ordination is not so readily possible unless one person orders the train movements and that person is kept fully informed of the traffic conditions in all parts of the transportation system, both inside and outside.

Coal Brook Colliery of The Hudson Coal Co. has the unfavorable transportation conditions outlined, as to multiplicity of openings and beds, as to uneven character of the coal, and as to lack of concentration, for the operations are widespread.

There are 5 mine openings and 4 beds, 9 inclined haulages, 11 main hauls and 45 gathering units, requiring the use of 40 electric locomotives, 9 hoists and 13 mules on inside work, and 5 steam locomotives on the outside. The mules have been largely replaced by electric locomotives.

The longest haul from the working face to the breaker tipple is approximately 4.2 miles—0.7 mile for the gathering unit, 2 miles over the inside main hauls and 1.5 miles over those outside. The shortest haul is 0.8 mile—0.5 mile of inside and 0.3 mile of outside haul. Half of the production is over the longer distance. Some cars in traveling from the working face to the breaker or in the reverse direction are handled by five different units and most by three or four.

The average number of loaded cars handled daily is 1,100 cars of coal and approximately 200 cars of rock, the cars used having a capacity of 70 cu.ft., level full. The transportation units must also handle the empties being returned to the mines, all mine supplies and power-plant ashes. Outside hauls are over double track and inside hauls over single track, with passing branches conveniently located.

The movement of trips over such an extensive system is greatly expedited by the use of a dispatching system. At Coal Brook Colliery one dispatcher is employed who controls the movements of all transportation units.

The office of the dispatcher is located on the surface near the tipple. This office is connected by telephone to 38 transportation terminal points, 10 on the outside and 28 on the inside. A special feature of the telephone system is that it is not necessary to ring the dispatcher from any of the 38 telephones.

To connect with the dispatcher, the caller merely lifts the telephone receiver and listens in until the line is clear, when he presses a transmitting button which signals the dispatcher, who is listening in on the entire system continuously. This feature relieves the dispatcher of the annoyance of a ringing bell and also saves the caller from uncertainty as to the moment at which the line can be used. Upon finishing his report and receiving instructions from the dispatcher, the caller simply hangs up the receiver, permitting the next person to use the line.

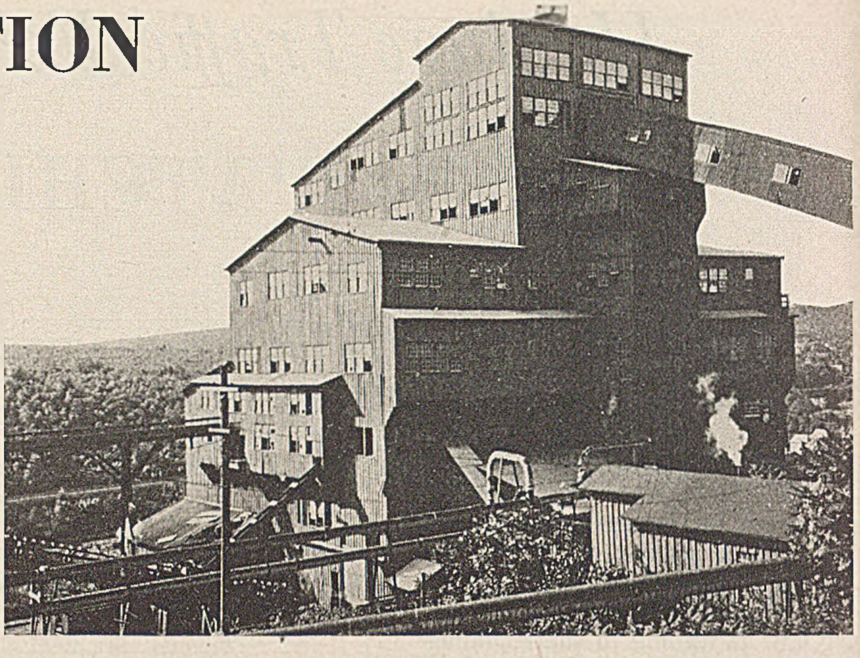
Ordinarily, where a dispatcher is employed the mine telephone system is used for both dispatching and other mine business. Such an arrangement may not be satisfactory at a large operation, for the telephone will not always be available for immediate use by the dispatcher nor by a party who wants to make a report. Neither should be made to wait. For this reason a separate mine telephone system is used at Coal Brook Colliery for dispatching, and no other business is handled over it.

The dispatcher has on a desk before him several "Mine car dispatch sheets," an illustration of a section of which accompanies this article. There is space for 30 transportation units on each sheet. The car requisition is obtained from a duplicate of a car requisition sheet made out by the sectional foreman. At the end of each shift each sectional foreman takes the bids for cars to be loaded the next day from each miner working in his section. The bids of those miners served by the same transportation unit are listed on the same requisition, one

(*Turn to page* 632)

In PREPARATION

"The Public Be Pleased"



Gravity Slope Breaker

By Ivan A. Given
Editorial Staff, Coal Age

PRESENT-DAY preparation in the anthracite field in the main reflects the increased stress of competition and the earnest effort being made to regain lost markets. Today the consumer is dictator. Substitute fuels, of which bituminous coal, coke and fuel oil are the chief, have narrowed the market for anthracite. How to satisfy critical consumers, reduce the encroachments of substitute fuels and regain lost markets are now the major problems of the hard-coal industry.

For the solution of these difficulties reliance is being placed on intensive merchandising, backed by the united efforts of the industry. But for merchandising, a good product is needed. Consequently, selling efforts are being backed by improved preparation, and today the cleanest anthracite of all times goes to the purchaser.

Naturally these refinments in preparation could not be achieved without some change in the existing breaker equipment and operation. The extent of these changes may be relatively slight where the run-of-mine product is fairly clean, or they may result in the scrapping of the entire breaker equipment where the loss of good coal in cleaning is high. How The Hudson Coal Co., one of the largest shippers in the anthracite field, has attacked the problem of change in equipment forced on it by competitive necessity is an interesting and instructive commentary on present-day anthracite preparation.

Standards adopted by the company prior to the latter part of 1926 defined the upper limits of slate and bone, as follows: Egg, 2 per cent slate and 4 per cent bone; stove, 4 per cent slate and 4 per cent bone; chestnut, 5 per cent slate and 5 per cent bone; pea, 8 per cent slate; buckwheat, 10 per cent slate; grate, 15 pieces each of slate and bone on the surface of the car.

Changes to enable the product to meet the requirements of the markets in which the company competes appeared desirable, however, and the foregoing standards of purity were reduced, the limits in effect today being as follows: Grate, 2 per cent slate and bone respectively; egg, 2 per cent slate and 3 per cent bone; stove, 3 per cent slate and 4 per cent bone; chestnut, 4 per cent slate and 5 per cent bone; pea, $7\frac{1}{2}$ per cent slate; buckwheat, 10 per cent slate.

But regardless of the quantity of bone and slate in the prepared product, so long as it does not exceed the limits set, the appearance of the coal in the car decides whether it shall be shipped or condemned. Coal as shipped by The Hudson Coal Co. must be not only up to the standards of cleanliness but must be attractive to the eye. Otherwise it will be condemned by the inspector. Some coal is rusty; some has a low percentage of ash, but yet has much of this impurity concentrated as a thin scale on the fracture planes of the coal; some is clean but lacks luster. In some cars when a test is made the slate and bone are found within the limits of the standard, yet as the impurities have become segregated the coal does not have the attractive appearance desired.

In all these cases, the coal, though it complies with the standard as to percentage of impurity, is condemned because of its appearance, and is again passed through the breaker. This time perhaps the rusty face and the scaly or dull layer is lost by attrition or fracture, and the coal is made attractive also by more perfect mixing.

Under the added burden thrown on the preparation equipment by the strict requirements detailed above, some changes were necessary, as will later be described. However, the existing jig equipment, with some additions, changes in practice, increased labor and retreatment of condemned coal is able to produce a satisfactory product. At present nine breakers—Clinton, Coal Brook, Powderly, Gravity Slope, Olyphant, Marvine, Laflin, Loree and Pine Ridge—are shipping to the market. With the exception of Laflin and Marvine, the primary cleaning equipment at all breakers consists of Lehigh Valley and Simplex jigs. Marvine and Laflin are completely equipped with the Chance sand-flotation process and the jigs at Gravity Slope breaker will be replaced by Chance cones when construction now under way is completed.

The total number of jigs in use at present is 217, counting those in Gravity Slope breaker and two that are working on rock at Coal Brook. The coal jigs, totaling 215, include two on grate, 38 on egg, 85 on stove, 62 on chestnut, 20 on pea, and eight on buckwheat. Their capacity varies with the feed and size of coal, but the usual average per hour is 8 to 9 tons of egg coal; 10 to 11 of stove; 12 to 13 of chestnut, and 13 to 14 of pea and buckwheat.

Other cleaning equipment includes four 15-ft. diameter Chance cones at Marvine, one at Laflin and two 7 ft. 8 in. diameter Chance cones at Olyphant. The latter were installed to supplement existing jig equipment and are used mainly for buckwheat though sometimes for chestnut coal. At Marvine breaker, in addition to the Chance cones, eight Deister concentrating tables and one Rhéolaveur washer were retained when the jigs were displaced; the tables and Rhéolaveur preparing silt. The tables have a capacity of $1\frac{1}{2}$ to 2 tons per hour and produce a product with a maximum ash of 10 per cent. Loree also is equipped with four Deister concentrating tables for treating silt. At Baltimore breaker, not now operating, a Rhéolaveur washer is used to prepare birdseye coal.

At all the breakers except Laflin, the prepared coal passes to storage pockets before it is loaded into railroad cars. These have sufficient capacity to prevent delays at the cleaning plant from stopping the loading of coal or delays in loading from sutting down the breaker. They enable the breaker to run when cars fail to arrive on time and they permit the car trimmers to load coal at their convenience. At Laflin, boom loaders are used for egg, stove and chestnut; the smaller sizes go to the pockets.

Most of the shipments are made in "hoppers," though much of the product sold to small dealers in the West is loaded into box cars. For this purpose, special loaders have been installed at the collieries from which such shipments are made—four Ottumwas, one each at Coal Brook, Olyphant, Pine Ridge and Baltimore, and two Manierre loaders at Loree. The coal is fed by belt conveyors from the pockets to the Ottumwa loaders and is distributed by them into the cars. In the case of the Manierre loaders, the coal flows from the storage pockets by gravity.

Silt is made only at the Loree and Marvine breakers largely because they are the only plants in which suitable equipment has been installed. As made on the Deister tables or in the Rhéolaveur washer, the ash content seldom exceeds 10 per cent, making it one of the purest sizes produced. Entering as it does into the manufacture of pigments, the sintering of iron ore and the briqueting industry, silt is readily salable at a cost almost equal to that of producing it. Another use to which the silt of The Hudson Coal Co. is put is that of rendering bituminous coal smokeless. Mixed with boiler coal in bituminous-fired power plants in proportions varying from 25 to 50 per cent silt, it eliminates smoke. The field for this pure product may be greatly expanded as new uses are found for it among other consumers.

Conforming to the trend toward centralization and recognizing its advantages, the company has decreased the number of its breakers by constructing narrow-gage surface railroads and making new coal openings. Within the last 13 or 14 years, five plants have been abandoned—Jermyn, Eddy Creek, Delaware and one each at Baltimore and Loree. Several of the breakers now handle the output from a number of mines.

Coal from Jermyn and Powderly mines is prepared at Powderly breaker. The run-of-mine from Eddy Creek and Dickson (Dickson and Manville) is taken to Marvine breaker and combined at that plant with the output of Marvine mine. Stillwater coal goes to Coal Brook breaker near Carbondale, Pa. Loree breaker is perhaps the best example of the results of concentration, as this one jig plant handles the coal from Loree 2, 3, 4 and 5 openings, from the Boston mine and from the Plymouth and Baltimore strip pits. Shipments from Stillwater to Coal Brook and from Eddy Creek and Dickson to Marvine are made in railroad cars.

Into the decision whether to build a central preparation plant many factors often enter, chief among them being the transportation cost. The fact that the coal in general must be hauled in railroad cars to such a plant if established has tended to prevent centralization. Where the coal at any plant for some reason lacks luster it may pay to go to some expense to mix the product with a coal that will correct that characteristic.

In the summer just passed tests were made on coal from Powderly mine to see if the Chance process would rid the coal of rust so as to make it sufficiently attractive in appearance that it could be marketed unmixed but as the rusty appearance could not thus be eliminated, the coal will be cleaned with the Jermyn coal necessitating a narrow-gage railroad haul from Jermyn to Powderly, where a Chance plant probably will be erected.

Actual removal of impurities begins before the coal reaches the surface. Strict supervision is employed at the face to reduce the quantity of refuse loaded and cars are selected and sent to the "court house," where they are dumped on platforms, and the bone and slate carefully picked out in the presence of the miner and penalties assessed accordingly. In loading cars by scraper from longwall faces, the car trimmers are enjoined to throw out all refuse possible. In working chambers by scraper, the men at the face pick the impurities out of the loose coal and it is further cleaned at the dumping point. By following the methods outlined above, an undue quantity of refuse in the run-of-mine coal is prevented.

After the coal reaches the surface, it is further cleaned and prepared in the breaker. In this cleaning some good coal is lost. This is largely in the silt—for the recovery of which seven of the breakers have no provision—and in the refuse which goes to the bank. The latter loss is largely the result of the rigid preparation standards which the company has set up. Fortunately this quantity is being greatly reduced by changes in equipment.

Recent years have witnessed in the anthracite region the passing of the larger sizes and a considerable increase in the tonnage of coal subjected to crushing. All breakers now make a practice of crushing steamboat, lump, grate and often egg because these sizes are in decreasing demand. The production of prepared sizes (grate, egg, stove, chestnut and pea), based on breaker shipments, is shown in Table I, which also gives the production of steam sizes for the same period.

Examination of Table I will show that over a period of ten years there

Table I—Percentage of Prepared Sizes by Years

(Total Breaker Shipments, Excluding Fuel)

Coal Year, April 1 to April 1	Grate	Egg	Stove	Chestnut	Pea	Total Prepared	Buckwheat	Birdseye	Rice	Barley	Silt
1919-20	2.10	18.40	23.90	28.30	4.00	76.70	11.80	11.40	.....	.....	....
1920-21	1.90	16.60	23.30	28.70	1.20	71.70	13.10	15.20	.....	.....	....
1921-22	1.40	14.60	25.70	30.40	2.70	74.80	14.10	11.10	.....	.....	....
1922-23†	2.31	20.61	26.15	26.42	0.08	75.51	13.08	10.80	.....	.....	0.61
1923-24	1.81	18.70	22.74	29.90	.....	73.28	13.15	13.14	.....	.....	0.43
1924-25	0.90	16.72	27.30	28.55	2.57	76.04	12.01	11.46	.....	.....	0.49
1925-26†	0.95	18.27	25.43	28.12	1.17	73.94	12.02	12.06	.....	.....	1.78
1926-27	0.36	16.73	27.05	27.43	2.85	74.42	11.21	12.91	.....	.....	1.46
1927-28	0.47	12.35	28.17	27.41	4.48	72.88	12.47	11.86	.....	.....	2.79
1928-29†	0.69	13.82	27.15	25.35	8.54	75.55	12.00	10.65	0.74*	.....	1.06
1929‡	0.63	13.38	26.31	25.87	9.17	75.36	11.76	9.99	0.55	0.13	2.21

†Strike year. ‡Calendar year, including August. *Includes barley.

has been a slight decline in the percentage of prepared sizes. This trend however, is more clearly shown in Fig. 1, which shows the production of prepared and steam sizes as influenced by the increase in the percentage of pea coal produced. These graphs show in striking fashion the increase in output of smaller sizes. As this increase tends to lower the total realization, a greater revenue being derived from sizes larger than pea, the company has changed its mining and shooting methods so as to increase the yield of prepared coal and counterbalance the adverse effects of crushing.

Perhaps the most immediate and far-reaching effect of raising the standards of preparation was the necessity with the existing jig equipment of increasing the number of men in the breaker for the purpose of reducing the loss of salable coal in the refuse. From a market standpoint several of the breakers thus equipped have performed satisfactorily though the jigs themselves without the aid of human eyes and hands have been found unequal to the task of entirely removing bone or improving appearance. Though hand picking on sizes other than lump or grate was not originally contemplated in any of the jig breakers, the stricter requirements of late years have made it necessary in preparing egg and stove sizes.

At one breaker, Coal Brook, rock jigs are employed to recover salable material from the refuse. Two of these jigs handle all the reject from the egg and stove jigs and about 12 per cent of the total quantity is reclaimed as salable coal. Rock jigs probably also will be installed at all breakers where no immediate change in the general preparation system is contemplated. These will displace the labor now employed in picking and permit the coal jigs to make a better separation. Coal recovered by the rock jigs is customarily returned to the feed and pursues the regular path through the breaker.

The production of a marketable product is accompanied by heavy losses. This is due to the character of the output and the quantity of refuse in the coal as mined. At all breakers some coal is condemned, but particularly at those that have high losses, during protracted periods, 40 to 60 per cent of the domestic sizes is, or has been, condemned. Even with such wholesale condemnations it was often impossible to meet the requirements of the sales force.

Efforts made to combat the general situation resulted in both the reorganization of the breaker service and the installation of new equipment. The egg and stove sizes at Pine Ridge breaker were taken to Laflin in railroad cars to be treated in Chance cones. Marvine breaker, one of the most modern in the anthracite field, was rebuilt so as to embody the Chance sand flotation process. Two Chance cones were installed at Olyphant breaker to prepare buckwheat. At the other breakers, pickers were employed to clean egg and stove refuse and increase the coal recovery.

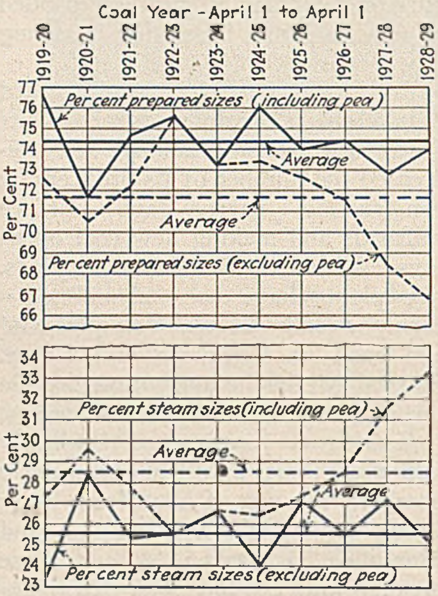


Fig. 1—Prepared and Steam Sizes Shipped by The Hudson Coal Co., 1919-1929

And now Gravity Slope breaker is being re-equipped with the Chance process.

When confronted by the unfavorable conditions already detailed, which were especially prevalent at Marvine, several remedies were proposed. These included: (1) adding to the cleaning-plant facilities other units of a like kind; (2) operating existing cleaning facilities without regard to the quantity of good coal that might pass over with the slate and bone and then using newly installed equipment to recover this waste, or (3) the installation of entirely new equipment to the displacement of the jig. The first alternative promised a large expenditure and the almost entire reconstruction of the plants, with uncertainty as to the results when the change was made.

The second plan was tested by making a laboratory study of the refuse from Marvine breaker, as well as a washing test. The laboratory analysis—on 1,000 lb. of refuse—showed that 36.9 per cent of the quantity then being produced was less than 1.75 sp.gr., which, if salable as coal, would have a value of $3.11 per gross ton. Furthermore, 7.63 per cent additional material could be recovered by crushing, with a value of $0.58 per gross ton.

The material recovered was found to be fairly low in ash and a good fuel, though its appearance was not of the best. As it would constitute at Marvine, about 4.62 per cent of the market product, it was regarded doubtful if the product then being produced by the jigs would carry this additional material.

To determine what the recovered material looked like in quantity, the entire jig waste at Marvine for two days was run through the Chance cone at Laflin. The recovered material was a concentration of the high ash and bony constitutents of the original feed at Marvine breaker and was not in itself a marketable product.

At the conclusion of this test, the opinion was definitely formulated that preparation of the coal in one operation, without secondary treating of the refuse, was the desired process. It was then decided that a test run of Marvine run-of-mine coal should be made and 20 railroad cars of this material, crushed in No. 1 rolls at Marvine, was put through the Laflin plant. At 1.70 sp.gr., 5.02 per cent of the material in the refuse after treatment would float and might be considered marketable coal.

A further analysis of this 5.02 per cent was made to determine just how much of it could be considered marketable. It was found that 0.6 per cent of the total refuse, equivalent to 0.066 per cent of the total feed, floated at 1.60 and had an ash analysis varying from 11.48 to 15.44 per cent. This could be classed as good coal. Sink at 1.60 and float at 1.65 comprised 2.7 per cent of the total refuse—0.296 per cent of the total feed—and had an ash analysis varying from 25.33 to 27.51 per cent.

Material between 1.65 and 1.70 totalled 1.72 per cent of the refuse, equivalent to 0.188 per cent of the total feed, and had an ash analysis substantially higher—between 29.20 and 31 per cent. Neither of the last two fractions could be classed as good coal, and the results of the analysis showed that only 0.066 per cent of the total feed could be regarded as good coal lost.

The facts gathered from the results of the experiments just detailed resulted in a decision to rebuild Marvine breaker with four 15-ft. Chance cones. However, the fight to make preparation fit market requirements did not stop there, as there were several other breakers with high losses. Good results at Marvine led to a decision to equip Gravity Slope breaker with the same system, and probably will also result in the conversion of the old equipment in other breakers which have a high bank loss.

Reconstruction of Gravity Slope breaker was dictated, as at Marvine, by the necessity for reducing the excessive loss of good coal to the refuse bank, as well as by the large quantity of the washed product condemned because of faulty preparation. This breaker was originally equipped with 9 egg, 12 stove, 11 chestnut, 2 pea and 2 buckwheat jigs, a total of 36. The run-of-mine coal was brought in by a conveyor and passed over grizzly bars to separate the stove and smaller, which went directly to two tiers of steam and prepared shakers, each tier containing four decks. The product passing over the grizzlies went to a set of bull shakers to be separated into lump, grate, egg and smaller.

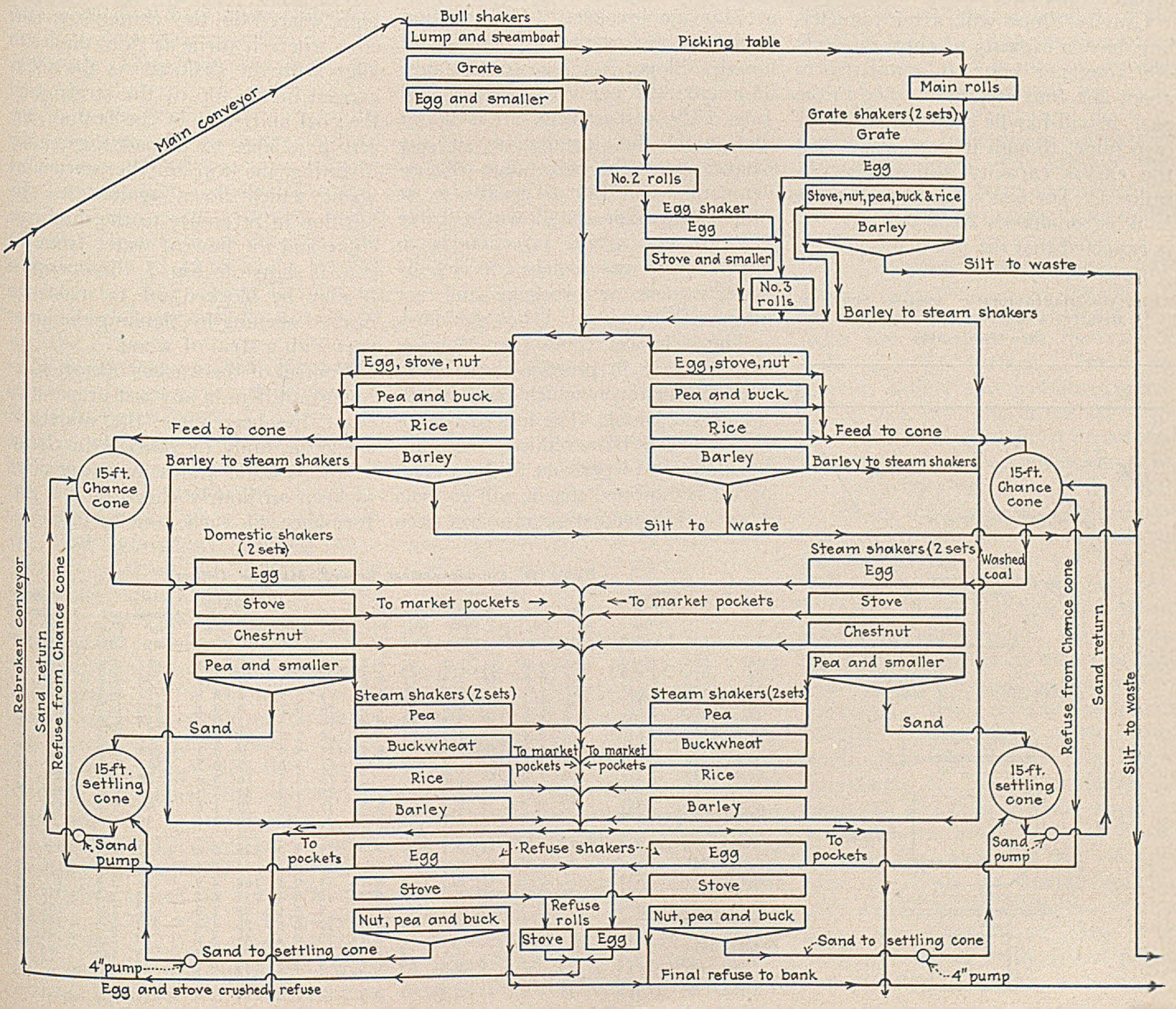
The lump size passed over a table and was hand-picked before going to the main rolls to be crushed to grate and smaller. The discharge from the main rolls passed to the "clean prepared shakers." Egg, stove and chestnut sizes passed to the jigs, the grate went to the No. 2 rolls and the pea and smaller to the steam shakers. Grate coal from the bull shakers also went to the No. 2 rolls and thence to prepared shakers.

Egg and smaller from the bull shakers were discharged onto "mud prepared shakers." Egg, stove, chestnut and pea sizes from these shakers passed to the jigs and the buckwheat and smaller to the steam shakers. Grate, egg, stove, chestnut, pea, buckwheat and birdseye sizes were made in the two tiers of prepared and steam shakers following the No. 2 rolls, all these sizes going to the jigs.

Refuse from the jigs passed to refuse shakers equipped with $\frac{3}{16}$-in. mesh screens. Egg, stove, and chestnut refuse from these screens were sent to the breaker refuse bank. Slush from the jigs passed to two shakers of $\frac{5}{16}$-in. and $\frac{1}{16}$-in. mesh, respectively, all material over $\frac{1}{16}$ in. being returned to the system. Silt passing the $\frac{1}{16}$-in. screen went to a silt tank, joining that from the prepared and steam shakers.

Two Chance cones will be installed in Gravity Slope breaker when construction is completed. The breaker, which was of wood, is being strengthened with a steel framework, which will support the two 15-ft. separating cones and the two 15-ft. settling cones which accompany them, as well as the shakers, rolls and driving machinery.

Fig. 2—Flow Sheet, Chance Installation at Gravity Slope Breaker



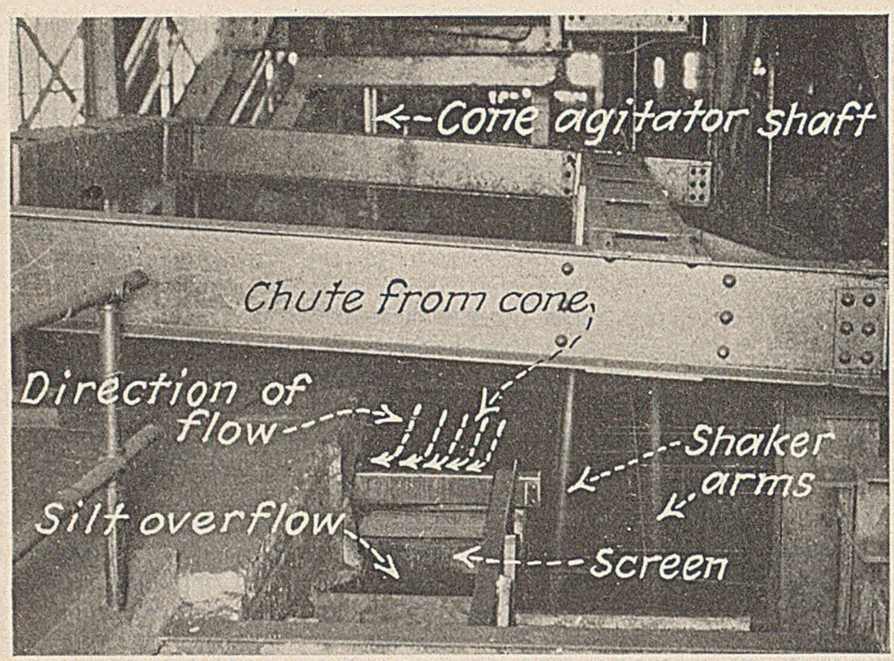


Fig. 3—Unloading Silt from Cone Discharge, Marvine Breaker

The position of the equipment and its function is shown in the flow sheet given in Fig. 2.

Gravity Slope will, after remodelling, have a capacity of approximately 400 tons per hour as compared to about 285 tons at present. As in the past, it will handle only coal from its own mine, though it is expected that the excess capacity will quickly be utilized. The loss of good coal to the bank is sometimes 26.30 per cent. It is expected that the installation of the Chance system will reduce the coal loss to the bank to figures as low or lower than those now being obtained at Marvine breaker. Condemnation is also an important consideration at Gravity Slope, running, for instance 35.1 and 32.7 per cent in June and July, 1929, respectively. It is hoped that with the installation of the Chance cones the percentage of condemnation will fall as greatly as at Marvine breaker, as shown in Table II. At that plant, rejection is in almost every case solely for lack of attractiveness or breakage and not because the quality is below standard.

The Chance cones at Marvine breaker have in practice lived up to the efficiencies on which their installation was based. The loss of coal to the bank has been reduced from approximately 14 per cent to 3 per cent, and it is expected that it will go even lower. Condemnation also has been reduced materially, as shown in Table II. Examination of this table shows that 16.3 per cent of the total cars loaded were condemned in the year before the cones were installed. In the period since their installation, the total condemnation has dropped to an average of 5.9 per cent. But even at that only a small part of the latter total was condemned for slate or bone, appearance being the cause.

When the Chance process was installed the operating expense at Marvine was reduced substantially. Similarly, it is expected that the operating expense at Gravity Slope will be reduced when the installation of Chance cones is completed. At Marvine, added experience has resulted in a competent breaker force, as well as in economies in maintenance and operation.

Desanding of silt, formerly a tedious operation, has been simplified by an unloading device fitted to the washed-coal discharge of each cone. It consists of a segment of $\frac{3}{16}$-in. screen about 30 in. long and 8 in. high, placed in the chute from the cone where it turns at right angles to align with the shakers. As the silt is carried in the top of the stream and the coal and sand in the bottom, the screen is able to unload the silt by diverting the top of the stream of water which flows against it. Its position in reference to the discharge chute and the flow of water from the cone is shown in Fig. 3. In operation it may be blocked off to make the desired opening by blanking the lower part with a strip of wood.

Control of the washer operation, an important item in any wet preparation plant, has been made the subject of a special study by officials in charge of preparation and a system evolved to keep an hourly check on the performance of each cone at Marvine

Fig. 4—Diagrammatic Sketch Showing Relative Position of Water Inlets (See Table III)

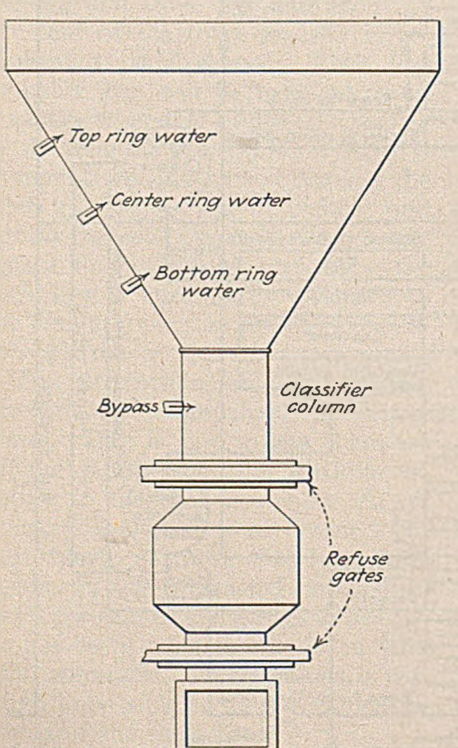


Table II—Condemnation Record, Marvine Colliery

	Total R.R. Cars Loaded	Slate No. Cars	Slate Per Cent	Bone No. Cars	Bone Per Cent	Oversize No. Cars	Oversize Per Cent	Undersize No. Cars	Undersize Per Cent	Breakage and Culm No. Cars	Breakage and Culm Per Cent	Appearance No. Cars	Appearance Per Cent	Total Condemned No. Cars	Total Condemned Per Cent
Jan., 1928	1,810	90	5.0	34	1.9	32	1.8	17	0.9	6	0.3	171	9.4	350	19.3
Feb., 1928	1,857	126	6.8	44	2.4	11	0.6	21	1.1	3	0.2	90	4.8	295	15.9
Mar., 1928	1,641	87	5.3	41	2.5	21	1.3	15	0.9	1	0.1	55	3.3	220	13.4
Apr., 1928	2,717	210	7.7	119	4.4	27	1.0	20	0.7	4	0.2	222	8.2	602	22.2
May, 1928	3,603	207	5.7	139	3.9	15	0.4	11	0.3	2	0.1	234	6.5	608	16.9
June, 1928	1,746	77	4.4	76	4.4	2	0.1	68	3.9	2	0.1	79	4.5	304	17.4
July, 1928	3,314	116	3.5	130	3.9	5	0.2	114	3.4	9	0.3	225	6.8	599	18.1
Aug., 1928	3,368	55	1.6	52	1.5	3	0.1	195	5.8	15	0.5	157	4.7	477	14.2
Sept., 1928	2,214	110	5.0	45	2.0	...	...	73	3.3	76	3.4	78	3.5	382	17.2
Oct., 1928	2,085½	31	1.5	19	0.9	...	...	28	1.3	64	3.1	158	7.6	300	14.4
Nov., 1928	1,765	15	0.8	5	0.3	1	0.1	17	1.0	29	1.6	90	5.1	157	8.9
Dec., 1928	593	5	0.8	7	1.2	...	...	...	...	12	2.0	38	6.4	62	10.4
Total 1928	26,713½	1,129	4.2	711	2.7	117	0.4	579	2.2	223	0.8	1,597	6.0	4,356	16.3
Jan., 1929	3,167	4	0.1	4	0.1	...	...	13	0.4	72	2.3	43	1.4	136	4.3
Feb., 1929	3,454	7	0.2	17	0.5	2	0.1	11	0.3	168	4.9	86	2.4	291	8.4
Mar., 1929	3,421	24	0.7	18	0.5	12	0.3	16	0.5	211	6.2	78	2.3	359	10.5
Apr., 1929	3,194	8	0.3	9	0.3	16	0.5	4	0.1	48	1.5	77	2.4	162	5.1
May, 1929	4,228	7	0.2	...	...	3	0.1	27	0.6	76	1.8	232	5.5	345	8.2
June, 1929	3,414	.....	...	...	...	5	0.1	12	0.4	55	1.6	83	2.4	155	4.5
July, 1929	2,761	.....	...	...	...	7	0.2	...	...	21	0.8	36	1.3	64	2.3
Aug., 1929	3,568	.....	...	1	0.0	19	0.5	7	0.2	33	0.9	39	1.1	99	2.7
Total, 1929	27,207	50	0.2	49	0.2	64	0.2	90	0.3	684	2.5	674	2.5	1,611	5.9

Table III—Operating Data, Cone No. 1, Marvine Breaker, Sept. 4, 1929

Time	Water Pressure, Lb. per Sq.In.	Number of Turns: Bypass	Number of Turns: Bottom Ring Water	Number of Turns: Center Ring Water	Number of Turns: Top Ring Water	Float on 1.65 Sp.Gr., Per Cent
7- 8 a.m.	19	4	4	4	0	3.3
8- 9 a.m.	19	4	3	3	0	2.9
9-10 a.m.	19	4	4	0	0	1.1
10-11 a.m.	20	4	4	2	0	1.6
11-12 a.m.	19	4	4	4	0	1.3
12:30-1:30 p.m.	18	4	4	4	0	1.5
1:30-2:30 p.m.	18	4	4	4	0	1.5
2:30-3:30 p.m.	17	4	4	4	0	1.3
Average						1.8

breaker. This system also is in use at other breakers—Olyphant and Laflin—where the cones have been installed. It will be adopted at Gravity Slope when operation begins.

One operator is in charge of a cone to observe the rate and character of the feed, the condition of the discharge and loading of the shaker screens and the water pressure, as well as to operate the slate discharge and the four valves supplying water to the cone. Consequently, he is a busy man and to aid in keeping the cone working at its highest efficiency, the control system described in the following paragraphs has been developed.

This is based on the results of the float-and-sink tests made on the final refuse at hourly intervals. Samples of this refuse, which is material smaller than chestnut, are collected every 12 min. Five of these samples, with a total weight of 35 to 40 lb., furnish material for one test. Results of tests made on a typical day are shown in Table III.

As the quantity of coal going over into the refuse is largely dependent on the feed, the problem of control consists in adjusting the water feed to the cone to compensate for varying quantities of refuse in the coal feed. There are times when the refuse in the feed increases, resulting in a greater quantity of slate in the separating cone above the classifier column. Such added slate causes the water which is being fed to the cone to be subjected to greater resistence and results in a higher specific gravity, which is easily overcome by the addition of more water. When the ammeter shows that the load on the cone is lightened, the added water is cut off.

Ordinarily, the cones are so operated that the float of the refuse therefrom when tested on a zinc-chloride solution of 1.65 sp.gr. is between 1.2 and 1.5 per cent. If at any time the test should show a markedly higher or lower figure, it is probably a signal that something should be done. However, before disturbing the adjustment of the valves, the next hourly test is taken as a check. If the condition still persists, the valves are adjusted to correct it.

The process in its entirety is shown in Table III. At 8 a.m., the float was 3.3 per cent, and the next test at 9 a.m. showed it to be still high at 2.9 per cent. The valves were accordingly adjusted to admit less water to the classifier column and reduce that going in at the top of the cone. At 10 a.m. the test showed 1.1 per cent float, and more water was admitted to the cone. Adjustments for the rest of the day are shown in the table, which gives the operating data for the entire period.

◆

Stripping Completes Recovery of Deep and Already Mined Beds

(Continued from page 606)

coal it is first drilled with "Cyclone" gasoline-type churn drills. The holes are loaded with 40-per cent straight dynamite and exploded with Cordite. Large pieces of rock remaining intact after the blast are broken up with air drills.

The shovels load the spoil into 5-cu.yd. side-dump cars in which it is transported by steam locomotives to a distant dumping ground. Depth of cut, lack of space and the downward dip of the seam make casting impracticable, though stripped areas occasionally are backfilled with material hauled from the loading point.

Dumping grounds usually are established in the coal basin where they will not interfere with future stripping of the lower seams. These, as a result of the basin-like formation, outcrop or nearly outcrop in succession along the surface, and, where possible, dumps are established between them or at some point where, because they have been mined and robbed, the spoil bank will not interfere with future operations. The outcrop of the seam is often covered with several feet of glacial drift, making its location obscure.

Shovels of 1- or 1½-cu.yd. capacity are used in loading the coal after it is uncovered. Occasional shots are required to loosen it for handling. It is transported to the breakers in the standard cars used in the underground workings of the mine. No trouble has been caused by water as it all goes through the strata or the old openings and flows down the dip into the adjacent mines.

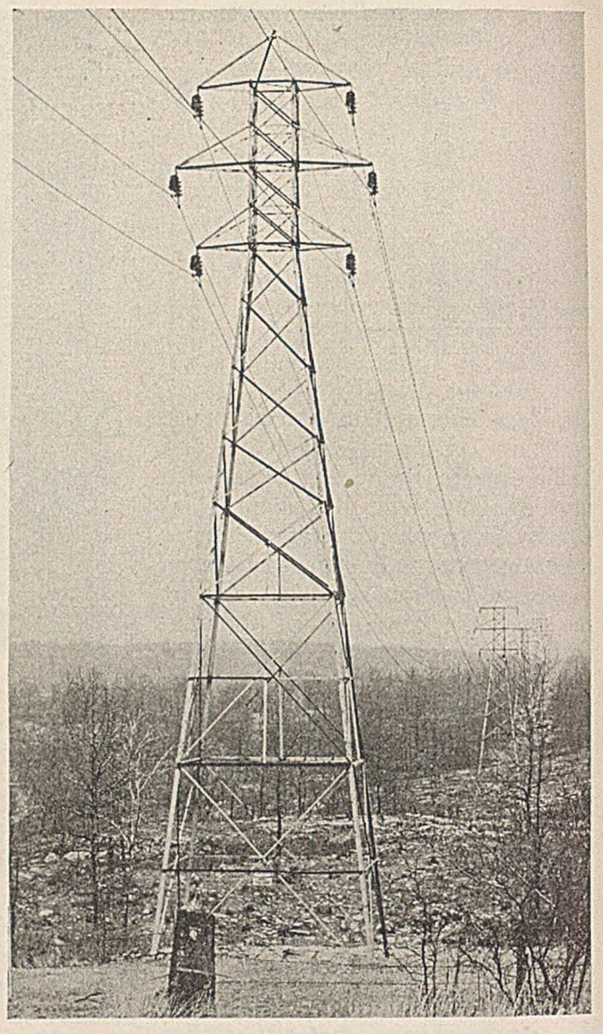
Operations at the Plymouth and Olyphant pits have about reached their economical limit with the present equipment. However, the company, in accordance with its policy of extending the strippings as long as they prove profitable, hopes to obtain still more tonnage from these pits by the use of improved equipment of larger size.

Other pits than those already described probably will be started in the future and though the size of equipment will hardly approach that used in the casting strippings of the Middle West for instance, because of the hard material in the overburden and because the material has to be loaded into dump cars, and again because of the uncertainty of passage over mined areas, it is believed that the scope of the stripping operations can and should be materially extended by the use of larger machines.

As the seams have been quite generally first-mined it is possible to prepare cross sections which will show the elevations of the various beds and the surface. These determine closely and without expense for drilling just what areas are strippable and what areas must be covered by underground methods. However, what this does not show is the depth of glacial drift or soil. This is important, for the drift is a material that can be removed at low cost.

Cross sections are being prepared, so that no areas will hereafter be removed by underground mining that more profitably and at the same time more completely could be removed by stripping. Few if any anthracite companies have been more forehanded than The Hudson Coal Co. in capitalizing on its opportunities in using the stripping method wherever it has shown possibilities of profit. Though the measures dip sharply from the crop the surface pitches with almost equal steepness so that there are often large areas that modern stripping methods can profitably develop.

With 50-Per Cent ELECTRIFICATION *Hudson Generates 9 Kw.-Hr. Per Ton Marketed*



Working at 23,000 Volts but Insulated for 50,000 Volts

By J. H. Edwards
Associate Editor Coal Age

IN 1928 the electric power generated and purchased by The Hudson Coal Co. totaled over 100,000,000 kw.-hr. and yet taken as a whole the mines are but slightly over 50-per cent electrified. The electric power requirements on the basis of the production of a normal year is 9 kw.-hr. per long ton. Here is a power supply and electrification problem of first magnitude.

In order to realize the maximum advantage from electrification it is generally recognized in the anthracite region that the boiler plant must be eliminated or must be replaced by one commensurate with the need for steam for heating purposes. A big boiler plant is much like a big house; it takes money to run it even if only a moiety of its service is used. Herein lies one of the few anthracite difficulties in the way of King Kilowatt.

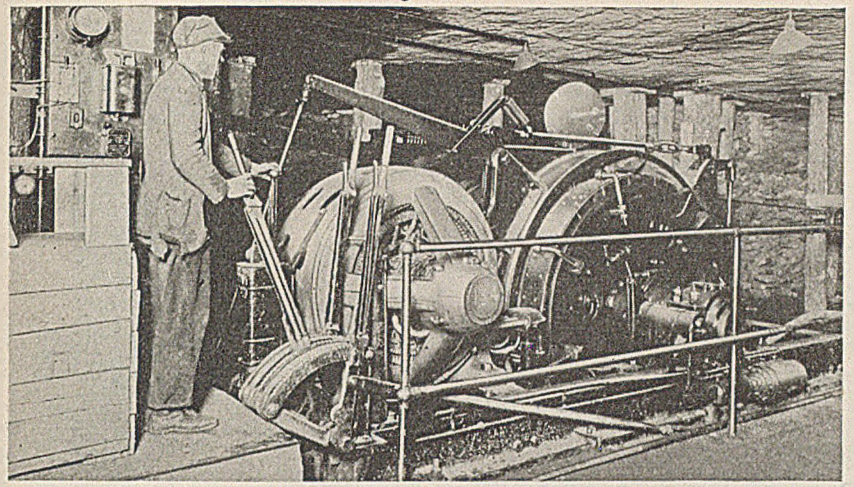
In winter much steam is required for heating the breaker and bath house, for warming the shafts and shaft landings and for thawing the standard-gage tracks over which the dripping railroad cars, fresh loaded with wet-washed coal, are handled. This track heating is accomplished by steam pipes lying on top of the ties and parallel to the rails. These pipes measure from 2 in. diameter down to ½ in. Approximately 7 miles of Hudson track is thus heated. At one colliery the outside heating load requires 1,100 boiler horsepower.

All except one of the shaft hoists, over half of the fans, a few mine pumps and a number of drives in several breakers are still being operated by steam from central boiler plants. Numerous small steam-generating plants formerly used for operating slope and plane hoists, outlying fans, and pumps, however, have been displaced by electrification.

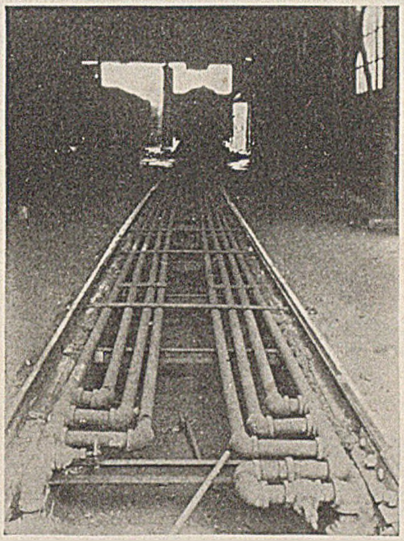
One reason for the number of fans being still operated by steam is that electrification would entail provision for stand-by power. The company cannot risk a failure in the supply of electricity. For these reasons, perhaps, the controlling factor in further electrification of fans will be the "outlawing" of boilers. The state boiler code of Pennsylvania, used as a standard by The Hudson Coal Co., indicates that the working pressure of boilers be lowered from time to time according to a schedule of age. When the cost of new boilers that would otherwise have to be installed can be credited against the cost of an electric hoist and yet some of the old boilers can be retained for the maintenance of a pressure suitable for heating service, the investment in complete electrification becomes more attractive.

The electric generating facilities now consist of three 25-cycle plants, totaling 22,140 kw. One of these plants, located at Baltimore colliery, near Wilkes-Barre, contains 1,040 kw. in 25-cycle, 2,300-volt engine-driven units. In the same plant there is a 1,000-kw. frequency converter tying in the 60-cycle line from Loree colliery (where power is purchased from the Luzerne County Gas & Electric Co.) and the 25-cycle line from the two other generating plants of The Hudson Coal Co.

The largest of these plants, one of 13,600 kw. capacity, is at Olyphant colliery, 6 miles northeast of Scranton. Here there are two 800-kw. 2,300-volt Corliss units, one 2,000-kw. 2,300-volt mixed-pressure turbine, and one 10.000-kw. 13,200-volt high-



Inside Hoists Such as This 250-Hp. Unit in Jermyn Colliery Put a Heavy Demand on the Line



Heating Installation for Tracks and Breakers

pressure turbine. These were installed through a period of years, in the order named, as the demands for electricity increased. The large unit was put into operation in 1922.

Both turbines are the Curtis type of the General Electric Co. The smaller one is equipped with an Alberger jet condenser and the larger with a Wheeler condenser of the same type. Cooling is effected by two 8,400-g.p.m. Wheeler natural-draft towers. The mixed-pressure turbine utilizes the exhaust from breaker-drive engines and from other steam-driven equipment located close to the power plant.

In the boiler room are ten 463-hp. Stirling boilers equipped with Coxe chain-grate stokers, and two 1,000-hp. boilers of the same design but equipped with Illinois chain grates. Birdseye is the usual fuel, but at times barley size is handled. Although the large boilers are designed for 275 lb. the plant is operated at 160 lb. to suit the older boilers and old engines. The boiler-feed water comes from mountain lakes. A Permutit zeolite water softener is included in the power-plant equipment.

The balanced-draft combustion control is automatic, as is also the feed-water regulation, Copes equipment performing the latter duty. Evaporation efficiency is checked by means of Venturi feed-water meters and Richardson coal scales. Each of the 1,000-hp. boilers is equipped with a Ranerex continuous CO_2 recorder.

The other plant, located at Coal Brook colliery near Carbondale, and containing one 7,500-kw. 6,600-volt General Electric turbine, was built nine years ago following destruction of an old plant by fire. So well has the turbine room of this plant been maintained that the entire equipment appears as if it had just gone into use.

Combined operating figures for both plants for the year 1928 show 84,419,500 kw.-hr. generated, a fuel consumption of 2.69 lb. per kw.-hr., 17.39 lb. steam per kw.-hr., and 6.4 lb. of water per lb. of fuel as fired. Of the total marketable tonnage produced by the company in the same year, 8.48 per cent was used in its stationary plants.

The combined capacity factor of the electrical generating equipment is high considering that only a few mines are double shifted and then only in sections. During May, 1929, the average was 52 per cent. This figure was determined by dividing the total kilowatt-hours generated by the number that would have been generated if the entire equipment had operated continuously at full capacity. The capacity at the power plant has been maintained at a minimum. This has been done by operating the electric mine pumps only during off-peak periods. This explains why the capacity factor has been so much larger than many mine operations can show.

The connected load on the power system is approximately 60,000 hp. Of this quantity sufficient is in synchronous motors to give an average power factor of over 85 per cent. Over half of the d.c. substation load

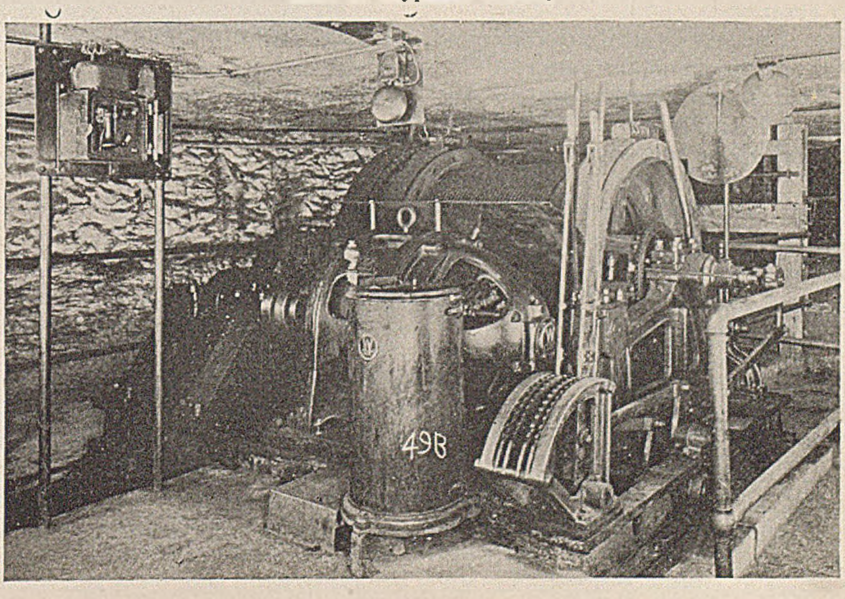
How The Hudson Coal Co. Has Increased Its Use of Electricity Since 1910

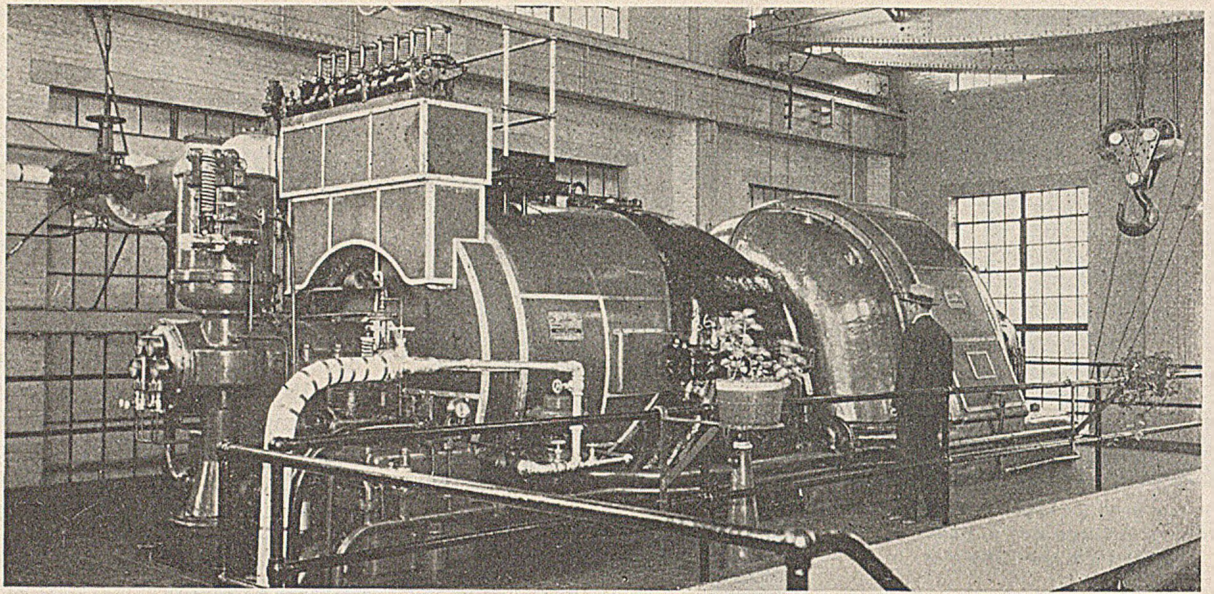
(Units in Kilowatt-Hours)

Year	Generated	Purchased	Total
1910	1,324,880	....	1,324,880
1911	1,672,548	....	1,672,548
1912	2,056,346	....	2,056,346
1913	3,462,550	....	3,462,550
1914	5,516,884	....	5,516,884
1915	11,303,892	....	11,303,892
1916	15,250,000	....	15,250,000
1917	19,042,200	684,195	19,726,395
1918	25,758,835	2,249,817	28,008,652
1919	26,875,700	1,858,903	28,734,603
1920	36,349,700	3,760,560	40,110,260
1921	42,256,950	9,463,721	51,720,671
1922	*45,412,100	*5,609,586	*51,021,686
1923	63,506,850	5,438,136	68,944,985
1924	75,665,400	6,096,435	81,761,835
1925	*67,235,550	*4,981,055	*72,216,605
1926	80,880,700	6,021,540	86,902,240
1927	82,514,400	8,462,245	90,976,645
1928	84,419,500	15,650,629	100,070,129

*Mining suspended during part of the year.

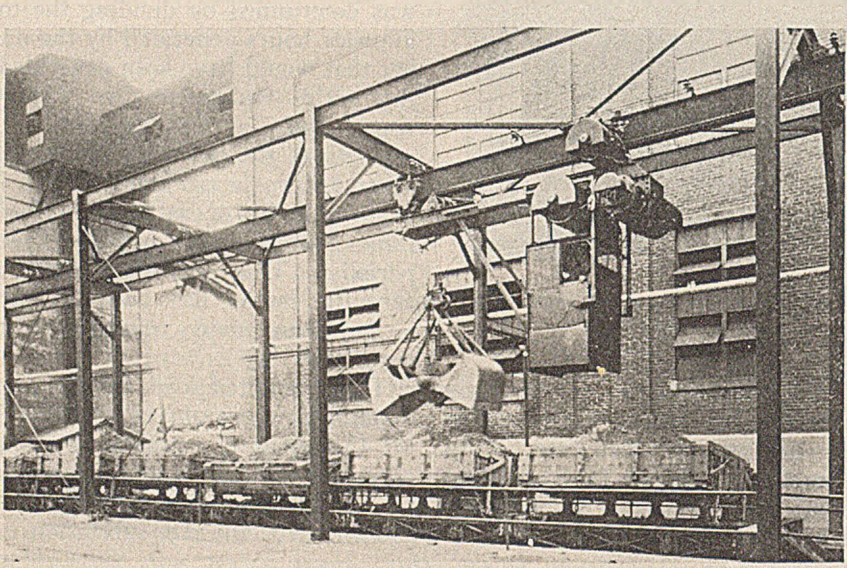
150-Hp. Hoist Operating No. 18 Plane, New County Vein, Grassy Island Mine of Olyphant Colliery





This 7,500-Kw. Turbine in Coal Brook Plant Is 9 Years Old but Appears Brand New

is powered by synchronous motors and there is a large load of the same character on air compressors. The largest compressor, a 5,000-cu.ft. machine, is driven by a direct-connected 1,000-hp. synchronous motor.



Loading Ashes at Coal Brook Power Plant

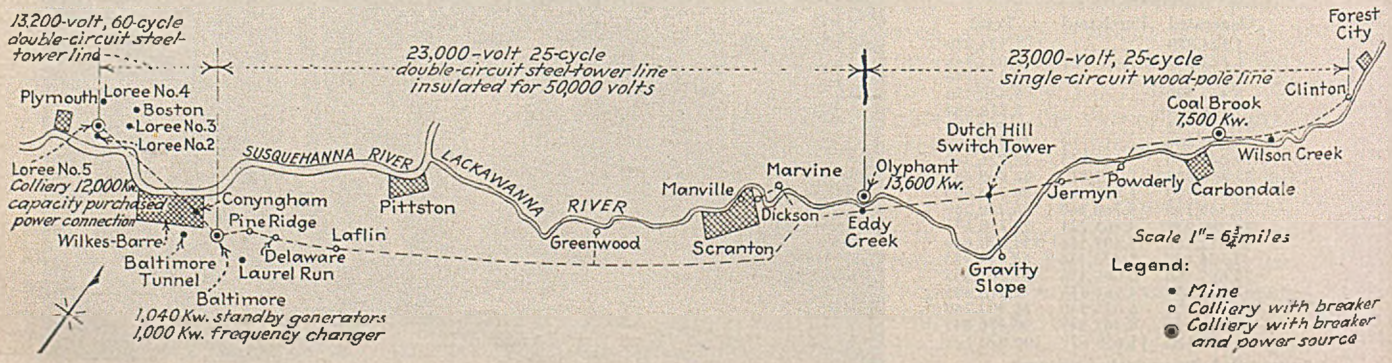
The main distribution system consists of 17 miles of 23,000-volt 25-cycle single-circuit wood-pole line, 22 miles of 23,000-volt 25-cycle double-circuit steel-tower line and 5.8 miles of 13,200-volt 60-cycle double-circuit steel-tower line. Many miles of 2,300-volt lines radiate from the a.c. substations.

By using the best line and substation equipment available and installing it according to the highest standards, power failures have been reduced to a negligible figure. Maintenance, of course, plays an important part. This work, also line construction, is carried on by two crews each having a fully equipped truck. They work out of the main operating office in Scranton.

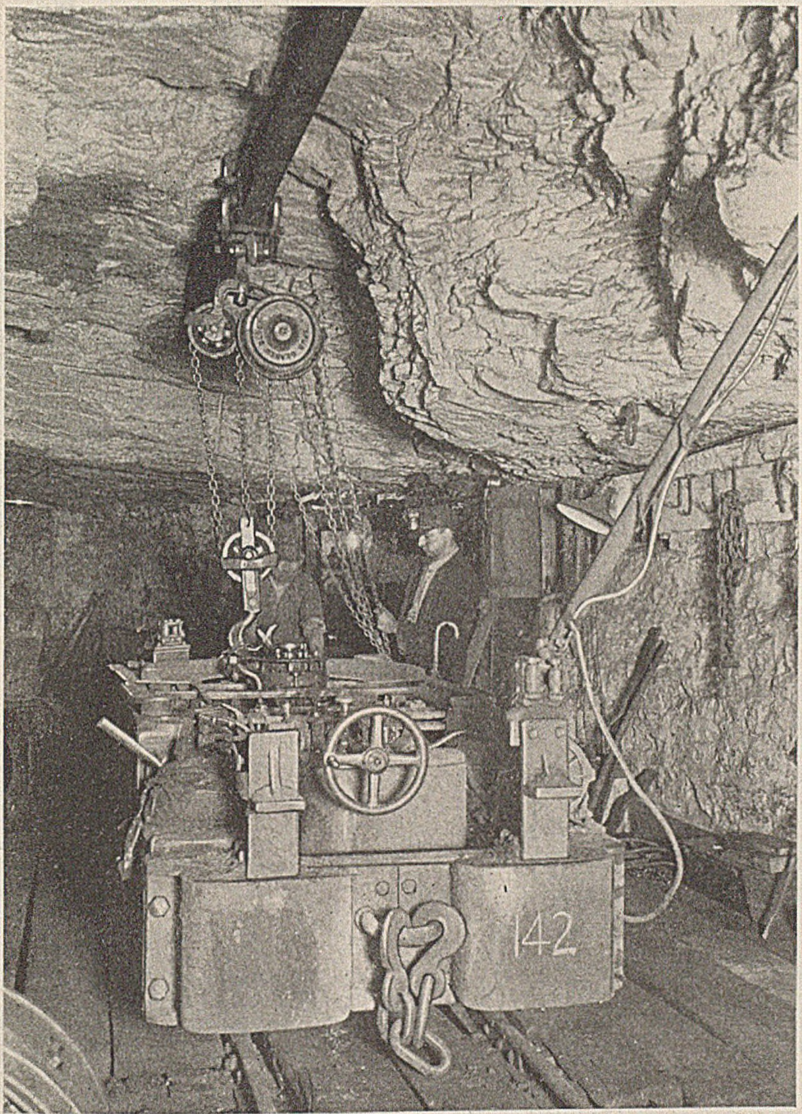
Load dispatching is handled from the Scranton office of the superintendent of power. This office is equipped with one-line circuit diagrams showing the location and numbers of all high-voltage switches. Switching on the high-tension lines is normally done under instruction from the office of the superintendent of power.

Because the generation of power is an important item in the cost of coal and yet one not closely allied with underground operations, the power department is divorced from the mining department. It comes under the chief electrical and mechanical engineer who in turn reports to the operating vice-president. The power department is conducted as if it were a utility pledged to render the best possible service commensurate with the best interests of its stockholders.

Relative Locations of Power Plants and Collieries Including Schematic Diagram of High Tension Lines



Improved MAINTENANCE Reduces Major Electrical Troubles



Repair Pit and Mono-Rail Hoist Speed Work in Jermyn Colliery

SIX years ago The Hudson Coal Co. threw off the restraints of tradition by relieving the operating department of the responsibilities of equipment maintenance. Even without the testimony of the cost sheets it is apparent that this system of management and the new maintenance methods which have been inaugurated under it have been abundantly successful in reducing delays and in lowering the labor of maintenance. For instance, because of fewer breakdowns it has been possible to reduce the force in the electrical department of the central repair shop from 34 to 18 men.

Maintenance and construction have been rightly placed under one head, because for many of the maintenance jobs the equivalent of a construction crew is required and because with this arrangement a type of installation is likely to be erected which will operate with minimum trouble. The tie-up is made more complete by having the electrical engineer, the mechanical engineer and the superintendent of maintenance and construction all report to one head—namely the chief electrical and mechanical engineer—who in turn reports to the operating vice-president. Design, installation and maintenance all fall to the same department, the head of which thus has no alibi.

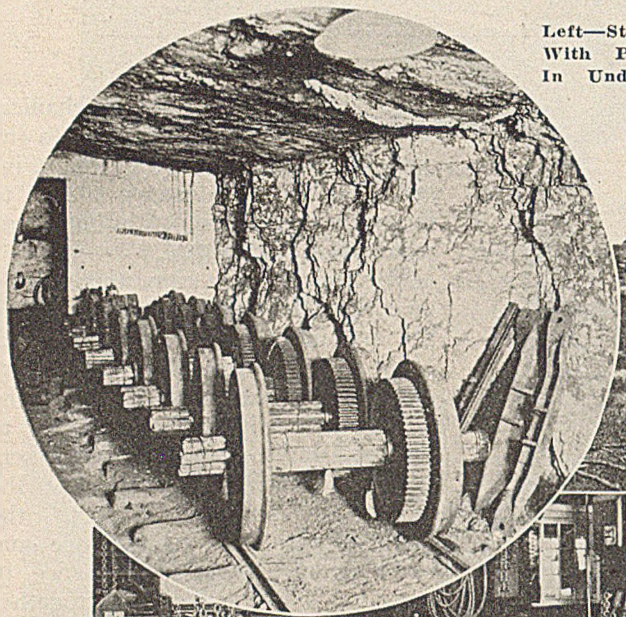
For each division, consisting usually of one colliery, maintenance foremen are appointed. This foreman looks after all equipment. All mechanical and electrical workmen, including the wiremen in the mines, report to their respective maintenance foremen. These foremen, who reside at the various collieries, report to the superintendent of maintenance and construction, who has an office in Scranton but whose time, together with that of his two assistants, is spent largely in the field. All collieries are accessible by improved road, and the farthest is only 28 miles from Scranton.

Except for hoisting ropes, general inspectors of equipment are no longer employed. Instead it has been found preferable to have the inspections made by the local maintenance foreman who can immediately take action to remedy any faulty conditions that inspection may have revealed.

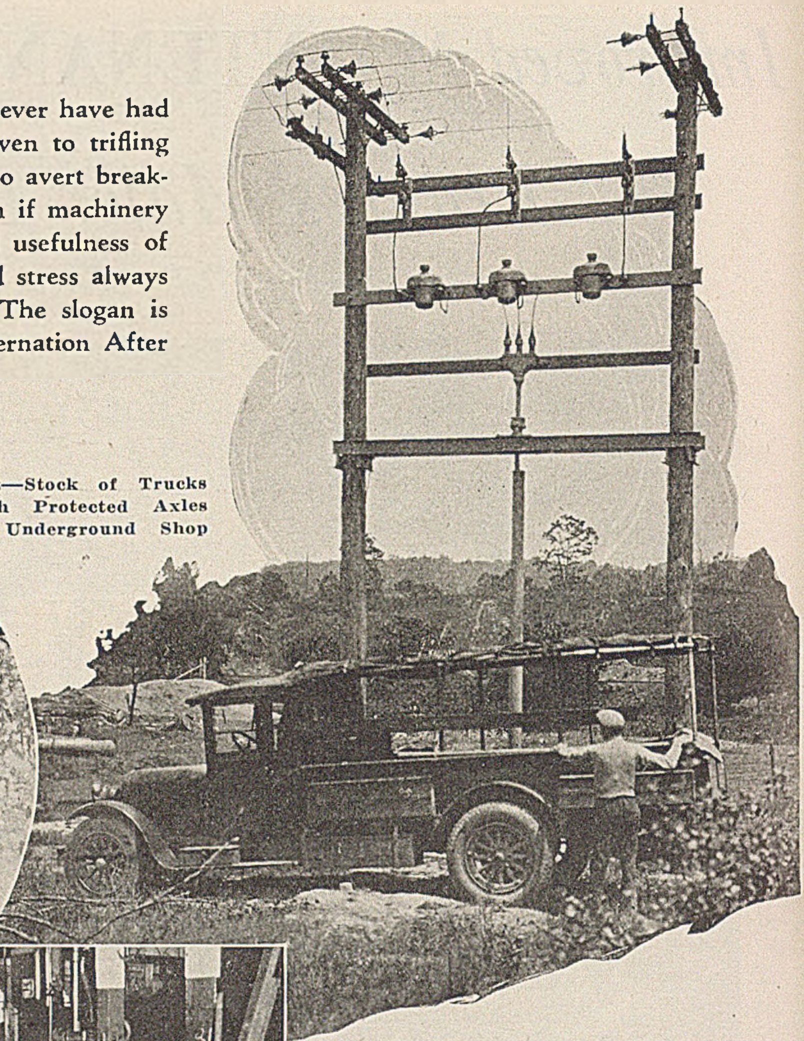
Each month the electrical maintenance foreman must fill out a standard form on which he lists every item of equipment under his jurisdiction. Where any faults are noted he appends an approximate date on which the deficiency will be corrected. Where there is too much equipment for the one man to see, he is helped by an assistant upon whose eyes he can depend.

Other monthly reports submitted by the electrical maintenance foreman include: meter readings; changes in total a.c. and d.c. connected loads; equipment items received, shipped away or relocated, and total man-hours and the amount chargeable to each of thirteen different types of

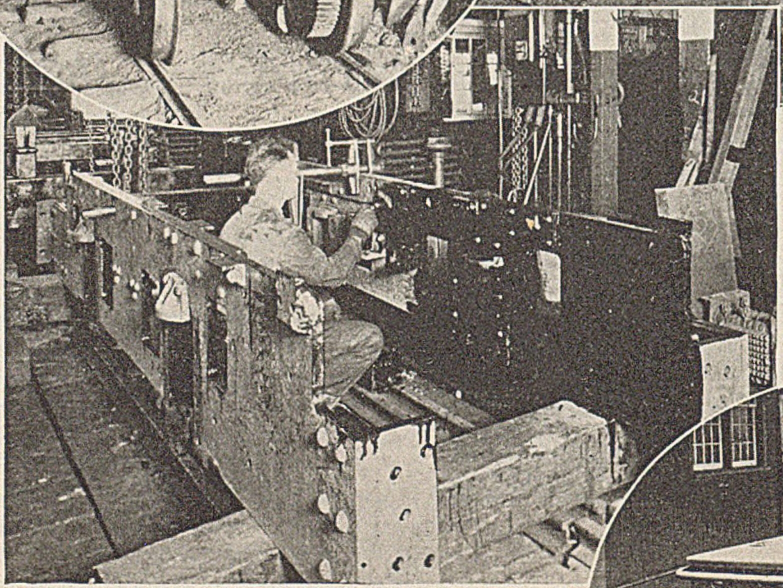
TO AVOID DOING JOBS that would never have had to be done had a little attention been given to trifling maladjustments when they first occurred, to avert breakdowns that inevitably slow down operation if machinery is not inspected, to preserve the life and usefulness of machinery, The Hudson Coal Co. has laid stress always and everywhere on MAINTENANCE. The slogan is "Care Before Trouble" instead of "Consternation After Trouble."



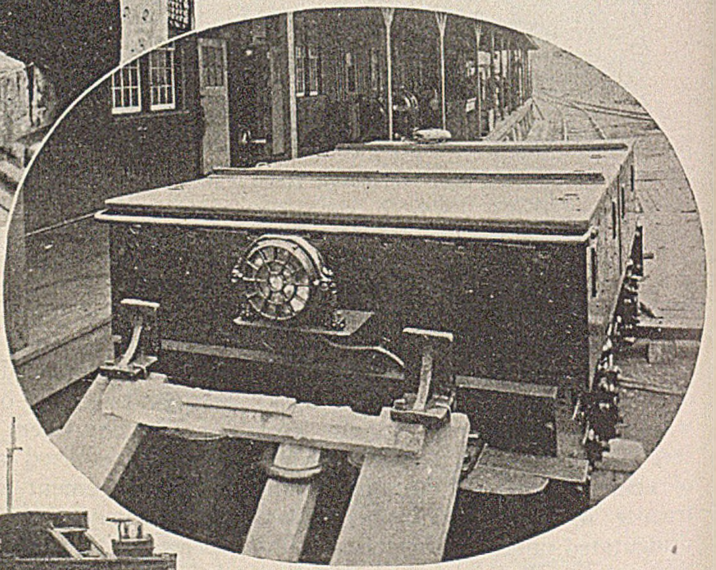
Left—Stock of Trucks With Protected Axles In Underground Shop



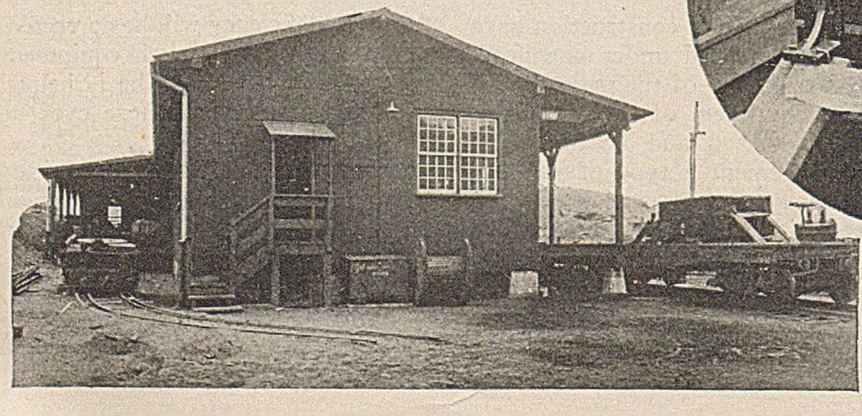
One of the Line Crew Trucks Out on the Job



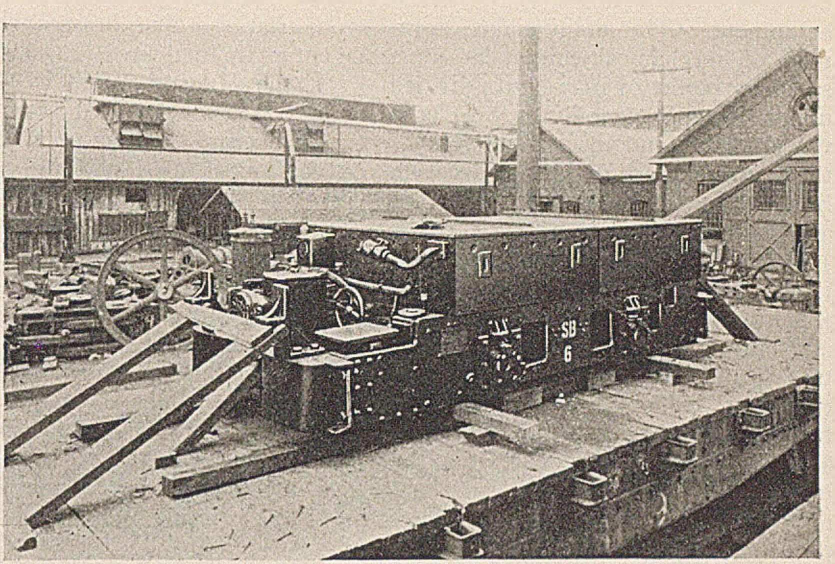
Left—Overhauling a Locomotive Means Rebuilding



Right—Storage-Battery Locomotive Leaving Central Shop After Overhauling

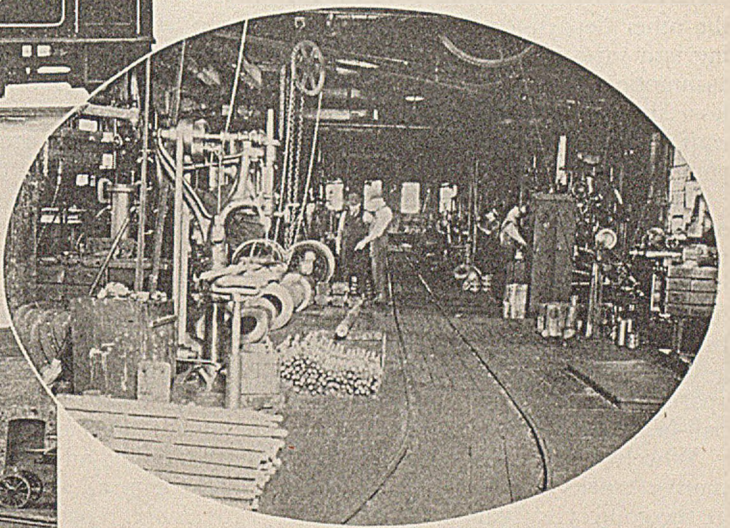


Left—Worn Locomotive at Left Ready to Enter the Electrical Shop and Overhauled Locomotive at the Right Leaving "Like New"

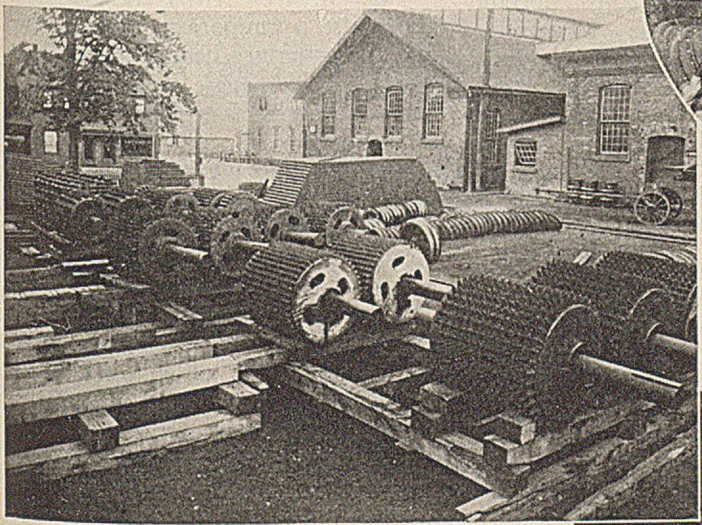


Overhauled Locomotive With Shop Buildings in Background

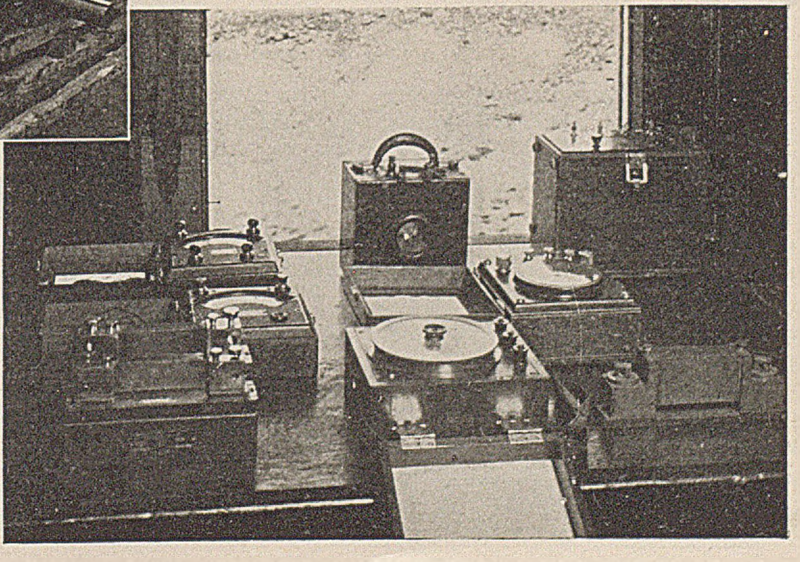
Equipped With Walschaert Valve Gear to Reduce Maintenance



Looking Down Aisle in Machine Shop



Repaired Breaker Rolls in Material Yard at Providence Repair Shop



Each Colliery Is Equipped With Indicating Instruments; Portable Graphic Meters Are Borrowed From Scranton Office equipment. The maintenance foreman of mechanical equipment must submit a report of man-hours divided under 45 equipment heads. In both the electrical and mechanical reports the man-hours are divided under each head into maintenance improvement and operation.

Because in some cases life depends upon the proper handling of wire ropes, an inspector who is a specialist is retained for this duty. On important ropes his inspections include calipering as an indication of internal condition. He, with his two assistants, personally supervises the installation of new hoisting ropes and the socketing of ropes that are shortened or otherwise changed.

On inside maintenance the mining department drills the holes for the suspension of trolley-wire hangers and other electrical conductors, but takes no further responsibility for the work. The exact location of each hole to be drilled is marked on the roof by the wireman. Calling upon the other department to do the drilling is a safety measure based on the assumption that the electricians are less skilled in detecting dangerous roof conditions than employees appointed by the colliery superintendent.

Patchwork is not tolerated in equipment repairing. For instance, take the case of an open coil in a locomotive armature, the commutator bars are not shorted and the armature left to work at increased speed as long as it will last, but instead a spare armature complete with the ball-bearing assembly is installed.

Wheels and gears of electric locomotive trucks are not reconditioned at the colliery. Against the need for repairs the colliery carries in stock, at the inside repair pits, pairs of axles complete with solid gears and new wheels. The axles are protected during shipment and while in stock with wood slats so that brasses will not be cut away by dented journals.

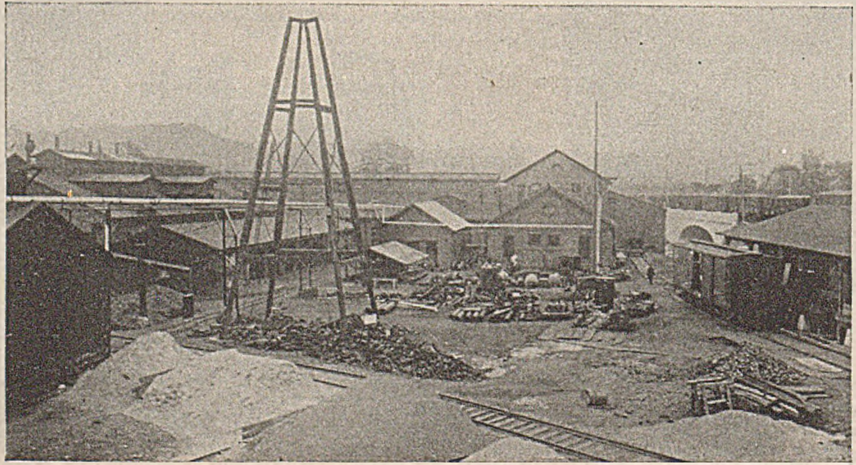
At the Hudson mines electric locomotives are provided with steel-tired wheels, depending upon the type of equipment used and the service, each division following a regular schedule in the care of locomotive armatures and stationary motors. For instance, at the Olyphant division locomotive armatures are removed, cleaned, baked and painted at regular intervals. The schedule is every 6 months for battery locomotives and once a year for trolley locomotives. Every three years, on the average, each a.c. motor is dismantled for cleaning, painting and other forms of rehabilitation.

Periodically, electric locomotives are sent to the central shop for complete overhauling in accordance with a prearranged schedule, but steam locomotives are overhauled at the colliery after each 10 to 12 months of service. These locomotives are all of the rod type and principally of 20- to 25-ton weight.

On locomotives with track gages as narrow as 28 in. there is scant space for eccentric-type valve motion. The parts are relatively inaccessible and are therefore more difficult to maintain than parts in most machinery of modern design. As an experiment in eliminating this annoyance a Vulcan 25-ton locomotive of recent purchase was equipped with Walscharet valve gear. With this type, commonly used on heavy standard-gage locomotives, the mechanism is outside the wheels where it can be more readily adjusted.

The central shop, known as the Providence repair shop, is located in Scranton. It includes a brass and iron foundry with 10,000- and 6,000-lb. cupolas, a machine shop, car shop, and an electrical repair shop. At Parsons, Pa., near Wilkes-Barre, is another shop which is confined to the repair and assembly of sheet-metal parts.

General View of Central Shops



The iron foundry casts miscellaneous gray-iron parts, mostly specials, including odd lengths of flanged pipe for fillers in mine-drainage lines. Of the great variety of parts cast of yellow metal, brasses for steam locomotives constitute a large item. Brass bushings for mining machines and electric locomotives are for the most part purchased from the machine manufacturers instead of being made locally.

Repair of pumps and breaker rolls are two major items of the machine-shop work. The last few years has brought about a marked change in the tolerances allowed in machining. There was a time when gears for tipples and breakers were considered "good enough" even if they were bored almost $\frac{1}{16}$ in. large. Now they must be a snug sliding fit. On certain centrifugal pumps the clearance to the wearing rings is made 0.025 in. or less.

It is the practice to buy from the equipment manufacturer all armature and stator coils except "soft" coils. In the winding process pure sheet mica is used at the corners of slots, and in bringing the top of the coil down level with the lamination, no hammering is allowed.

Instead, fiber strips are placed on the coils, a temporary band applied and the armature heated in the oven. While the armature is hot a second temporary band is applied to draw the coils down to the proper level. The armature is dipped three times. Hard solder, 70 per cent tin and 30 per cent lead, is used in soldering leads to the commutator and "50-50 solder" is used on the bands.

After a mine locomotive has gone through the shop it is supposed to be in a condition which will give the same service as a new machine. The frame has been re-riveted and all parts checked over in detail. The same care is taken in overhauling a mining machine.

The foreman of the electric shop reports to the superintendent of maintenance and construction, and the superintendent of the other departments of the central shop reports to the mechanical engineer. As both the superintendent of maintenance and construction and the mechanical engineer report to the chief electrical and mechanical engineer, the central shop is kept under the jurisdiction of the one man who is responsible for all things pertaining to electrical and mechanical equipment.

Rugged Trolley-Line Construction at Clinton Colliery

Recorded Electrical Experience Results in STANDARD PRACTICES *At Hudson Mines*

ONLY by systematic application of expertly chosen standards which are changed as often as experience dictates and as equipment of better design becomes available can reliability and low maintenance cost of electrical equipment be attained. For many years all new installations of The Hudson Coal Co. have been made under the guidance of such standards with the result that at least 90 per cent of the electrical equipment is now as near trouble-free, efficient and safe as the best industrial practice in this country can make it. The earlier installations, however, which will not serve for long in their present locations are being permitted to continue in operation.

Briefly, the electrical equipment aggregates approximately 60,000 connected horsepower. This equipment divided in classes and named in the order of magnitude is as follows: Mine pumps, hoists which operate underground slopes and planes, direct-current substations, air-compressors, fans, breaker drives and miscellaneous units. To these must be added approximately 30,000 hp. of d.c. motors that are driven by power derived from the substations. The standards, of course, are governed to some extent by the duty which the equipment is to perform, but certain general rules apply to all equipment.

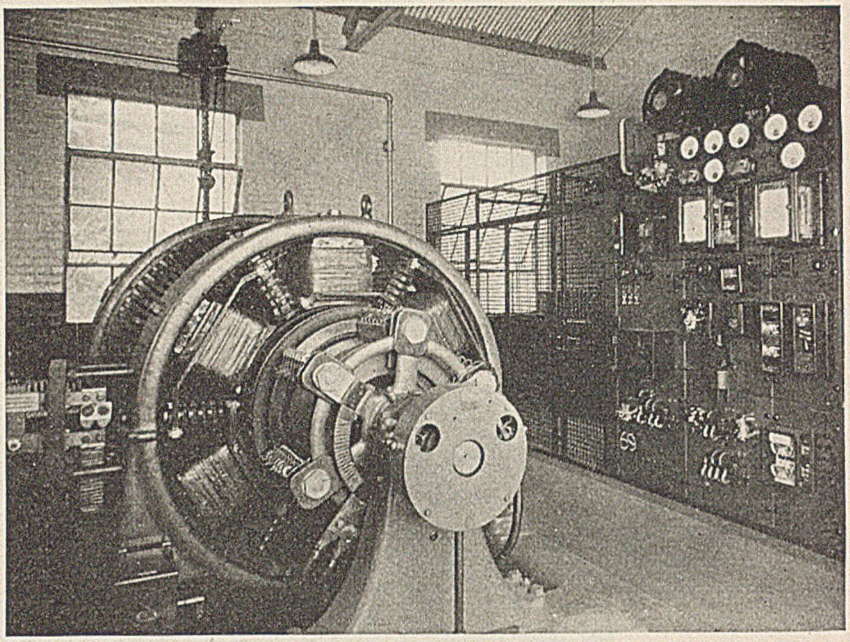
Alternating-current motors of less than 100 hp. are wound for 440 volts and those above for 2,300 volts. There are in use, however, a few motors as small as 75 hp. that operate on the higher voltage. Wiring which serves equipment rated at 250 volts or less is insulated for 600 volts. Wiring for 440-volt circuits has 1,500-volt insulation and that for 2,300 volts is insulated for 5,000-

volts. Because of its ability to stand a higher temperature without deterioration varnished cambric is used instead of rubber on all 440- and 2,300-volt circuits.

In all cases the service wiring from poles enters buildings through lead-covered cable in rigid iron conduit which is laid underground and embedded in concrete. The cable is sealed at the ends with potheads. This underground entrance eliminates the breakage of drip loops by wind vibration, reduces the fire hazard and, because of the inductance of the cable in metal conduit, affords a distinct measure of lightning protection. Lightning arresters are installed on the pole but choke coils are eliminated.

Safety in d.c. substations and around motor-control panels is assured by thoroughly insulating all parts, such as the terminals of oil switches, which can be reached from the floor. These parts are wrapped with varnished cambric to a thickness equivalent to that on the wiring, then given one layer of cotton tape half lapped. Two coats of General Electric gray switchboard paint complete the job. Bare copper bus, placed out of reach if it carries above 300 volts, is rubbed with sandpaper to a bright finish and given two coats of banana-oil lacquer.

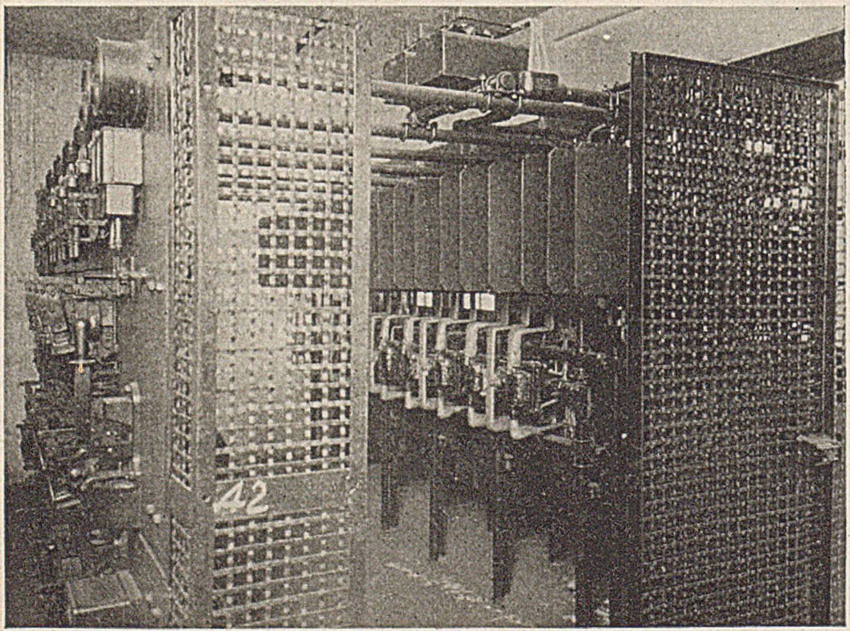
On automatic control panels of 2,300-volt motors the oil-immersed primary contactors are never mounted on the back of the panel but instead are floor-mounted at such a distance to the rear of it as will allow safe space for inspection. This leaves nothing on the panel but the 220-volt control wiring and the secondary wiring, if it is a slip-ring motor. All control panels of the motors in each breaker are grouped together in a fireproof control room.



Full-Automatic 300-Kw. Single-Unit Substation at Coal Brook Colliery

On the primary side of the 2,300 440-volt power distribution transformers D. & W. oil fuse cutouts are used exclusively. Experience has shown that the plug-type porcelain cutouts regularly furnished with the transformers are not sufficiently rugged. In conduit wiring only composition covers are used on terminal fittings. For pole disconnects on 2,300-volt entrances to new substations 600-amp. 14,000-volt gang-operated horn switches of the high-pressure contact type are provided.

Oil-Immersed 2,300-Volt Contactors Are Mounted at a Distance Back of Breaker Motor-Starting Panels



Where 440-volt and 2,300-volt power are to be conducted down boreholes and slopes or along mine passages for the supply of pumping stations and hoists, wire-armored cables are used exclusively. The same construction is used for 250-volt single conductor d.c. feeders entering through boreholes and slopes and is continued through mine passages to the trolley feed switches.

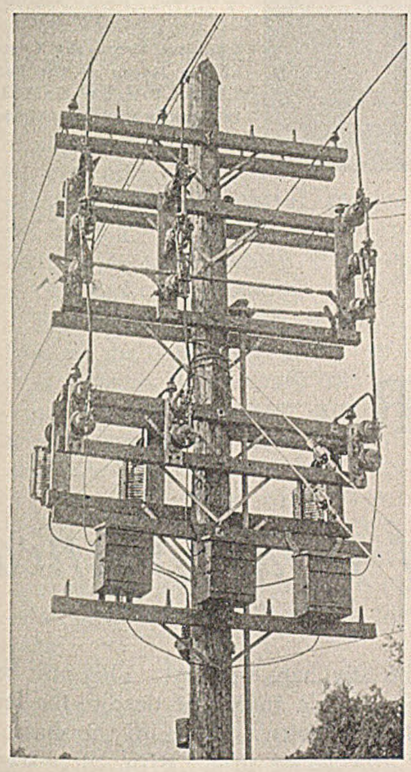
Many of the hoists are located within the mines. There are eighty 25-hp. units operating scraper loaders and many larger hoists handling cars on slopes and planes. The bases of the scraper hoists are arranged so that any hoist can be equipped with a 250-volt d.c. motor or with 440-volt motors of either 25 or 60 cycles.

The largest hoist located underground is of 250-hp. and the largest outside, operating a slope, is of 600-hp. Those of 150 hp. and larger are equipped with contactor control. All except one, a pedulum-relay time-limit type recently purchased, have current-limit acceleration.

Pumps and fans are treated in other articles in this issue so will be but briefly considered here. Slip-ring induction motors with constant-speed controls are the standard type for all fans. Pumping follows the common practice of using squirrel-cage motors for all centrifugals. The Jermyn station alone contains four 500-hp. motors, four 300-hp., and one 125-hp. The eight large motors in this station are started from the same autotransformer.

To supply the jackhammers which are owned by the miners and are used for drilling shotholes in coal and rock, it is necessary to furnish a large quantity of compressed air to each mine. The largest compressor is a 5,000-cu.ft. unit powered by a 1,000-hp. direct-connected synchronous motor. It is located close to the breaker at the Pine Ridge colliery. Several of the smaller compressors are powered in the same way. The older ones are belted to induction motors. All except the semi-portable units, which are mostly of the 9x8-in. size, are located outside the mines.

Two old steam compressors at



Gang-operated 600-Amp. 14,000-Volt High-Pressure Contact Switch on 2,300-Volt Line Entering 300-Kw. Substation

Conyngham colliery are now being changed to motor drive, using 300-hp. line-start synchronous motors rated 80-per cent power factor, 120 r.p.m. Instead of belted exciters there will be one 21-kw. motor-generator set for the excitation of both motors.

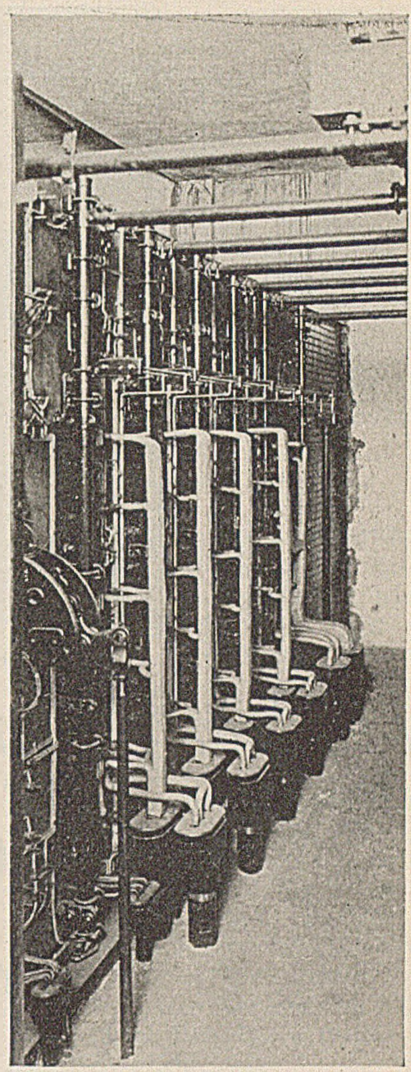
Direct current at 275 volts for inside work is supplied by units of 300, 200 and 150 kw. aggregating 8,700 kw. capacity. The load consists principally of 263 locomotives and 38 mining machines. But of these locomotives 39 are straight storage-battery units which place no demand on the d.c. supply during the day. That the d.c. load would be much greater with complete inside electrification is indicated by the fact that over 1,000 mules are now used. Mining machines are employed only in thin seams with coal 20 to 40 in. thick.

A 300-kw. synchronous motor-generator set wound to compound from 275 to 300 volts is the standard for substation use. There are sixteen of these and fifteen older induction-motor sets. No synchronous converters are used. Locating the substation outside and carrying the d.c. feeders in through boreholes or mine openings is the favored method, but where conditions dictate, the substation is placed inside the mine. At present, however, there is only one located inside. Approximately 3,000 ft. is the limit set for the transmission of direct current.

Three substation units of late installation have full-automatic a.c. and d.c. control panels. Two other 300-kw. synchronous units have push-button contactor a.c. control affording automatic sequence and protection.

The standard method of d.c. wiring from 300-kw. units to the switchboard is to carry four 1,000,000 circ. mil varnished-cambric lead-covered cables in separate ducts. Two are connected in the positive line and two in the negative. In case of trouble any lead can be taken out of service or any one can be connected into the opposite polarity.

For track bonding, type EP2 No. 2/0 26-in. terminal pin-driven bonds are favored for light rails, and type AW12 No. 2/0 electric-weld-with-copper-electrode bonds for main line. Trolley-wire hangers are carefully lined with respect to height above the rail by using extension pipes cut to a length to suit the height of the roof at each point. In most of the mines the wire is placed 20 in. outside of the rail in order that coal on the car next to the locomotive will not be in the

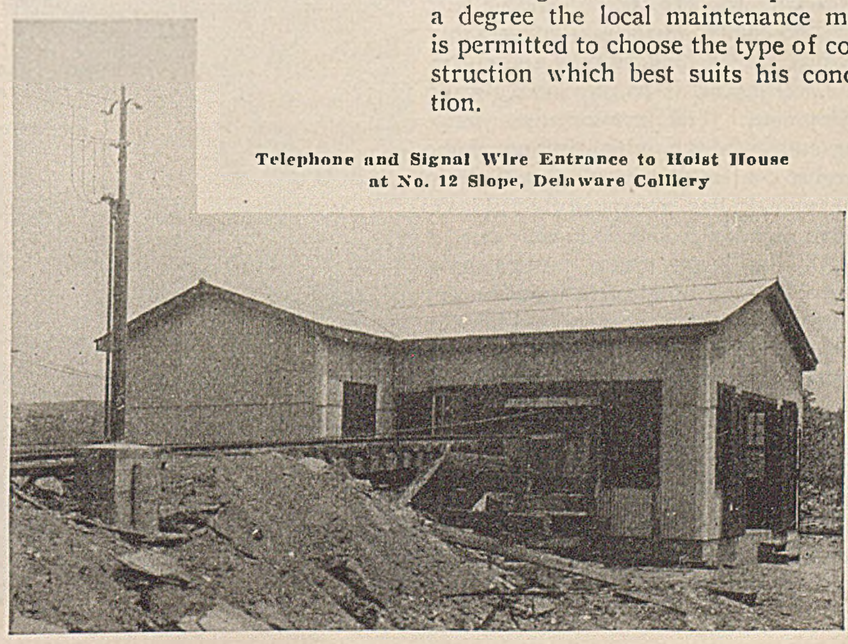


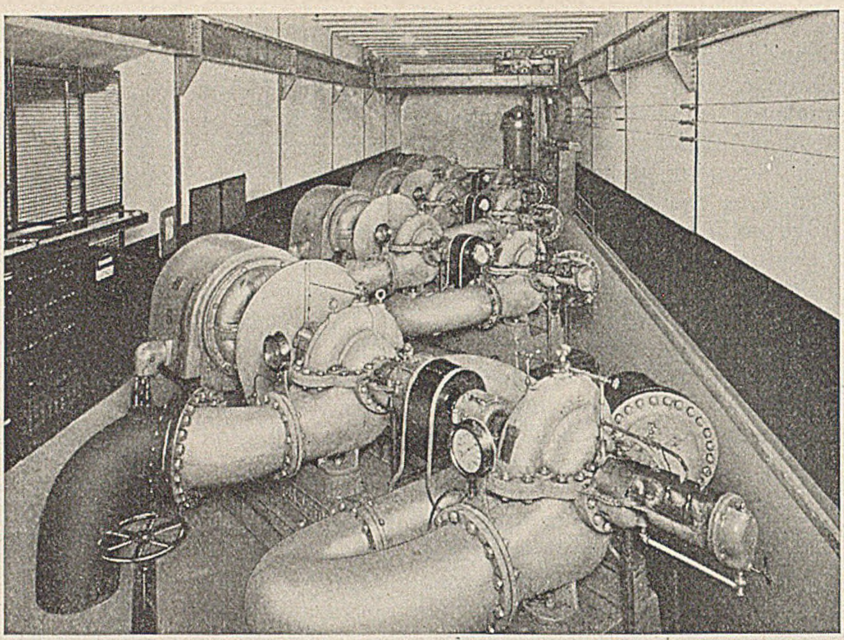
Showing Neat Construction Back of Automatic Motor-Starting Panels in Control Room of Olyphant Breaker

way of the trolley pole. This is necessary because of the height of some of the cars.

Rigid standards for trolley construction, bonding, telephone and signal wiring have not been adopted. To a degree the local maintenance man is permitted to choose the type of construction which best suits his condition.

Telephone and Signal Wire Entrance to Hoist House at No. 12 Slope, Delaware Colliery





Looking From the Center of the Room at the Four 5,000-G.P.M. 500-Hp. Units in Jermyn Pumping Station

Hudson Pumps Can Handle 40 TONS OF WATER *For Every Ton of Coal Mined*

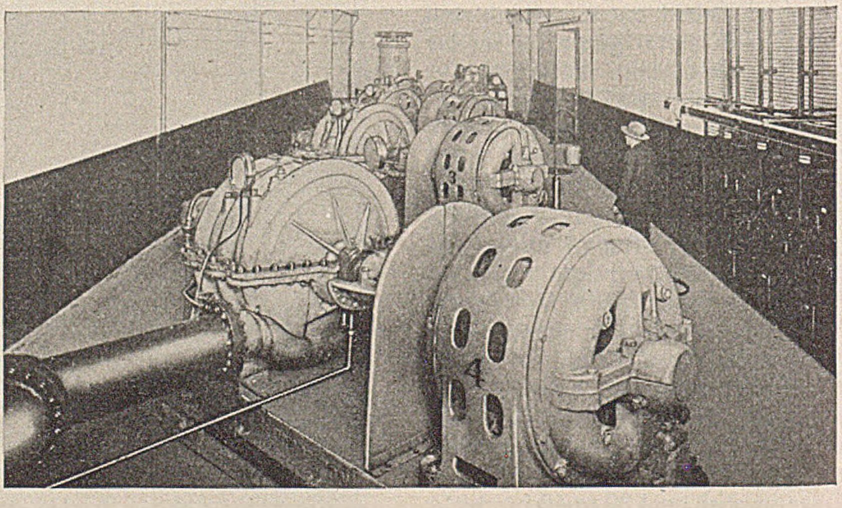
IF all the mine pumps of The Hudson Coal Co. were operated continuously they would be capable of handling over three times the company's normal yearly average which totals 12 tons of water for every ton of coal mined. To be more exact the capacity factor of the pumps is 27 per cent. Of the 373,305 g.p.m. total capacity including coal-washer pumps, boiler-feed pumps, and so on, 197,500 g.p.m. is in mine-dewatering equipment. The Jermyn mine-pumping station alone, which is one of the largest coal-mine pumping stations in the world, has a capacity of 33,000 g.p.m. against a 270-ft. head.

All the large steam pumps have been replaced by electric units except those few which are located at the bottoms of shafts adjacent to central boiler plants. Practically all the large electric pumps are of centrifugal type, these ranging in size up to 800 hp. Five stations with complete automatic control have been installed. Three of these each have one 2,000-g.p.m. pump, another has two 2,000-g.p.m. units, and the last a 3,000-g.p.m. unit.

Automatic control, including priming, has been so successful that it is regarded as a paying proposition even though the pump is located close to the shaft or other location where men have to be stationed at all times because they have other jobs to perform. An example of this is the Clark bed pump at Grassy shaft of the Olyphant colliery. This unit has been made automatic despite the fact that it is within 150 ft. of the shaft.

It consists of an 8 in. three-stage 2,000-g.p.m. centrifugal pump operating against a 400-ft. head and driven by a 350-hp. 2,300-volt squirrel-cage induction motor. The usual operating conditions and every irregularity

Four 3,000-G.P.M. 300-Hp. Units in the Other End of the Jermyn Pumproom



that has been experienced, is provided for in the control sequence and protection. Most of the time the sump level is higher than the pump suction, but it may be lower. A Mercoid pressure switch automatically controls the starting and stopping of the unit.

The Jermyn pumping station, a stupendous undertaking in mine drainage put into operation in 1922, had its inception in a determination to prevent a reoccurrence of the flooding of the mine which happened in 1920. The immensity of this underground pumping project is probably best conveyed by stating the dimensions of the station. It is 181 ft. long, 22 ft. wide, and 30 ft. high. Yet those dimensions do not include a wing or adjacent excavation 40 ft. long, 12 ft. wide and 17 ft. high in which the switchboard and control equipment are located, nor does it comprise the pumproom sump which is provided at one end of the station.

The entire pumproom is below the level of the main mine sump; in fact it is directly underneath the latter. This arrangement best suited the mining conditions and incidentally eliminated the necessity for the priming of the pumps when they are started, but it presented many problems in guarding against seepage and against possible mishaps which might otherwise suddenly flood the pumproom.

The line of eight large centrifugal pumps is a sight which could be duplicated in the central pumping station of a city of two or three millions, but it astonishes the visitor to find such a plant in a coal mine, 270 ft. below ground. The units are set at an angle of 45 deg. with the length of the room in order to conserve space, but even so, it was not possible to house them all without making the room of its present stupendous proportions.

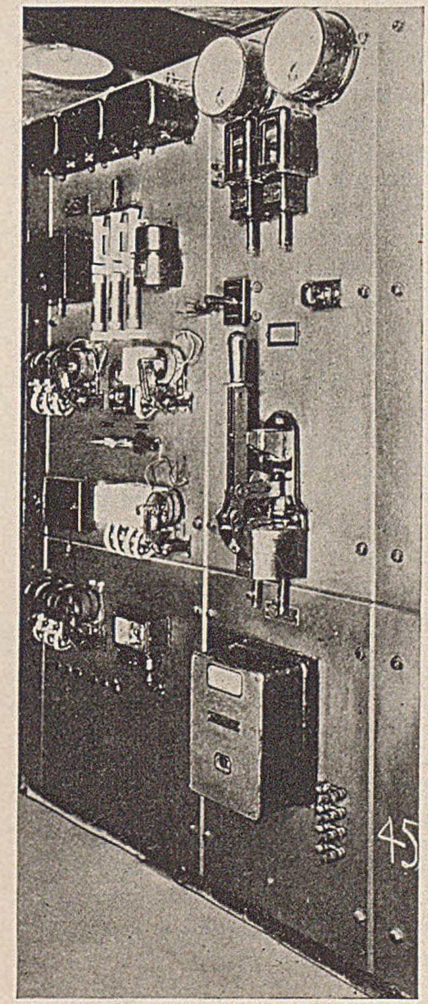
There are four 5,000-g.p.m. Barrett-Haentjens units consisting of two single-stage pumps in series and driven by 500-hp. 2,300-volt squirrel-cage induction motors. The other four are 3,000-g.p.m. three-stage Scranton pumps powered by 300-hp. motors of the same type. The unit which is connected to the pumproom sump is rated 1,000-g.p.m., 270-ft. head, 125-hp. All of the pumps are bronze-fitted throughout.

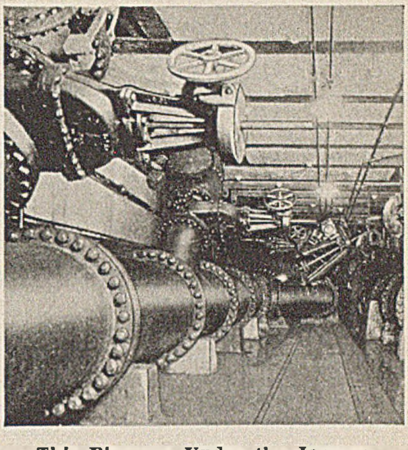
Leading from the surface to the pumproom is a two-compartment rock slope 690 ft. long on a 39 per cent gradient. One side contains a track which is served by a 52-hp. hoist and a stairway. The other side carries the 36-in. wood-lined cast-iron discharge pipe and three 2,300-volt wire-armored feed cables. The pumproom is ventilated by a 52x29-in. Sturtevant fan, direct-driven by a 40-hp. motor. This is installed near the bottom of the slope. The track compartment of the slope is the air intake and the other side the upcast.

Three 36-in. intake lines connect the pump-suction headers to three original sumps in the basin of the Archbald coal bed which lies about 25 ft. above the pumproom ceiling. Because these original sumps are at different elevations, the top of the highest intake pipe is 11 ft. above that of the lowest, and the middle one is about halfway between the two. Ordinarily the water is kept pumped low enough so that but one intake is covered. These intake pipes are of cast iron with wood lining.

Deane controls motor-operate the main intake and discharge valves. The piping includes cross-connections and valves to take care of every conceivable necessity. If one of the intakes should become clogged with debris, water can be forced back through it to dislodge the obstruction.

A 350-Hp. Automatic Pump Control Panel With Pressure Switch to Left of Watthour Meter





This Pipeway Under the Jermyn Pumproom Has a 13-Ft. Ceiling

The pumproom chamber is divided by a floor which is level with the pump bases. The pipeway below is 13 ft. high and the room above 17 ft. A 10-ton electric bridge crane is available for repairing any of the pumps or motors.

The power-control panels form a switchboard 40 ft. long. All eight large motors are started from a common auto-transformer by manually-operated oil switches. In order to protect completely the 2,300-volt buses and switching equipment from minor drips from the concrete roof a Monel metal drain has been installed over the switchboard.

The Jermyn pump station, of course, overshadows all the other pumping plants of The Hudson Coal Co., but there is one other which should not be left without mention. It is a 10,000-g.p.m. station in Carbondale No. 3 section of Powderly colliery. Here, two 5,000-g.p.m. vertical pumps are installed which are a distinct departure from the more common practice. They consist of Layne & Bowler 42-in. impeller, single-stage units operating at 750-r.p.m. against a 90-ft. head and are of the deep-well type with motor on the surface and pumps located in the shaft 90 ft. below. The drives consist of 250-hp. 2,300-volt vertical motors.

Pumping, of course, will continue to be a major problem of the company, but the troubles incident thereto are diminishing in proportion to the number of modern electric units installed. More complete electrification which is destined to take place at least as fast as the boilers already old become inoperative for power purposes will bring about substitution of modern electric pumps in place of the steam pumps that are still in service.

Teaching SAFETY

More by Word of Mouth and Demonstration Than by Rule

SAFETY has its separate department with The Hudson Coal Co. A safety engineer, two safety inspectors who give their full time, a ventilation inspector, and one safety inspector who divides his time equally between inspections and the training of the mine rescue crew comprise this department, though safety is a leading function of all mine and sectional foremen. The inspectors cover all the properties of the company in Lackawanna and Luzerne counties. The inspectors' visits are not scheduled but come without notice. Consequently, there can be no window dressing prior to any visit. The ventilation inspector checks the condition of the air at the various operations.

Only one safety inspector goes to a particular mine at any one time, and at each visit he covers one section in detail. He goes into every working place, the haulage roads, the slopes and planes, pump and engine rooms. He inspects all electric locomotives, their sand boxes, brakes and jacks, and also notes whether the company rules are being observed. In each room he tests the roof and, to prevent runaways, examines the men as to the manner in which they block their cars. He also questions them as to the handling of explosives. The roads in the rooms get his careful attention.

Wherever there is explosive gas he questions the men on the manner in which they test for its presence and ascertains where they keep their safety lamps. Particularly are they examined as to whether they test for gas in the highest point at the face and how far they go back before firing a shot. The inspector also examines the safety lamp to see if it is in good working order.

Care is taken to find by examination whether they realize that they must examine for gas the first thing in the morning and before and after firing all holes. The examination of the place and of the men is by no means perfunctory. No chances are taken. It is not assumed that they have read the anthracite mine laws and company rules, general and special, relating to the mining of anthracite or that they know the company's instructions. The inspector before he leaves the miners' place ascertains definitely whether they realize the dangers that confront them and know the best way to protect themselves against these hazards.

On leaving, the inspector goes to the colliery office and reports what he has found, giving the ticket numbers of the men. A copy of his report goes to the superintendent, one to the mine foreman and two are sent to the sectional foreman. On one of the two reports received by him the sectional foreman notes what action he has taken with regard to the criticisms that the inspector has made. After signing the copy he forwards it to the safety department. Any difference of opinion as to the recommendations of the inspector is referred to the safety engineer and superintendent for their adjudication. In case of disagreement, the matter is referred to the general manager for final decision.

From the records it is possible to ascertain which men have the greatest disposition to disregard the company rules and anthracite mine laws, so when a section is to be visited the inspector visits the men with the worst record first, lest the latter should get wind in advance of the inspection and prepare for it by taking more precautions than usual. Sectional foremen, it may here be interjected, are directed not to travel their rounds in the same direction each day but to vary their system of inspection so that the mine workers will not be prepared for the visit. In this way every man's safety performance has to be continuous and not pursued only when a visit from the sectional foreman or the safety inspector is anticipated.

In short, there are two principles that are paramount with the safety department—unexpected visitation and personal instruction. A third must be added to these two—discipline. A man thus carefully trained knows his duty and recognizes that he must do it, and if he will not, the company for his protection cannot do otherwise than discipline him by suspension or discharge. To do less would be to fail of its duty toward him.

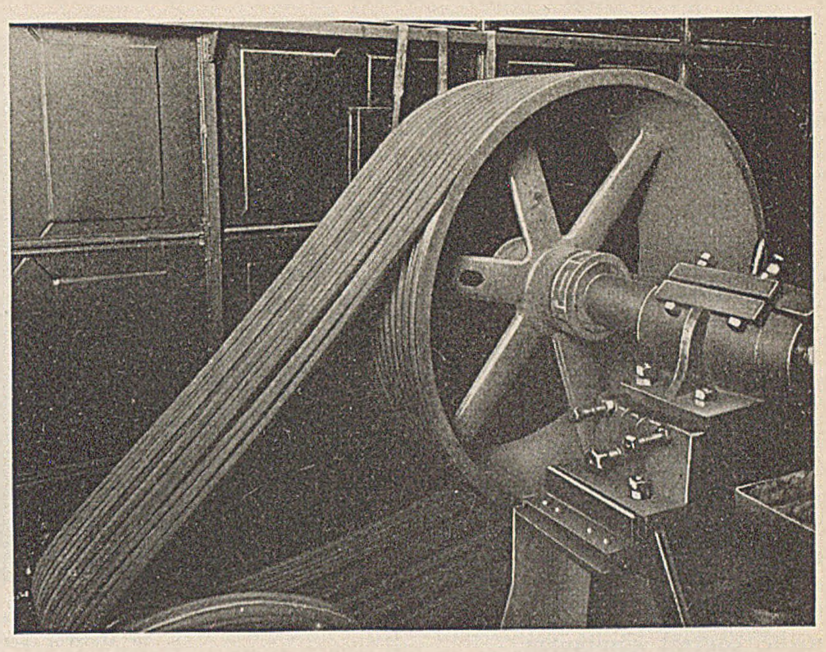
Accurate statistics form the basis for safety activity and are in particular the reason for the elaborate precautions taken to safeguard the men against runaway cars, which are important hazards in mines with heavy gradients. Some of the statistics are more than usually interesting and may be included in this article with advantage. Inquiry shows that accidents to fingers, hands, eyes, head, toes and feet are decreasing.

	Year 1926	Year 1928	All Accidents	Year 1926	Year 1928
Fingers					
Serious.....	314	213	Inside.....	863	533
Minor......	798	475	Outside....	249	155
	1,112	688		1,112	688
Hand					
Serious.....	198	143	Inside.....	567	381
Minor......	483	328	Outside....	114	90
	681	471		681	471
Eye					
Serious.....	79	58	Inside.....	566	465
Minor......	616	516	Outside....	129	109
	695	574		695	574
Head					
Fatalities...	2	0			
Serious.....	28	34	Inside.....	183	171
Minor......	107	157	Outside....	17	20
	137	191		200	191
Toe					
Serious.....	5	2	Inside.....	9	3
Minor......	7	2	Outside....	3	1
	12	4		12	4
Foot					
Serious.....	195	169	Inside.....	524	383
Minor......	439	283	Outside....	110	69
	634	452		634	452

It has been found that foot injuries usually are sustained when the toes are smashed. Consequently, it seems of little value to protect the toe unless the whole foot is protected. That is not true of fingers and hands, the first often suffering when the hand does not.

The inclosed table shows the rating of the various companies in the anthracite region with regard to fatalities per 1,000 men employed. It wlll be seen that The Hudson Coal Co. stands well among competing companies, and among those large enough to produce about 5,000,000 tons yearly it has a leading record. Notwithstanding, the officials are not elated with these figures, and spoke so disparagingly of their success in safety that it was quite a surprise when, on further inquiry, the facts

(*Turn to page* 628)



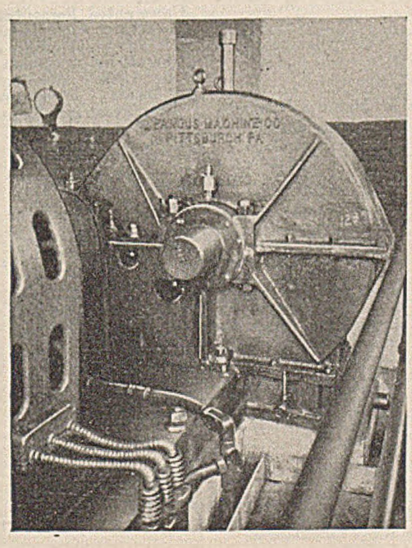
At Stillwater No. 1 Tunnel, Clinton Colliery, the 75-Hp. Motor is Connected to the Fan by a Close-Up Drive

FAN DRIVES

Arranged to Fit Safety, Efficiency And Utility Programs

OFFICIALS of The Hudson Coal Co. estimate that the operations taken as a whole are 50 per cent electrified. The degree is above that figure for some types of equipment and below it for others, but for mine fans it is almost the exact percentage. Of the 59 active fans, 28 are driven by electric motors and 31 by steam engines. Four steam units, classed as emergency fans, bring the total to 63 installations. The use of several types of drives on electric fans is indicative of the effort to take advantage of improved equipment and secure that which is the most satisfactory.

200-Hp. Fan-Drive Gear at Coal Brook Colliery Has Roller Bearings



The feeling that at the gassy mines a provision would have to be made for emergency power if the fans were electrified, and the fact that certain boiler plants must be kept in operation for hoisting and heating explain why so many steam-driven fans are still in use. At Dickson colliery two fans are equipped with combination electric and steam drives.

In the summer the connecting rods are removed from the engines and the fans are motor-operated, and in the winter the silent chains are removed from the motor drives, the connecting rods replaced and the units steam-operated. The electricity is used during the summer for its economy in operation and live steam is used in the winter so that the exhaust from the engine will afford heating for the Providence repair shop buildings and tracks. The motors and engines are located on opposite sides of the fan.

The first seventeen fans that were electrified have long-center flat-belt, drives, most of which incorporate a counter shaft for speed reduction. Of the remaining eleven fans, five have herringbone gear reducers, four have silent chains, one a short-center flat belt with idler and one a Tex-rope drive.

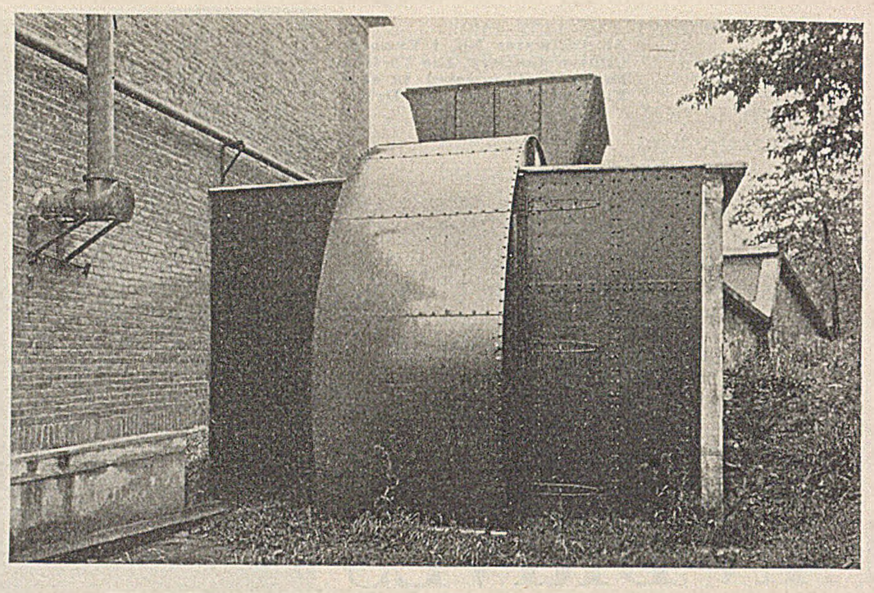
Two of the most outstanding gear drives are those at No. 24 slope Birdseye section, Eddy Creek mine, Olyphant colliery and at No. 22 tunnel, Third Bed, section 4, Coal Brook colliery.

The installation at Eddy Creek is a new Jeffrey 14x5-ft. fan designed to deliver 250,000 cu.ft. per minute against a 2.5-in. water gage. The drive equipment consists of two 150-hp. 2,300-volt slip-ring motors, both connected through flexible all-metal couplings to Falk herringbone inclosed gear reducer. Only one motor is used at any time to drive the fan. The motors, which operate on 25-cycle power, are rated at 750 r.p.m., and the fan operates at 110 r.p.m.

Although the fan is but 1½ miles from the company's principal generating plant two lines therefrom have been installed to insure against power failure. Both lines are brought into the fan-motor room where they terminate at the clips of double-throw disconnect switches. The fan therefore can be operated by either of two motors supplied by two separate power lines.

Inasmuch as there is a 300-kva. synchronous motor-driven air compressor in the same room and attendance is deemed advisable, the fan motors are equipped with manual control.

The Coal Brook colliery gear drive is applied to a Jeffrey 14x7-ft. 300,000-cu.ft. fan that was installed in 1926. Here the one motor used is a 200-hp. General Electric unit, and the Fawcus gear reduction is equipped with Norma-Hoffman roller bearings. This fan has fully automatic control equipment.



This Jeffrey 14x15-Ft. Fan at Olyphant Colliery Was Designed to Deliver 250,000 Cu.Ft. at 2½-In. Water Gage

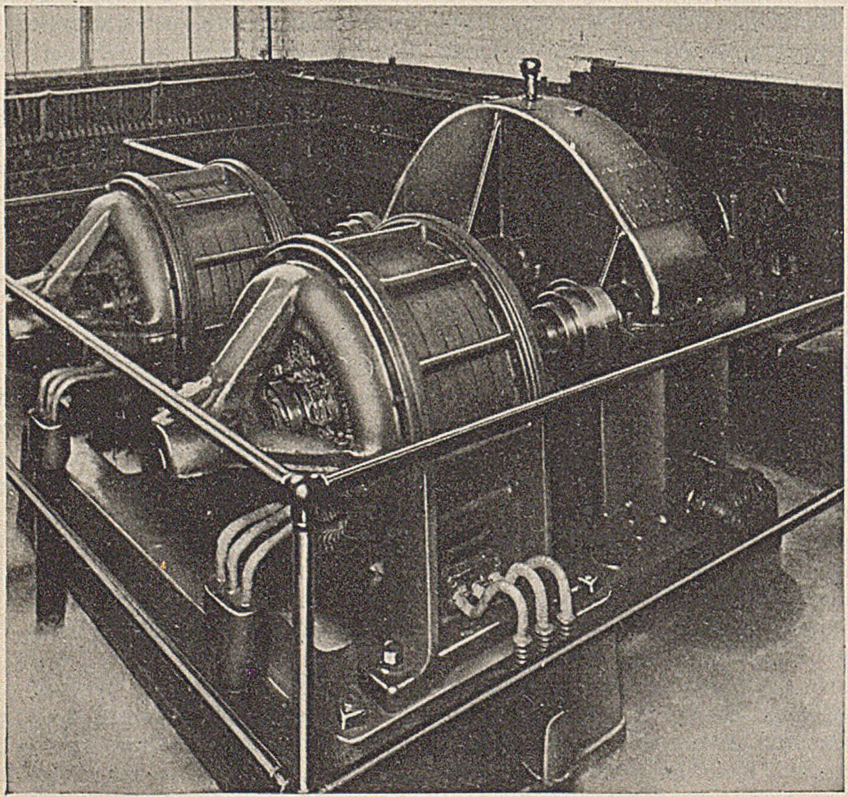
No synchronous motors are used on fans but instead all are of the slip-ring induction type. None is equipped with heavy resistance and other control features for variable-speed operation. One is provided with an automatic starter for remote control from a foreman's office 800 ft. distant. An alarm in the office warns the men at that point whenever the fan stops.

The Texrope drive is on a 75-hp. fan at Stillwater No. 1 tunnel of Clinton colliery. This motor and drive are in the same building with a 300-kva. synchronous motor-driven compressor and a 300-kw. synchronous motor-generator set.

The use of two sources of electric power for fans is not confined to the one instance described. Three other fans are equipped with this type of power insurance. One of these, that at Mill Creek, Pine Ridge colliery, is equipped with two motors and can be driven by either as was noted in the case of the fan at the Birdseye section of the Eddy Creek Mine. Internal-combustion engines have not been employed as standby drives but probably will be when certain of the remaining steam fans are electrified.

All fans are operated exhausting. Quite a number of the fans, however, are of the reversible type.

Two Motors and Two Power Lines Insure Operation of the Mine Fan at Olyphant Colliery



Teaching Safety By Word of Mouth

(*Continued from page 626*)

in this table were ascertained, but they have an uphill fight, for deeper mines, caved ground and more gas afford problems more difficult than were faced in earlier days.

Non-Catastrophic Fatality Record for Inside Employees of Leading Anthracite Companies

(1902-1926 inclusive—25 years)

Rank	Name of Company	Unweighted Average of Fatalities per 1,000 Inside Employees	Percentage of Total Number of Inside Accidents in Anthracite Region
1	Coxe Bros. & Co.	3.15	6.09
2	Hudson Coal Co.	3.54	6.83
3	Jeddo Highland Coal Co / G. B. Markle Co.	3.55	6.85
4	Hillside Coal & Iron Co. / Pennsylvania Coal Co.	3.65	7.04
5	Philadelphia & Reading Coal & Iron Co.	3.67	7.07
6	Lehigh Coal & Navigation Co.	3.77	7.[illegible]
7	Kingston Coal Co.	3.87	7.46
8	Glen Alden Coal Co.	4.04	7.79
9	Susquehanna Coal Co.	4.28	8.24
10	Scranton Coal Co.	4.36	8.40
11	Lehigh & Wilkes-Barre Coal Co.	4.52	8.72
12	Lehigh Valley Coal Co.	4.64	8.95
13	Temple Coal Co. (Or Lackawanna County Coal Co.)	4.83	9.30
			100.00

Averages of above averages per year—3.99

Baltimore Tunnel disaster of 1919 not included in the above calculation.

STORES DEPARTMENT

Methods of Hudson Rank With the Best

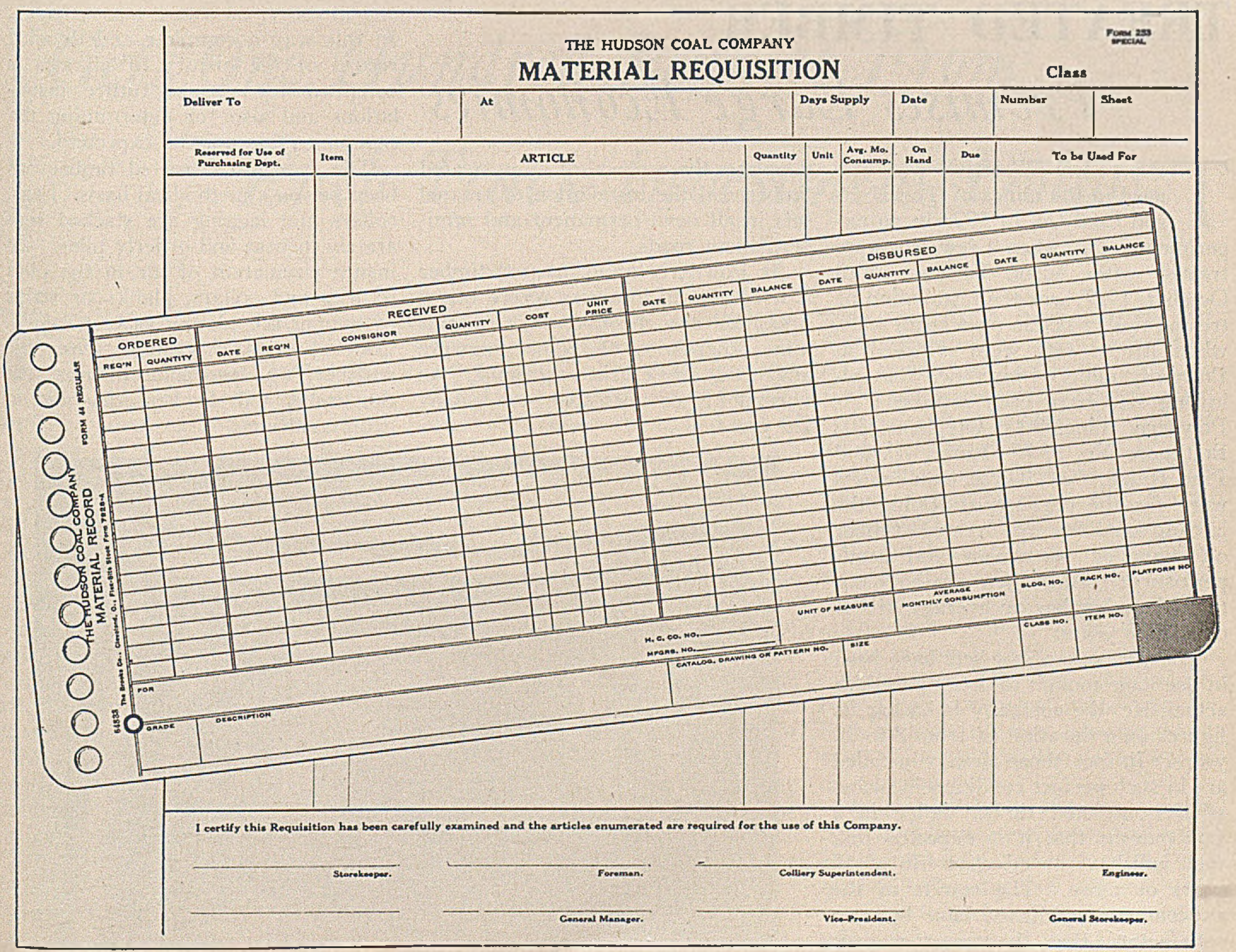
UNDER the most favorable conditions the cost of supplies for anthracite mining will be 10 to 15 per cent of the direct operating cost. Without skillful purchasing and careful handling that percentage may be doubled. The Hudson Coal Co. has the advantage of quantity buying which justifies a well organized purchasing department, but with this buying of a large volume of materials for a number of widely distributed mines goes the necessity for a systematic method of handling and distributing.

This is done by a stores department which is as well organized and operates as efficiently and smoothly as any coal-company organization in the United States. The working plan and classification of materials is practically the same as has become standard with railroad companies. At Providence, in the outskirts of Scranton, are located the central warehouse and stores-department offices. Only the less bulky materials and the miscellaneous parts for which there is no regular demand are stored at this point. At each colliery there is a local warehouse in charge of a storekeeper who reports to the general storekeeper.

Approximately 17,000 items are listed in the perpetual inventory maintained in the office at Providence warehouse. "Brooks Visualizers" have recently been installed to replace the card system formerly employed. Considerable effort is exerted to keep down inventory consistent with insuring continuous operation.

In a month, the stores department receives and distributes materials and supplies of a value aggregating nearly a half-million dollars.

Requisitions for material originate with the local storekeeper but must receive also the signatures of the local foreman, colliery superintendent, general manager, vice-president, and general storekeeper. This array of sig-


THE HUDSON COAL COMPANY
MATERIAL REQUISITION
Form 253 Special
Class
Deliver To | At | Days Supply | Date | Number | Sheet
Reserved for Use of Purchasing Dept. | Item | ARTICLE | Quantity | Unit | Avg. Mo. Consump. | On Hand | Due | To be Used For
I certify this Requisition has been carefully examined and the articles enumerated are required for the use of this Company.
Storekeeper. Foreman. Colliery Superintendent. Engineer.
General Manager. Vice-President. General Storekeeper.

THE HUDSON COAL COMPANY MATERIAL RECORD
FORM 44 REGULAR
ORDERED: REQ'N, QUANTITY
RECEIVED: DATE, REQ'N, CONSIGNOR, QUANTITY, COST, UNIT PRICE
DISBURSED: DATE, QUANTITY, BALANCE, DATE, QUANTITY, BALANCE, DATE, QUANTITY, BALANCE
H. C. CO. NO. — MFGRS. NO. — CATALOG, DRAWING OR PATTERN NO. — SIZE — UNIT OF MEASURE — AVERAGE MONTHLY CONSUMPTION — BLDG. NO. — RACK NO. — PLATFORM NO. — CLASS NO. — ITEM NO.
FOR
GRADE — DESCRIPTION

natures, all vital if the purchase of unnecessary material is to be avoided, may appear to involve the requisition in a snarl of red tape which would cause expensive delays, but this is avoided by the use of two active copies.

While one copy goes to the main office for signatures, the other is being studied in the office of the general storekeeper. Items immediately required, which can be furnished from stock, are shipped without waiting for further signatures. By the time that the general storekeeper is ready to present the revised requisition to the purchasing agent, the copy with all signatures is available.

In order to reduce clerical work, local storekeepers are instructed to make but one requisition per month for each class of material. Requisitions for all classes are not made up at the same time each month but instead are spread over the thirty days according to a fixed schedule assigning a certain date for each class.

The material classification includes 66 classes arranged so that related materials have consecutive numbers. For instance, classes 10 to 19 inclusive comprise the electrical group, consisting respectively of: Communication; conduit, their fittings and condulets; compensators, controllers and rheostats; and so on. The 66 classes are divided into 33 major groups.

Transportation of material from the central warehouse to the collieries is by rail even though all of the collieries are accessible on hard road and the farthest apart are separated by only 30 miles. Only in emergencies is material transported by truck.

As the stores department is operated, it is a service to the mining department and to the engineering department which includes maintenance and construction. These departments are relieved of the responsibility of ordering and stocking all standard materials for which a definite quantity to be stocked at each colliery can be established.

◆

TREATED TIMBER

Promises Large Economies

TREATED TIMBER was first used in the mines of The Hudson Coal Co. in 1923 in an experimental way when a few sets were treated with Aczol, but not until October, 1927, was the installation of treated timber begun on a large scale, when fifteen sets were installed at Powderly mine. Since then the following sets have been installed: At Powderly mine, 800; Olyphant, 30; Baltimore No. 5, 75; Loree, 70, and Pine Ridge, 50. These installations were for the purpose of testing the lasting qualities of treated timber on main or permanent and semi-permanent roads, where ordinary untreated timber has an average life of only 3.35 years.

Though none of the sets have been in use long enough to determine their actual life, the company is basing its figures on a duration of from 8 to 10 years. In fact, those already installed are in such perfect condition in places where untreated timber failed in a few months that it is expected that they will have an effective life of 14 years or more. The results of the experiments conducted have been so satisfactory that the program contemplates the renewal of all untreated timber and the installation of treated sets in all new, permanent and semi-permanent roads.

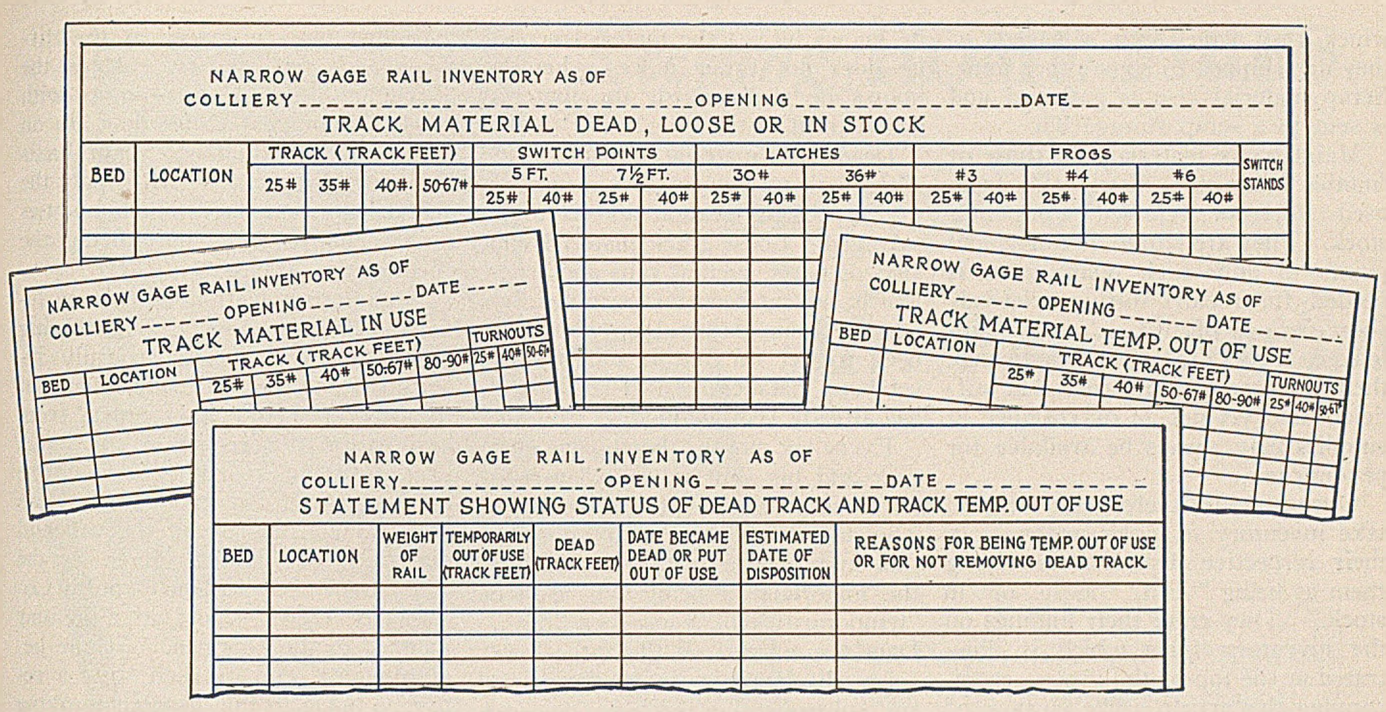
At Powderly mine, treated timber is used also in localities where heavy pressures are encountered. At this mine, where most of the openings are advanced in crushed ground, the normal life of untreated sets is only 2.9 years.

Yellow pine is used exclusively in treated underground timbering. All sets are framed before treating and are impregnated by the full-cell method. Zinc chloride and Aczol are employed as the preservative agents and the pressure treatment insures penetration to the heartwood and usually some distance further.

Lagging also is treated for use in a few mines, Aczol being used exclusively for this purpose. The miners who install the sets are instructed not to cut the treated timber unless it is absolutely necessary to do so. All places so cut in framing are painted with a creosote paint called Carbosota, even though the cut does not penetrate beyond the preservative.

Monthly reports are required on all the treated sets installed in the mines. Each set is given a number and its position is marked on the mine map. In addition, a date nail is driven into each leg and into the collar. If any part of a set must be replaced, the replacement timber can then be distinguished from the parts remaining in place. The monthly reports give the condition of each set installed and, in case of failure of any member, the cause also is given. In this way a complete and detailed record of the history of all sets is compiled for use in future installations and also for determining the economies that may be expectetd.

The storage of treated timber has been put on a methodical basis. Legs, collars and lagging are stacked separately in neat and orderly piles. To insure circulation of air in the piles of legs and collars, planks or strips of lumber are placed between layers. Coupled with protection from the weather, this provision insures that the timber will be kept dry and in good condition.



INVENTORY

Gets One Hundred Pennies From Each Track Investment Dollar

TO GET the most out of each dollar invested is the interest of every mining man be he section foreman, engineer or manager. No better way has been devised of watching the invested dollar, to see that its hundred pennies down to the very last is converted into service, than that of the inventory. The Hudson Coal Co. uses it effectively to keep investments in track material—that most elusive of forms of investment—at a minimum. The system of inventorying rail eliminates waste, for it controls reclamation, storage, distribution and scrapping of the track materials not in use.

If it were not for the inventory that brings up the equipment in concrete form in the manager's office to confront the man who has neglected it, these materials might be hidden until buried, lost or made worthless by rust. Moreover the same inventory helps in the buying of new track materials, for it indicates the need for them—at the proper time, for the right place and in the exact quantity.

The average useful life of ties and rails in the Hudson mines is 5 and 12 years respectively. But if proper care is not taken of them and if they are not kept more or less constantly in use, their life in years and their service, measured by the tonnage handled, will be considerably lowered because these materials, when in track, generally deteriorate more rapidly out of use than in use. In these mines, consequently, track in sections calculated to be idle for a year or more is lifted and its elements stored or redistributed.

It would seem to go without saying that, under a policy of this sort, the officials would endeavor, as the mine workings retreated, always to recover all track materials which could render any further service in the operation of the mine. When, however, this particular provision in the policy was first suggested, it was doubtful if economies could be shown, inasmuch as the salvage value of the track might prove to be less than the cost of lifting and handling it.

A test was conducted at one of the collieries with the result, that, for an investment of $1,617 in labor and transportation, track materials having a replacement value of $6,321—based on the cost of materials of equal quality and condition—were salvaged, taken to the surface and placed on railroad cars. The ratio of value received to money expended was so high that the till then existing doubt as to the wisdom of the policy was at once banished.

Track materials replaced by new or by materials salvaged from dead track are sorted and classified as to kind and quality. They are then stored as used stock at convenient points underground for use at the mine from which they have been salvaged, or they are shipped to some other mine. Scrap material also is gathered and is sent to a scrap storage bin.

Maintenance materials are those of suitable character distributed from used stock or released from new stock. They are stored at convenient points in only such quantity as is needed for repairs during relatively short periods of time. Track maintenance forces are urged to anticipate their requirements in order that sufficient and yet not an overbalance of supplies may always be available for pending use.

Once a month the section foremen take inventory of track materials in their respective districts, classifying them as being "dead," "loose" or "in stock." They enter their findings on the inventory form which is illustrated at the top of the group accompanying this article. The purpose of these monthly inventories is to furnish the superintendent with a current statement as to what usable salvaged materials are on hand, and to enable him to fill his wants without having further to burden the colliery with the cost of new materials. When he knows he has the material needed he does not order more; when he knows he really needs the material he orders it in time.

Dead track material is that in place which will no longer serve a purpose in its present location and is to be salvaged. Loose track material consists of parts, such as rails and frogs, which, having been disassembled, has not yet been gathered or which has been routed for re-use and has not yet been installed. Used track stock has already been defined.

Every six months the colliery engineer and his staff take inventory of all track materials on the property. The staff does this by actual observation and measurements; it classifies the materials as being "in use" or "temporarily out of use" or "dead." Data are entered on the three lower forms displayed in the headpiece and are subsequently assembled on one larger recapitulation form which is not here shown. This six-month inventory serves as a check on the monthly report of the foremen and presents other detailed information valuable to officials at the mines and those at headquarters.

◆

Haulage Traffic Expedited By Dispatching

(*Continued from page 607*)

copy being furnished to the serving transportation unit and the other to the dispatcher.

The notation to the heading "cars on hand" is the number on hand at the beginning of the shift and is taken from the last report of the unit the previous day and checked against the first report of the unit.

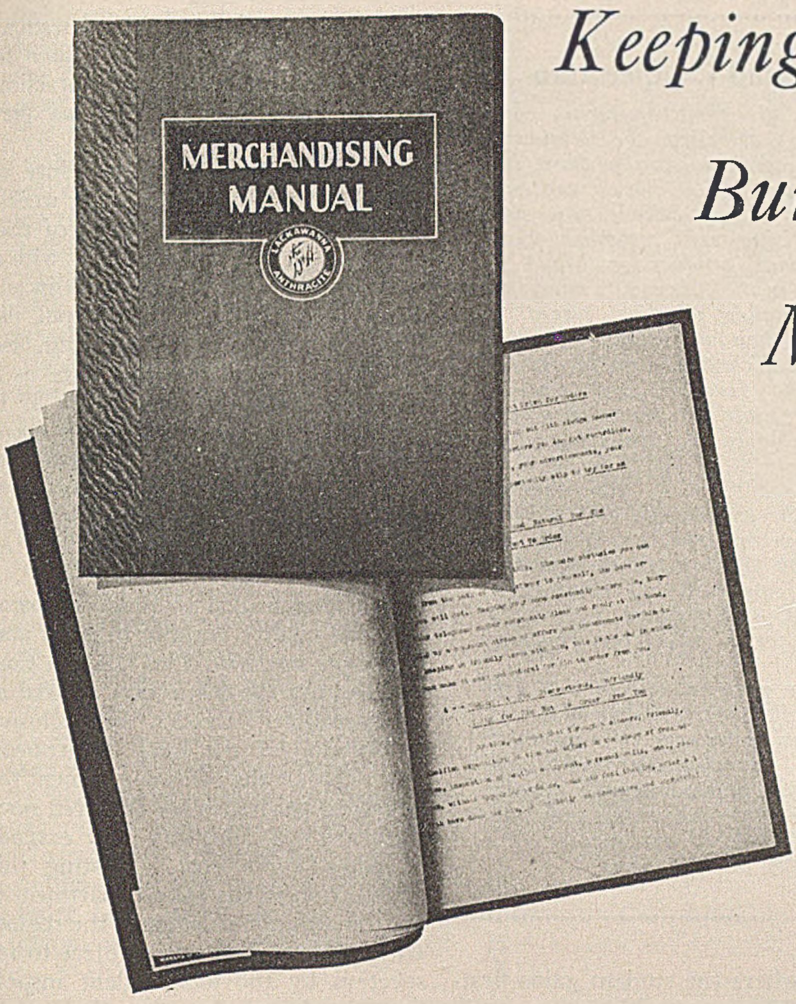
The remaining information is received during the day, for the unit makes a report each time it arrives at its telephone. The verbal report is somewhat as follows: "Locomotive No. 16 Midland, left 15 empties, taking 10 loads; No. 42 Plane, left 12 empties, taking 10 loads." In all cases the dispatcher takes the time of the telephone report as being the time of the trip movement unless otherwise notified.

Delays, derailments and other accidents, together with whatever explanation is necessary, are reported to the dispatcher from the nearest telephone station. When kept waiting for loads or empties, the delayed units are required to keep in touch with the dispatcher. The information on delays and accidents, together with that on car supply at the different "set-off" points, enables the dispatcher to redirect the units with much advantage. Units that are on their way from outside main hauls and are pulling empties to supply the delayed unit can divert their empties to other units, thus minimizing the effect of the delay.

Each transportation unit must report. Those in charge of gathering units keep the dispatcher fully informed as to the car requirements of the section served and receive from him information regarding the status of the supply of empty cars. The headmen and footmen on slopes and planes report the arrival and departure of trips as given in the example of the telephone report. Locomotive crews report in a similar manner to the footmen. At the beginning and end of each shift a report is made to the dispatcher giving the number of loads and empties on each branch.

At the close of the day shift the dispatcher makes up a summary report on the number of cars handled and delays occurring during the day. This summary report, together with the dispatch sheet, is used by the superintendent and his subordinates—the mine foremen, sectional foremen and driver bosses—to determine the particular transportation unit or units requiring closer supervision on account of delays, and those requiring study either as to the possibility of consolidation or rearrangement of the transportation in a section to effect economies of operation, or as to the need of changing the equipment or of enlarging a unit that, serving a growing section, may have become inadequate to meet its needs.

Where Coal Brook's Transportation Activity Centers



Keeping HOME FIRES *Burning for Mr. Paterfamilias*

By Sydney A. Hale
Editor, Coal Age

Mr. Paterfamilias and his brood may mean little or nothing in the life of many bituminous coal producers—particularly those soft-coal operators who depend upon the railroad and industrial markets for their sales. Not so with the anthracite industry. In the hard-coal field, upward of 80 per cent of the output finds its way into the cellars of Mr. Paterfamilias and his tribe. So the big story in anthracite merchandising is the story of moving the tonnage used literally to keep the home fires burning.

ANTHRACITE SELLING is no longer a problem of rationing fuel to consumers who feel that, if hard coal be denied them, they must revert to wood or worry along temporarily with some impossible substitute to keep from freezing. The quota system of distribution, conceived in the stress of wartime and post-strike demands, is a fading memory. Gone, too, is the district sales agent who bluntly informed a complaining retail coal merchant that "that is the way our company prepares its coal and there is nothing you can do about it"—and no one drops a tear in recalling his passing.

The merchandising of anthracite has become a highly competitive venture. That "natural monopoly" which geology and geography combined to give the anthracite industry in production is woefully ineffective in dominating markets. Aristocrat of fuels it may be, but the producers of hard coal today are sweating in the common scramble for business. Oil, coke, bituminous coal and gas have invaded the territory once fondly considered indisputably the private sales preserve of the anthracite industry and their raids have left their mark upon hard-coal tonnage. Internal competition also is sharper than it has been in a generation.

Management in The Hudson Coal Co. has not been slow to sense changing conditions. Although it sells no coal direct to the retail trade outside of the Wyoming Valley, no major producing company has been closer to the retail distributors of its product. In the days when distribution was largely a statistical and transportation question and contacts between the average retail coal merchant and the general sales office of the producing companies were non-existent, The Hudson Coal Co. was cementing friendly relations with the men who sold its coal to the household consumer. In a quiet way the sales officials of the company were working to make the retail distributors better merchants. The developments which have taken place since the inauguration of group merchandising activities by the industry have been in the nature of intensification, complementing and supplementation of the program previously undertaken.

The distribution set-up of The Hudson Coal Co. differs from that employed by many of the other old-line companies and larger independent producers in the anthracite region. Many of these market the bulk of their output direct or through a single affiliated sales company. The bulk of the domestic tonnage produced by The Hudson Coal Co. reaches the retail merchant through one of fourteen independent wholesale distributors with exclusive sales contracts. This system of distribution is of long standing. Changes have been made from time to time in the wholesale agents and in territories, but the essential features of the system itself have been left undisturbed. Much of the steam tonnage other than railroad fuel also moves through the same wholesale channels. The Hudson Coal Co., however, does sell a considerable quantity of the steam sizes direct to industrial consumers, but, for the most part, these contracts are with industries having plants located in two or more wholesale sales territories.

As is shown in the map of sales territories, most of the tonnage marketed is sold north, east and south of Pennsylvania. Sales during the coal year ended March 31, 1929, totaled 7,077,366 gross tons. Of this quantity, New York State and tidewater markets took 3,005,619 tons. New Jersey, Pennsylvania and the South absorbed 1,721,899 tons. The New England States accounted for 1,590,718 tons. Sales to Canada and to markets in the United States west of Buffalo were 759,130 tons. The lake trade is an unimportant factor with The Hudson Coal Co.; it controls no docks at the Head of the Lakes and its shipments are limited to an occasional cargo for one of its agents.

Interposition of a wholesale company between the producer and the retailer sometimes tends to short-circuit direct contacts. Not so, as previously indicated, in the case of The Hudson Coal Co. No organization has been more assiduous in its cultivation of the retail distributor both through its own sales staff and through the wholesaler. Executive heads of The Hudson Coal Co. at Scranton know the retailers who buy Hudson coal, their present volume of business and their possibilities for future expansion. Contact is maintained with the individual retailer through sales representatives and sales-service engineers, through frequent conferences with the wholesale agents and through dealer merchandising campaigns. Trips are frequently arranged for dealers to visit the collieries. Hudson Coal retail distributors are invited and urged to use the facilities and draw upon the experience of the producing company in the solution of their problems.

For several years The Hudson Coal Co. has been building up its sales-service staff until at the present time it is employing about twenty men to work with the retail distributors on questions of sales, combustion, yard management, advertising, credits and collections. These men are given a thorough course in training before they are sent out on the "firing line." The course starts with run-of-mine testing, where the student gains first-hand acquaintance with anthracite in its raw state. After about a fortnight of this work, the student is promoted to the coal-inspection platform, where he is taught how to test coal and to judge slate and bone content.

When this apprenticeship has been completed, the student goes underground and spends several days under the tutelage of mine foremen studying actual mining conditions. The next step in his training is a course of four to six weeks in the fuel-research laboratory of the company. Here he makes actual practical tests on various sizes and kinds of anthracite and also on competitive fuels. The Hudson Coal Co. has developed a passion for competitive facts. It not only wants to know what its own product will do, but also what performance records are possible with fuels that may be offered in the same markets so that it can meet competition on the basis of facts rather than hysteria or rhetoric.

After the student has finished his work in the research laboratory and also has spent a few days in the chemical laboratory, he is ready to take up the job of guide for visitors going through the Marvine colliery. This part of the course is considered specially valuable because the questions which the student is called upon to answer compel him to make practical use of the experience he has previously acquired.

The assignment to guide duty at Marvine lasts for several weeks. When the student is relieved of that work, he is sent into the field with a service engineer. These tours in anthracite-consuming territory put the finishing touches on his training. He is then ready to take his place as a full-fledged service engineer. It is the policy of the company, as openings are available, to promote the service engineers to executive positions in the sales department or to place them as salesmen with one of the wholesale distributors.

Teaching a man to judge preparation and quality is more than an academic pursuit with The Hudson Coal Co. because the inspection of coal at its operations is under the exclusive jurisdiction of the sales department. Not only has the sales department the last word but it also has the first, since its inspection authority also extends to run-of-mine coal. Vesting this jurisdiction in the sales department is not the common practice in the region. All coal loaded is also subject to inspection by the independent inspectors employed by the Anthracite Operators' Conference, but, in so far as individual shippers are concerned, the more common practice is to place company inspection under the supervision of the operating department; in some cases this jurisdiction is final; in others the inspection is subject to approval by the sales department.

Quality, sizing and appearance are the determining factors in the inspection tests. Standards of sizing, maximum percentages of oversize and undersize, and maximum permissible percentages of slate and bone in sizes larger than No. 1 buckwheat have been established by the Anthracite Operators' Conference. These standards, referred to in more detail elsewhere in this issue of *Coal Age* (see p. 608), are followed by The Hudson Coal Co. But appearance, which is not taken into consideration in the general standards, has a strong influence on consumer acceptance, and many a car which passes the Conference standards is sent back for re-preparation because it does not please the eye. For production as a whole, about one car in eight loaded at the breaker is condemned by the inspectors and sent back for re-preparation. The average on coal prepared by the Chance system, however, is much

Retail Co-operation

There are some producing companies that believe the solution of their merchandising problem lies in direct advertising to the consumer. They believe that such advertising will establish their particular product or brand so firmly in the consumer's mind that the retailer will be forced to handle their merchandise.

But that attitude, in the opinion of The Hudson Coal Co., is neither fair to the dealer nor profitable to the producing company. "We feel," the general sales agent states, "that working with the progressive dealer, helping him to build himself into the position of heating headquarters in his community, is the friendly, helpful, progressive, profitable thing for a producing company to do.

"We want to help you to help yourself," is its message to the retail coal merchant. "We want you to be the most successful coal dealer in your community because in this way—and in this way only—we can build our success on a firm and friendly basis."

less; on some days condemnations have run as low as 1 per cent. Every car rejected and sent back for re-preparation entails an additional cost, it is estimated, of approximately $30.

When a service engineer is sent to work with a retail coal company, his activities are not confined to servicing anthracite. He is ready to assist the retailer in solving problems connected with the servicing of other fuels which the retailer may be handling. The broad philosophy back of this is sound. If the producing company is to convince the retail coal merchant that it cherishes a genuine desire to help him in his business, it can hardly hope to establish conviction if its sole interest is in promoting the sale of its own product. To go in and service a competitive fuel may not be the most pleasant task imaginable, but the co-operative spirit such service displays helps in the long run not only to make the retailer more eager to push Hudson coal, but also, perhaps, less eager to push competitive fuels.

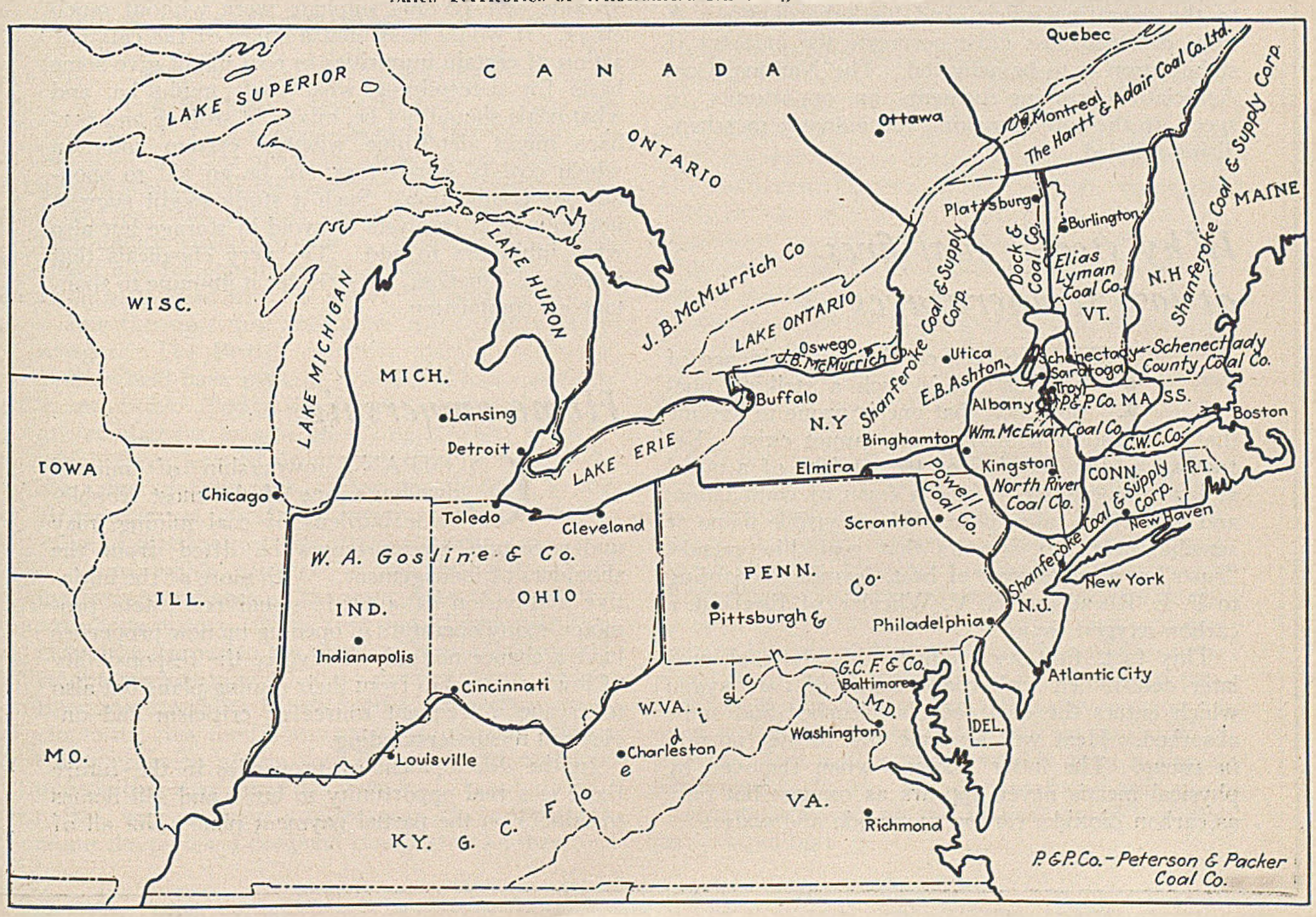
The service of these sales engineers is free to retail coal dealers buying Hudson coal. An engineer spends a minimum of two weeks with each retailer and during the period of his assignment he is in effect the employee of the retailer. Each service man is equipped with a special car and cleaning equipment.

Few types of dealer helps have been overlooked by The Hudson Coal Co. in its merchandising program. The backbone of its 1929 campaign is a direct-mail advertising schedule of 21 units to be sent out by the retailer to his customers and prospects in seven mailings. The major pieces are six folders lithographed in two colors. Order blanks printed on self-addressed and stamped postcards go with the first three folders and blotters accompany the remaining three. A calendar in a greeting folder is the seventh mailing piece. A "Merchandising Manual" suggesting how the dealer may most effectively use the campaign and follow it up with other forms of promotion and solicitation is part of the service. The cost to the dealer, exclusive of postage in mailing out the literature, ranges from 19.7 to 28c. per unit (21 pieces); these prices include individual imprinting on all pieces except the mailing envelops.

In addition to this major campaign, the company also has prepared a series of 12 mailing cards. A series of advertisements to be run by the retailer in his local community newspaper is another dealer help. Furnace cards covering the care and operation of home-heating equipment (*Coal Age,* Vol. 33, p. 549) also are furnished retailers for distribution to their customers. Billboards inviting the world at large to visit the Marvine breaker dot the main trails to Scranton; thousands of tourists have accepted the invitation and their names have been sent to the Hudson dealers in their community.

No single phase of the merchandising campaign outlined can be credited with the upturn in sales in a period when the anthracite industry as a whole has not been particularly cheerful. It is in the cumulative effect of insistence on quality preparation, of service and of advertising in all its forms that the secret is to be found. And that, of course, is only another way of saying that success has been achieved by deep study, careful planning and unflagging hard work. That it has been successful is borne out by the fact that sales in 1928 increased approximately 400,000 tons over the preceding year and sales for the first seven months of 1929 were 434,057 tons greater than during the corresponding period in 1928.

Sales Territories of Wholesalers Handling Hudson Coal



COAL AGE

SYDNEY A. HALE, *Editor*

NEW YORK, OCTOBER, 1929

On to Cincinnati

FOR THE SECOND TIME this year Cincinnati becomes the Mecca of the faithful in the coal industry. Last spring it was the annual convention of practical operating men and exposition of equipment, held under the auspices of the Manufacturers' Division of the American Mining Congress, that beckoned. This time it is the National Coal Association which calls to the executives in the bituminous-producing companies to gather at the Hotel Sinton Oct. 23-25, primarily to discuss the merchandising problems of the industry.

Mere statement of the fundamental theme of the convention ought to whet the desire of every bituminous operator to attend. Large and complicated as the technical problems of the industry may be, they must yield in immediate importance to the pressing need for placing the selling of coal upon a sounder and more profitable basis. An executive problem in the first instance, nevertheless it is a problem which should be of intimate concern also to the operating official and his subordinates. A sales consciousness must permeate the industry if stabilization is to be achieved. The National Coal Association meeting presents an opportunity to speed up the job of making the industry merchandising-minded.

Why stored coal fires at low temperatures

FLAME, the chief visual evidence of combustion, is such a striking phenomenon that one is prone to assume that combustion without flame cannot exist. Yet rusting, a slow burning of the surface of a metal at low temperature, is also a form of combustion, and one which takes place without visible flame or sensible heat. It appears that coal, like metals, "rusts" at a low degree of heat, forming, according to F. E. Rhead and R. V. Wheeler, of England, a carbon-oxygen complex.

This fact, first ascertained with charcoal, was later determined with coal. Some of the oxygen which enters the coal face is adsorbed and some absorbed. Heat will separate the former portion *in vacuo*. The latter fraction when removed by physical means never appears as oxygen but only as carbon dioxide, carbon monoxide and water.

Following the publication of this theory, H. C. Porter and O. G. Ralston advanced a similar explanation based on their own independent investigations in this country. Finally W. A. Bone, of England, elaborated the method by which these reactions might be explained, the hydrogen of the methane in coal being held by Dr. Bone to form hydroxyl groups from which the carbon obtains its oxygen. But this, which may explain what occurs with coal, does not show what happens with charcoal, for in such reactions hydrogen can take no part; so perhaps the union between carbon and oxygen is more direct than Dr. Bone would suggest.

Another interesting development comes from Germany. H. Schrader, in *Brennstoff Chemie*, states that alkali causes a marked increase in the rate of oxidation of various coals, lignite, peat and cellulose. J. D. Davis and D. A. Reynolds discovered that Utah coal from the Mesa Verde formation when treated with 0.5 N caustic soda absorbed oxygen twice as rapidly as when untreated. Are we then to believe that catalysis enters into the oxidation of coals and, therefore, into incipient combustion? Perhaps this will explain why Wyoming coals, and especially those of the northeastern section of the state, fire so readily in storage, in the railroad car and in the coal bed. The alkali itself may aid the combustion by causing at a low temperature a chemical activity that would normally take place only at a higher thermometric reading.

S. W. Parr and F. W. Kressman declare that 10 per cent solutions of calcium chloride and sodium bicarbonate retarded oxidation, whereas calcium hydroxide and ferrous sulphate were without much effect. It would seem that a study of the catalytic action of certain impurities in coal might give some basis for determining what coals might be, and what coals should not be, mixed in storage and perhaps might determine whether certain soils on which coal is stored may not be an aid to spontaneous combustion. Such a study might suggest not only what catalysts to avoid in storage but also what inhibitors to add. The very chemicals that make coal "dustless" may render it immune to spontaneous combustion.

Home ownership

COMPANY ownership of miners' dwellings, one of the most troublesome burdens of coal mining, may under certain circumstances be lifted from the shoulders of management. With more of the initiative and vision of a professional real-estate promoter, many operators in opening up new properties have a chance not only to divorce the responsibility of town ownership from their mining plans but also to escape a frequent source of criticism and unpleasant misunderstanding.

In the development of properties in the future there is a real opportunity to build and sell homes to miners on the partial payment plan. Not all of the coal acreage yet awaiting development lies in isolated country; a considerable number of tracts are within convenient reach of centers of population. These tracts almost invariably are rural, where surface-land values are not inordinately high. Good roads and the automobile have forever banished the necessity for locating the miner's home within the shadows of the plant.

With one stroke employee home-ownership would make the worker more independent and contented, his family more happy, and it would free the plant owner of an aggravating liability.

Surface treatment unavailing

SEEING that a spore that will cause rot in timber cannot develop on the surface of the wood, it is of little avail to brush or dip-coat timber. The spore processes extend inward naturally and cannot be hindered by a surface coat.

Proper impregnation is worth what it costs. Surface impregnation avails little. It may fill the crevices and thus prevent infection, but hardly for long. Eventually the cuts and cracks in the timbers will open up and the spores will enter and decay the wood. Brush-and-dip treatment is a sop to the unwary. Those who use them cannot fail to conclude that treatment of timber is useless.

Good salesmanship

WELSH ANTHRACITE has been known for a century or more but it always has had a limited sale. It has been used for warming greenhouses because it gives a steady, reliable heat, and for malting because it is free from arsenic, from which some British bituminous coals are not. Arsenical poisoning sometimes resulted from the drinking of beer made from malt dried with the aid of British soft coal.

But the uses for anthracite were distressingly meager. The British domestic market for many years would have none of it and still looks askance at anthracite. Today, the Welsh anthracite interests are seeking markets in New England and Canada, which have learned from American salesmanship the value of anthracite, rather than looking to the British market, which still remains "unsold" on the value of that fuel for domestic purposes.

All of which points to a remarkable sense of marketing prudence in the early days of American anthracite history. New York and Philadelphia had not as yet learned to burn coal. They still depended on the consumption of wood in open fires. When Shoemaker and the Wurts brothers brought anthracite to the city, the former narrowly escaped jailing, the purchasers of his coal having found to their disgust that they could not burn it.

But with a super-salesmanship that did them credit the pioneers designed closed grates—stoves—for the burning of anthracite which not only put the fuel on a lasting market basis but also made American coal consumers confirmed advocates of the closed grate, so that when bituminous coal got a foothold, it also was burned in stoves and the open fire became almost unknown, in fact "quite English, y'know; quite English." The open grate has been successful in keeping anthracite in Great Britain from ready acceptance. It has been the stumbling block of the struggling Welsh industry.

If anthracite had not come to market before bituminous coal and if, when it came, those who brought it had not been exceedingly enterprising, America might not have welcomed anthracite as it has and it might still be warming one-half of itself at a time before an open soft-coal fire and burning much fuel for little heat.

Forward!

"LATEST of the sleeping giants of business to awaken to the need of a better public understanding of its objects and problems"—the language quoted is that of an official press announcement—the anthracite industry has organized the Anthracite Institute with the avowed purpose of keeping the consuming public informed on all developments in hard coal, of protecting anthracite users against unfair practices and "to promote the best interest of the anthracite industry and all engaged therein." Special stress is laid upon the research work now being conducted at Norristown.

This newest move on the part of the hard-coal producers to meet changing marketing conditions is in step with the spirit of the times. It will centralize and co-ordinate many activities now scattered through two or three separate organizations. The Anthracite Bureau of Information, Anthracite Coal Service and more recently the Anthracite Operators' Conference all have been part of the program to maintain the prestige of the industry and its market place. Under the new set-up most of the activities of these groups will be merged. It would not be surprising if the first two ceased to exist as separate entities and the Conference in the future be confined to the handling of labor problems.

The launching of the Institute with representation in its membership of every important old line and individual producing company, coming as it does so closely on the heels of the organization of the Anthracite Heating Corporation to furnish group support and encouragement to needed developments in domestic heating, is convincing evidence that the hard-coal giant is thoroughly awake. The predecessor organizations of the Institute have performed yeoman service for the cause—greater in many respects than the public has realized. With the close knit co-operation possible with a single, centralized body, the way is open for a still more rapid advance through the twilight jungles of the new competition.

NOTES

From Across the Sea

MANY of Germany's coal seams are on steep gradients, and in some cases these beds are being mined successfully with the aid of undercutting machines. According to *Eickhoff-Mitteilungen*, experience has shown that success will be most certain if the roof is good, the coal breaks down into small pieces and the excavated area does not have to be backfilled, for it is not as easy as in level workings to keep backfilling in place. But it has been found in Germany, as in Scotland, that if the first two requirements can be satisfied, the third, though a disadvantage, may be overcome.

In the illustration is indicated the method of working a seam inclined at an angle of 40 to 45 deg. to the horizontal with an average thickness of 15½ in. The coal is a soft anthracite (*anthrazit*) which breaks into small pieces. The roof and floor are both strong and contain little clay.

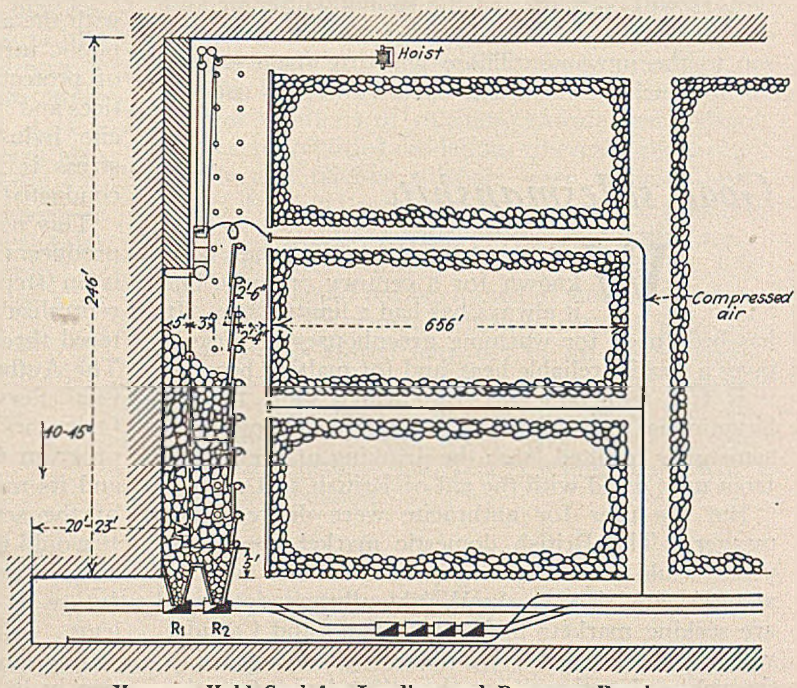
The coal is mined by longwall, which advances parallel with the strike, the face being cut straight up the pitch. The space to the rear of the face is filled by material brought in by the upper road and by both the intermediate roads. The length of the coal face is 246 ft. The lower road is driven 15 to 18 ft. in advance of the face, the rock obtained from the brushing of the road being taken to the surface or used for backfilling in other workings of the mine.

An Eickhoff chain coal cutter with a double helical motor drive undercuts the face to a depth of 5 ft. in a single shift. Because of the steep inclination the machine is secured to a safety rope. One man using the hand winch shown in the upper road can raise the machine to any level desired and prevent it from falling.

As the coal is undercut it breaks up into small pieces and falls into the two hoppers, whence it can be drawn into mine cars as desired. Thus made readily available, the coal can be filled into cars with minimum delay.

During the cutting shift the coal is not removed but is left lying on the floor between the face on one side and a line of boards on the other. These boards are hung from posts set at an even distance from the coal face. The boards are from 9 ft. 10 in. to 13 ft. 1½ in. long and at one end are fitted with a hook, by which they are supported. During the filling shift the timbermen advance the boards 5 ft. to another line of props. The broken coal occupies more space than when in the seam, but the cut being only 5 ft. deep and the width of the two hoppers in aggregate 10½ ft., or more than twice as much, the broken coal never rises above the upper intermediate level. Consequently, the walls of boards need never be placed above that roadway.

At a distance of 2 ft. 3 in. back of the line of boards described and toward the extracted area, another line of props is set which is fitted with boards by which the backfilling is kept in place. Between these two boarded passages travels the air by which the working place is ventilated during cutting and filling operations. To make possible the construction of the advance hopper R, the seam is always mined at the road 5 ft. in advance of the face line and for an equal height. Compressed air is used for cutting. This is brought to the machine through the intermediate roads so that no pipe lines are needed along the coal face.



Hoppers Hold Coal for Loading and Decrease Breakage

The working time is so divided that during the night shift no work other than the cutting of the coal is performed. For this operation three men are employed; one drives the machine, one raises and moves the hose pipe from place to place and performs other odd jobs, and the third operates the safety haulage rope. This third man also helps to prepare the machine for action before cutting commences and assists the other men to put the bits in the cutter, the machine used being equipped with a bar singularly like that which is standard in America. As the coal is soft, one set of bits will cut an entire face without resharpening.

In the following shift (*frühschicht*) which appears to be in the small hours of the morning, the coal from the hoppers at the face is loaded into cars and trammed by two men to the incline 650 to 1,000 ft. away. Six timbermen clear away the coal from the face, shift the boards forward by which coal is to be restrained and nail on the boards by which the backfilling is to be held in place. A hand miner meantime is busy extending the lower gangway and making the 5x5 ft. notch where the hopper is to be placed when it is advanced from its former position. A boss, or *oberhauer*, supervises the work.

The afternoon, or rock, shift is devoted to drilling in the gangway, brushing the rock and timbering. At the same time the waste from the upper and two intermediate roads is deposited in a conveyor trough. The waste from the lower road is filled into mine cars and transported to the incline. For this work 4 rock miners, 2 timber carriers and a boss are employed. Thus the entire force for a single face is as follows:

Early shift—Coal miners, 1; timbermen, 6; trammers, 2; boss, 1; total, 10 men.

Afternoon shift—Rock brushers, 4; timber trammers, 2; boss, 1; total, 7 men.

Night shift—Coal cutters, 1; assistant, 1; winchman, 1; total, 3 men.

In all 20 men are employed. As each face produces 59½ net tons of coal per day the output per man is 2.975 net tons. The extreme thinness of the coal must, of course, be remembered, only 15½ in., which is less even than the lowest coal mined in the Osage coal field or in the anthracite region of America. Before coal cutters were introduced 1.52 net tons per man was the customary performance, so it will be seen that the use of the coal cutter has doubled the output per man.

R Dawson Hall

On the ENGINEER'S BOOK SHELF

Power Resources of the World, by Hugh Quigley, Power International Executive Council; 170 pp., 6x9¾ in.; World Power Conference, 63 Lincoln's Inn Fields, London W.C.2; price, $4.25.

One lays down this little volume with a defeated feeling. Perhaps the author had just that repercussion in mind when he wrote it, for he hopes that in exposing the welter of standards and the different estimates of power resources based on different, or even the same, standards, geologists, electricians and economists will be moved to get together to devise standards, to evaluate resources and to give the public something reliable.

But, when it is obtained, doubtless the public will still not be satisfied, for there will still be many inaccuracies and uncertainties, and the standards chosen for fuel estimation will cease to fit conditions as soon as necessities make the use of inferior sources necessary and the advance in technique makes it possible to use what is now rejected.

To show how inaccurate figures of resources may be, Mr. Dunlap quotes Dr. Gustav Egloff as saying that "oil discovery is a possibility in 1,100,000,000 acres in the United States alone, or 56 per cent of its total area. The contrast of this huge territory with the 2,000,000 acres producing oil at the present time makes it certain that new fields will be continually discovered." To show how estimates vary, Mr. Quigley states that the Prussian Geological Institute gives Germany only 22 per cent as much coal as was given to it by the Toronto Congress and 64 per cent more brown coal than was attributed to it by the same authority.

But, as has been said, difficulties arise in standards. "At most only 20 per cent of the oil in the ground is brought to the surface by present methods of recovery. This oil alone, could it be recovered by means of flooding, repressuring or mining, would supply the world's needs for over 50 years," says Mr. Quigley, again quoting Dr. Egloff. Standards for water power are equally uncertain. Shall they be based on the power deliverable for 90 per cent of the year, or on the power that is developed at time of minimum flow, or at the time of maximum flow, or on the average for the year, and should the figures be based on theoretical horsepower, turbine or electric generator horsepower?

Mr. Quigley would limit the depth of coal entering the estimates to 1,000 meters, or 3,280 ft. He would have such estimates based solely on coal reserves which actually have been surveyed and can be economically exploited. What is such a surveyed coal area? That can be defined only with difficulty. What can be economically exploited requires definition and depends on location. In some countries areas indubitably known to be coal bearing can be described as "surveyed" only by a broad interpretation of that expression. It seems probable that fuel resources will have to be recalculated every ten years and that in the case of coal it will be best to base one of the calculations on all coal of whatever thickness and depth and another on all exploitable coal, the expression "exploitable" being based on the experience of the previous decade and caused to vary with the advance of technique and economic necessity.

The Transactions of the Fuel Conference, World Power Conference, London, 1928; 4 vol., pp. 4241; 6x9¾ in. leather binding; G. E. Stechert & Co. 31 East 10th St., New York City; price, $72.

This voluminous publication covers the proceedings of the World Power Conference held in London, Sept. 24-Oct. 6, and consists of three text volumes and one index volume. It is printed partly in English, partly in German and partly in French. Where the papers are in German or French, résumés in English are included. Where they are in English there are résumés in German and French. Some of the German papers are followed by a complete English translation. In some cases the translation is abridged.

Of 158 articles, 12 are in French, 33 in German and 113 in English. As the authors were all chosen by recognized scientific bodies in each of the countries represented, the papers are by competent authorities in every instance. The information therefore is reliable and authoritative. Lengthy references have been made to several in *Coal Age*, notably the one by G. Raw on dry cleaning, that by the State Electricity Commission of Victoria on brown coal and that by A. D. Kissel on the use of coal as fertilizer, which is in French. The others are mostly equally new and interesting.

Safety in Mines as Affected by First-Aid and Mine Rescue Contests; Information Circular 6,153, U. S. Bureau of Mines, by J. D. Ryan; Mimeograph, pp. 11.

In this circular is given a short history of the safety movement, some conclusions of the author, some quotations from mine managers who have done extended safety work and a short résumé of the work of the U. S. Bureau of Mines in training mine rescue and first-aid teams and in holding international meets.

The author quotes James Powell, Superior Coal Co., Gillespie, Ill., as saying that his accident costs in 1928 were cut 26 per cent as compared with those of 1927, and Mr. Argust, division superintendent, Peabody Coal Co., Taylorville, Ill., as remarking: "Where the operator alone attempts to establish rules and discipline, the effort ofttimes is resented by the employees. Consequently the operator and his small operating organization do not have the co-operation necessary to obtain results. By organizing teams the operator has an opportunity to meet these men frequently. Not only does he talk to them on the first-aid movement but also about prevention of accidents. In a short time the men interested in first-aid and rescue work are taking sides with the operator, supporting and defending him in carrying out discipline and safety rules.

"Members of trained teams attend the frequent meetings held by miners. Among the problems discussed are new rules put into effect by the operator for safety. It is natural that the men who have been trained should defend the operator's position because they know it is for the best interest of the employees."

The Relative Inflammability and Explosibility of Coal Dusts, by T. N. Mason and R. V. Wheeler; paper 48, Safety in Mines Research Board, Mines Department, Great Britain; 13 pp., 6x9⅝ in.; price, 3d. (6c.).

Offhand the mining man has assumed that ignitability of coal dust is equivalent to explosibility and this bulletin declares he is right. Ten coals have been analyzed for their volatile content, tested for the quantity of incombustible needed to suppress inflammation and for the mean speed of their flames, and for the pressures developed on explosion.

The second and third determinations are held to be measures of relative inflammability and the last of relative explosibility, and within the range of error such as must exist in such tests, the coals line themselves up in all four characteristics in about the same order, the higher volatile coal needing the most rock dust to suppress inflammation, having the highest flame speed and developing the greatest pressure. Of course, the irregularities may not all be due to slight experimental variations but may result from small but fundamental differences in the coals themselves.

As in some experiments they were all British coals and in some were British and true coals from New Zealand, they did not have the range that could be obtained in the United States. The moisture ran from 0.76 to 11.22 per cent and the volatile matter from 27.44 to 40.97, but within the range taken the conclusions are valuable. One doubts if a little resin in the coal such as is found in Utah would not modify the results in an important manner.

The BOSSES

Stimulating Interest in Safety

"WHAT'S the lay, Jim?" asked Mac as he came into the Super's office in answer to a friendly summons.

"The Old Man is disappointed in our people's lack of interest in safety get-together. He wants a big enrollment in first-aid training and a large attendance of men, women and children at safety rallies. His big idea is to offer some incentive for attendance. He wants to pay the men for attending training classes, wants to offer entertainments and prizes as a drawing card at the rallies. What do you think of it?"

Mac beamed. "Say, now that's an idea. The whole town and plant will turn out if you give 'em something."

"Hold on, Friend," interrupted Jim. "You better think over the matter before you go into a dance of delight. Dad's idea is not new by any means. Personally I don't like it. You can't bribe people to be safe and that's what it amounts to, seems to me. It's too artificial. Men would take first aid only for the pay that's in it. Women would attend the rallies in hopes of winning a parasol or something. Don't you see they would forget the real purpose of the gatherings? Now, Mac, I may be wrong in my views so take the matter home with you and work up your own slants for our bosses' meeting tomorrow night."

WHAT DO YOU THINK?

1. *Can safety be stimulated in this way?*
2. *Do men get as much out of first-aid training when paid?*
3. *Do you know of a better method?*
4. *Should men be penalized by compulsory lay-offs for breaking safety rules?*

All superintendents, foremen, electrical and mechanical men are urged

Talk It Over

Foremanship Training

Fortunate indeed are those men employed at a plant where the bosses meet once or twice a month to talk over their problems. No man is always right in his reasoning and all need the advice and toning influence of others to guide and check their processes of thought. To all mine bosses, and particularly to those so unfortunately situated as not to have the advantage of participating in foremanship gatherings, these pages are useful. The mere reading of what the other fellow has to say will, of course, be of much help to the man. But he would do better to take an active part in compounding these pages, remembering that he will get out of the pages in measure equal to what he puts into them. New contributors are welcomed.

Has the Limit Of Improvement in Blasting Been Reached?

Vivid Story of Progress Revealed by Statements

THE QUESTION of getting the highest possible percentage of merchantable coal touches on a problem old in the annals of modern mining. With the introduction of explosives came a generation in whom the pride of craftsmanship was submerged in a desire for easy money. To existing evils the undercutting machines added the menace of increasing pulverization of coal, and it soon became evident that something had to be done.

Extensive experiments followed, in which the depth and placement of drill-holes, and snubbing away a portion of the bottom coal to cause the cut to roll over when shot down, were given attention. But the quantity of powder for a given shot was left to the discretion of the miner, who resented bitterly any infringement of his sacred heritage. Spartan methods became inevitable, and it was only after rigorous measures had been taken that improvement became evident.

In my own experience the rise of tonnage from 135 to 200 tons from one box of permissible powder, in three years, tells a tale more vividly than the most prolific pen. Rigorous supervision is the answer to this, as it is to almost every phase of mining. Tactful handling of, and personal contact with, the miners, with most direct methods when they became untractable, paved the way for better results.

Every two weeks a statement was made of each machine on each section as a unit. The statement designated the nature of the work done by each machine, whether wide or narrow. As the various sections were compared one with the other, results were not hard to determine. A copy of the statement was given to each section foreman and to the mine manager, and together they would determine the reason for any serious or prolonged deficiency in the case of any machine or section. In addition to this statement there was an itemized list of the check numbers of the men on each machine, with the number of tons per box of powder opposite each number. It was a comparatively simple matter to confront the offending party with this list and gently chide him for his shortcomings. A spirited rivalry resulted from these damning figures and the next statement would show gratifying results.

Where hand-snubbing is done, systematic scrutiny by shotfirers is imperative, or by room bosses if no shotfirers are employed. Never hesitate to praise good work and encourage the men to visit well-shot places to see how it is done. The suggestion itself probably will bring surprising results. A little personal instruction might do the trick, or the solution might merely be in the handling of men. The same system can be used in checking the cost of materials used per ton of coal mined in each section, also in checking the cost of dead-work.

ALEXANDER BENNETT
Panama, Ill.

Long Faces Give Lumps

IN ORDER to produce the largest possible percentage of lump coal, the first step necessary is to lay out the mine to the best advantage. Modified longwall layouts lend themselves well to the production of lump coal. One such method is described in *Coal Age*, issue of March 5, 1925, which is said to have changed a 50-50 production as between lump and slack coal to 95 per cent lump.

If it were practicable, miners should be reimbursed, as is the operator, for producing a maximum of larger sizes. But as this arrangement is not possible, the next best plan is to pay only for lump coal, going back to the screen-coal basis. This is about the only plan that will bring the desired results where coal is loaded on a tonnage basis. Paying miners a flat rate for loading will not bring the desired results. Favoritism would come into play. The shotfirers would be tempted to shoot the coal heavily for one man and lightly for another, with the consequence that one would work harder than the other. Where black powder is to be used, I would recommend the pellet rather than the granular variety.

Linton, Ind. W. H. LUXTON

Pillars Sometimes Yield Large Quantity of Slack

OVERCHARGING of shots is a fault common to nearly all miners. It is only natural that they use an extra stick of explosive if overcharging will lessen their labor in shearing or in trimming roof and ribs. In mines where all drilling and shooting is done by the miners, use of an excess of powder is inevitable. While the quantity of explosives to be issued daily is more or less regulated by the state mining laws and by the management, I don't think a foreman can keep close enough check on the miner to prevent him from using heavy shots.

Mac's plan won't work out very satisfactorily, as the quantity of powder necessary to bring down a cut of coal will vary from day to day, the variables being the depth and width of the cut. Judgment in determining the shot charges is every bit as difficult in pick mining as in machine mining. This system is liable to create dissatisfaction among the miners' and cause a loss of tonnage.

Perhaps Mac may be getting most of his slack from the pillar sections, from

to discuss the questions. Acceptable letters will be paid for.

large stumps and places left down by the cutters where the coal is squeezed and therefore mined by pick. Close supervision of pillar sections to keep all places in line will eliminate much of the slack originating from this cause. An extra hole drilled midway between the cut and the top of the working place, for a block shot, will eliminate much of the pulverization created in the break shot. Shotfirers will accomplish much in the reduction of slack and in lessening the explosion hazard. These benefits ought to influence the Old Man toward the employment of shotfirers. Drilling of holes by power machines are Mac's and Jim's next best move to lower slack percentages. VICTOR G. GANDY
Hepzibah, W. Va.

Best Results Hard to Get Without Close Supervision

SELDOM do we find a representative of a powder company or an experienced shotfirer who cannot get better results in blasting than the average miner. The system that gives the best results is to have all coal cut, drilled and shot by specialists, preferably at night, with adherence to the policy that all places be cleaned up every day. Working places should be so proportioned as to throw only that quantity of coal that can be shoveled up with average effort in one shift. Supervision should be adequate to provide for two to three visits to each working place daily.

In a system of this sort each miner takes a definite quantity of explosives to his working place each morning. The explosives are carried in a powder bag which is hung from a post in a breakthrough or placed in a cubbyhole. The miner should always have a supply of clay dummies available for the shotfirer.
Paintsville, Ky. GEORGE EDWARDS

Shotfirers Are Compulsory In British Columbia Mines

IT IS scarcely practicable for a mine boss to designate a set quantity of explosive to be used on any particular day in any one working place. Even if the correct weight could be predetermined, still there remains the likelihood of variation in conditions during mining of the current cut. Few men are wise enough to envisage the actual explosives requirements 24 hours in advance. Speaking from years of practical experience, Mac has placed in the hands of the "Super" the only sane solution in suggesting the employment of shotfirers.

In British Columbia the employment of shotfirers is compulsory under the Coal Mines Regulation Act. No shothole can be charged except under the direct supervision of a certified shotfirer. Only if this man is taken into the confidence of the management and given complete authority over the regulation of shot charges in his district, can maximum results be expected, especially where a number of shotfirers are employed.

There are, of course, exceptions among shotfirers, just as there are in other occupations. If more lump coal is produced in Tom Jones' section than in the territory allotted to Bill Smith, give Tom Jones whatever credit is due him. Very soon Bill Smith will sit up and take notice. He will place responsibility for the production of quality coal squarely on the shoulders of his shotfirers and weed out the careless coal-at-any-price men.
JOHN BENNETT
Superintendent
Princeton, B. C., Canada.

Miners Should Not Drill Nor Blast Shotholes

DANGERS incident to the handling and using of explosives in a careless and unlawful manner are of the most hazardous type. The very law requiring the employment of shotfirers puts the lives of the men employed for the purpose constantly in peril. To reduce this last element of danger it is necessary to employ a special corps of men for drilling and charging all shots, as well as for firing them. Thus would the miner be entirely eliminated from the blasting operation. For greatest safety, loose powder should not be allowed in the mine.
Springfield, Ill. THOMAS ENGLISH

Watch Out for Degradation In the Preparation Plant

I NOTE that Mac and Jim have no shotfirers, which appears rather unusual. However, the employment of shotfirers is no cure-all, for rare indeed are the cases in which these men cut down the quantity of explosives made up by the miner. My observations are that a shotfirer does not like to have his miners cuss him out because the shots failed to pull the cut, and so he tolerates or rather abets overcharging.

Mac, if you want more lump coal, give your miners a coke fork with, say, 1½-in. tines. Let them load out the lump coal first and then the nut and slack. Pay them a flat rate for both grades, but, as an incentive, pay them a premium for lump tonnage. In other words, pay a differential as between lump and slack, but at a rate not in excess of the gross rate now being paid. Consider the current prices of eastern Kentucky slack at 60c. and block at $2.25 to $2.50, Louisville. The differential between the prices of these two products is so great as to warrant an adjustment in accordance with the plan indicated.

Jim might go on his tipple and see that the shaker screens are not hammering a large percentage of the lump into egg, nut and slack, as was being done at one large mine in Kentucky visited by the writer. At this particular plant the block actually jumped 4 to 6 in. from the round perforated nut screen to the egg screen. The 4-in. round holes were about one-third full of coal only slightly larger than that size, with the result that the block actually had to fight its way across the screen. Finally, on leaving the screen it fell another few inches onto the loading boom. At that time this mine was producing 700 to 800 tons a day and prices were $3 for lump and 50c. for slack; so Jim can figure the loss. C. J. HODGES
Hartshorne, Okla.

Bug Dust Vs. Explosives

ALMOST all miners are inclined to use too much powder; they express their reason for doing so with the remark, "Powder is stronger than man." First of all, Mac should study his shooting problem and also should experiment, changing the arrangement of the shots until best results are gotten for a given set of conditions. He should not forget that shooting cannot be solved as a mathematical problem, nor can a standardized procedure be applied to all working places in the mine. One of the most important things for him to do is to see that all bug dust is removed before shooting. It cost his company a lot of money to install cutting machines and so he ought to realize the most from them. Leave in the bug dust and add more powder to the charges, say many of the miners.

I doubt if Mac can come anywhere near telling how much explosive will be needed in a working place, but his section foremen, who are on the job every day, will make a pretty good guess. It seems quite necessary that the powder issued to the miners be standardized as to quantity. It should be kept to a minimum and where more is needed it should be requisitioned through the foreman.
Altoona, Ala. JOHN JONES

So Much and No More

IT CERTAINLY is necessary and practicable to designate the quantity of explosives to be used by each miner each day. Mac's plan of using a 30-day card, similar to a meal ticket, is good except that it invites cheating. I have known a miner to get his card punched, though intending to lay off the next day, and allow another miner to use it. On his return to work he would get his supply of explosives on the same punch.

Probably the best plan is to furnish each foreman with an order book for explosives. As he makes his rounds, he can determine the exact amount of powder needed by his men and accordingly issue an order for that amount. All orders should be made in triplicate, one for the miner, one for the office and one for the foreman's records. No explosives should be issued without an order. WALTER HORNSBY
Stickney, W. Va.

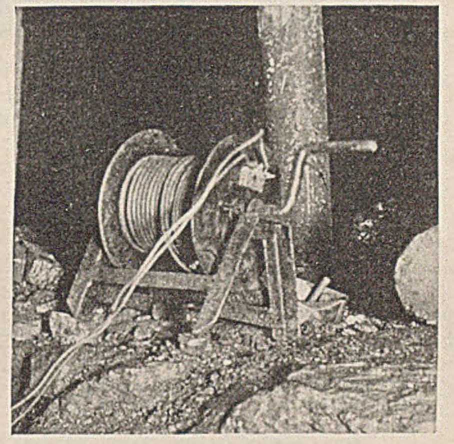
OPERATING IDEAS *from* Production, Electrical *and* Mechanical Men

Reeling Signal Cable Cuts Mishaps From Shotfiring

IN THE scraper-loader sections of its mines The Hudson Coal Co. found it necessary to remove the temptation to utilize the chamber signal wires for electric shotfiring. Instead of stringing shotfiring cable every time shots were to be exploded some of the men would, if no boss was around, disconnect the power from the signal lines, hook the firing leads to them at the face, retreat to the entry and fire the shots by energizing the signal wires. Occasionally this would result in a premature shot due to forgetfulness or to a misunderstanding as to whether the power had been cut off the signal line.

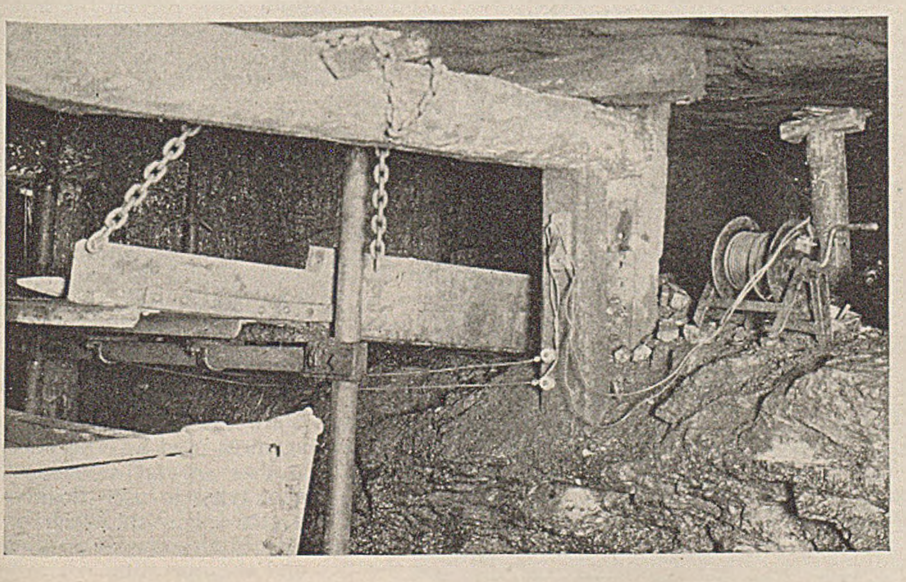
Usually a hoist serves four chambers, or rooms, each 24 to 30 ft. wide and 250 to 300 ft. long. As coal is loaded in but one chamber at a time, it was decided to eliminate permanent signal wires in the chambers and to provide a convenient reel for moving the signal cable from one chamber to another served by the same hoist.

In one of the illustrations the reel is shown in use in a scraper-loading chamber in a 34-in. bed at Clinton colliery. The reel is made just large enough to carry 300 ft. of No. 18 two-conductor Tirex rubber cable, and for simplicity is made devoid of collector rings. When it is necessary to pay out more cable the leads from the signal bus on the entry are disconnected temporarily from a terminal block on the side of the reel so that it can rotate. The terminal posts are fitted with wing nuts.



Terminal Block Instead of Collector Rings Simplifies Reels

The Black and White Signal Bus Under the Loading Chute Terminates at the Car Trimmer's Signal Switch on the Post. Sufficient Cable Is Unwound From the Reel to Serve a Signal Switch at the Face



The permanent signal bus on the entry and its connection to the battery and bell at the hoist consists of two No. 12 solid single-conductor copper wires with 600-volt rubber insulation and a black and white paraffin outer braid. The battery, which is 7½-volt Columbia No. 256, contains ten standard dry cells connected in series-multiple. Six to eight months is the average life of such a battery for mechanical-loader signaling.

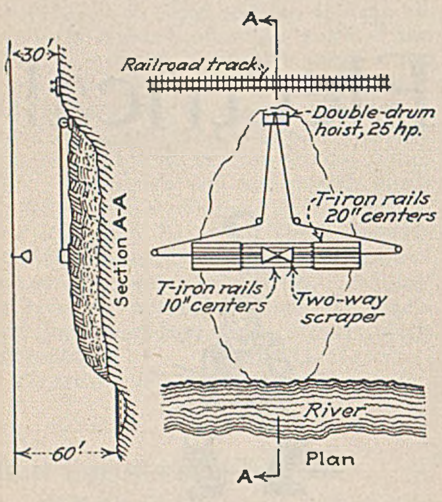
For shotfiring, No. 18 stranded 7-wire single-conductor rubber-covered single-braid wire is used. As the braid of this wire is black and that of the signal bus is black and white there is no opportunity for confusion. A further distinguishing feature is afforded by the chamber signal cable being twin-conductor and the shotfiring wires being single-conductor.

Scraper to Spread Rock From Aerial Buckets

A simple, one-man method of spreading rock dumped from an aerial-tram system, has been suggested for use at the Stillwater operation of The Hudson Coal Co. This idea has been tried and found successful elsewhere.

At Stillwater coal is dumped at a point about 800 ft. from the mine opening. It is taken thence by an aerial tramway, 1,800 ft. long, to a loading station on the Erie R.R. by which means it is transported to the Coal Brook breaker seven miles away. This aerial tramway cuts across the Lackawanna River valley, the lowest elevation of which is, roughly, 60 ft. below the track rope of the bucket line. As much rock is taken from the workings of this

Operating Ideas from PRODUCTION, ELECTRICAL *and* MECHANICAL MEN



Spreading Rock on Dump

colliery, not only coal but rock also is handled by the tramway. The rock is dumped in the Lackawanna Valley.

The proposed scraper layout for spreading this rock on the dump is shown schematically in the accompanying sketch. Directly under the rope is laid a floor of T-iron rails of 60-lb. weight, set at about 10-in. centers on which rock is dumped from the buckets. This floor is extended across the dump by 25-lb. T-iron rails set at 20-in. centers and on it moves a two-way scraper operated by sheaves and ropes to a 25-hp. double-drum hoist. The merit of this idea is its simplicity and the great portability of the equipment it involves.

Air Motor Turns Wheels For Valve Setting

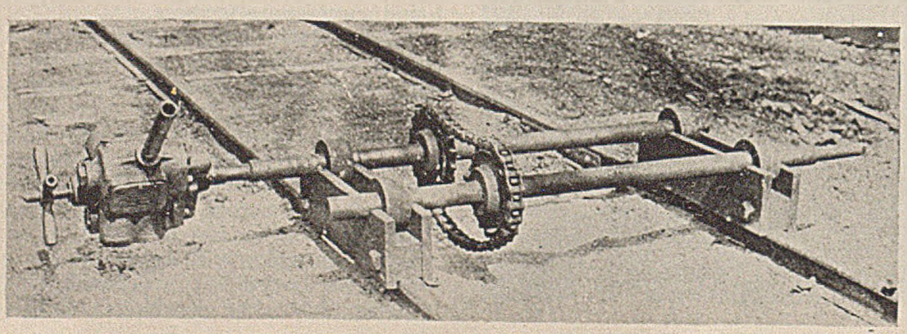
After a side-rod steam locomotive has been overhauled its wheels must be turned so that the valves may be set. If the wheels are rotated with a bar, this is tedious work and extra men will be required or the job will not be done with dispatch. To improve this item of shop practice, the device shown in the accompanying illustration was made at the Olyphant shop of The Hudson Coal Co.

It consists of two pairs of rollers mounted on chain-connected shafts each of which have one end arranged for attachment to an air-motor drill. After the locomotive has been assembled and the driving box binders are in place, the locomotive is jacked up to permit the rollers to be put on the rail and under one pair of driving wheels. The locomotive is then lowered sufficiently to allow some weight to rest on the rollers.

With this arrangement the drivers are turned by the air motor. Fine adjustments are made by rotating the roller shaft with a pipe wrench. T. B. Griffin, mechanical maintenance foreman, who made the device, states that two men now set the valves on a locomotive in a shorter time than before when four men were required for the job.

That the device is used many times a year at the Olyphant colliery becomes evident when it is explained that the steam equipment consists of 14 locomotives, and that each one is given a general overhauling after 10 to 12 months' service.

Assembled Outside for Illustration

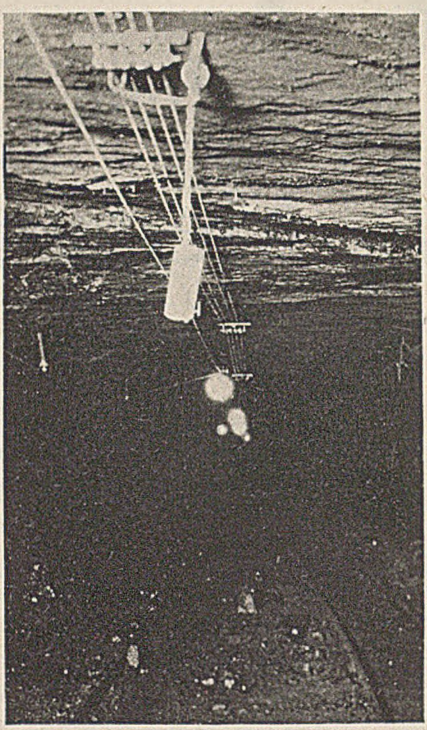


Coming Through

Consider the wealth of operating ideas appearing in this one issue, all coming from one coal company. Experience of years, growing from the efforts of scores of men, are here condensed into meaty data and information which can be put to use with little if any experimenting. The Hudson Coal Co. has been good enough to give you the benefit of its experience. There are many men in this great coal company who are as interested in your development of ideas as you are in what they offer. Accepted ideas, illustrated by sketch or photograph, will be paid for—$5 or more for each.

Signal and Phone Wires On Common Bracket

In mines of The Hudson Coal Co. a new type of construction was adopted recently for supporting signal and telephone wires. It consists of a "Peirce" four-spool galvanized bracket modified by a hole drilled in the center so as to be attached by one expansion bolt instead of two. An installation of this type is shown in the accompanying illustration made along the double track at the foot of No. 9 plane, Jermyn mine.



Wires Tight and Parallel

No. 12 solid-copper rubber-covered double-braid wire is used for the pair of signal wires and the pair of telephone wires carried on the brackets. The regular spacing is 30 ft. In the upper foreground hangs the regulation button used in signaling the hoist operator.

Rugged Device Provides For Indicator Switch

Several types of switching devices are in use to operate the red and green lights which indicate the open and closed positions of track switches. Apparently there is not a complete device of this kind suitable for mine use on the market, otherwise homemade arrangements would not be so much in evidence. The Hudson Coal Co. comes closer to using a factory-made arrangement than many other companies.

This is shown in the accompanying illustration made on No. 19 plane foot branch, Archbald vein, Jermyn colliery. On the post is mounted a quick-make and quick-break switch. The regular handle has been displaced by a slotted arm to engage one end of the lever which is actuated by a rod connected to the bridle of the track switch. The cover of the steel box guarding the electric switch is illustrated in the open position in order to show the switch.

This arrangement used by The Hudson Coal Co. has several advantages over some other types in use. Positive terminals are guarded by the steel box instead of being in an exposed position on the ties and the operating connect-

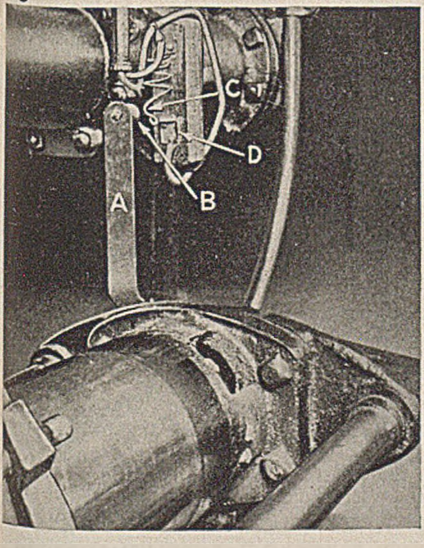
[O]perating Ideas from Production, Electrical and Mechanical Men

Guarded Contacts and a Rugged Connecting Rod

[connec]tion between the track switch and the electric switch is quite rugged. The particular type of three-point electric switch used is not sensitive to slight changes in adjustment or length of the connecting rod.

Blinking Light Shows Feed Pump Working

If the feed pump is not within plain sight of the boiler-room firing aisle the firemen should have some form of indicator or alarm to warn them if the pump stops. In the Coal Brook power plant of The Hudson Coal Co., the feed pumps are installed in a room removed farther than usual from the center of the boiler aisle, therefore a signal light to indicate feed-pump operation is installed at the latter location.



Contact Above Plunger

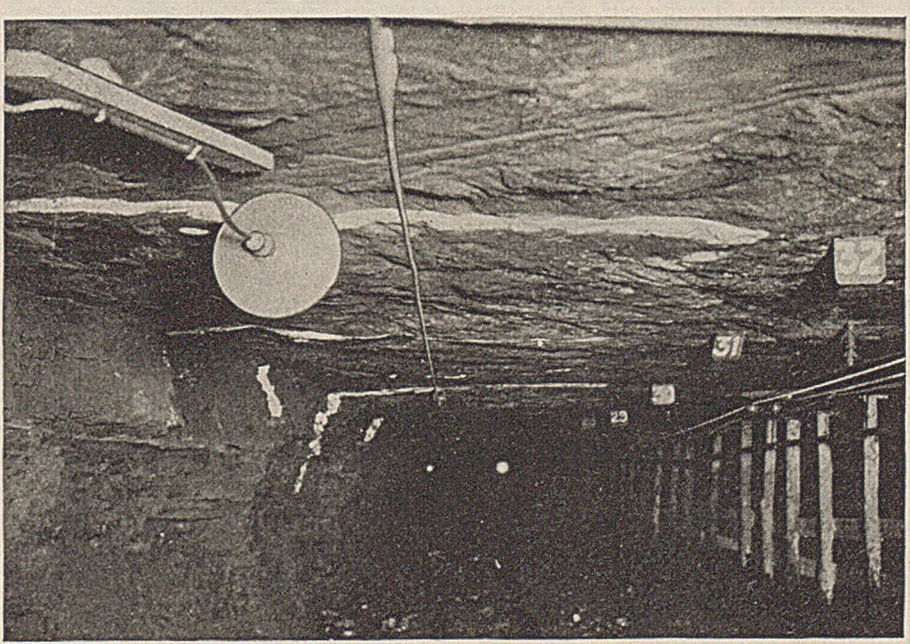
This light blinks on for a half second or so at the end of each stroke of the plunger pump. The contactor on one of the pumps is shown in accompanying illustration. A fiber knob *B* mounted on a strap *A* which is fastened to the end of the plunger engages the switch. The latter consists of a brass wire spring *C*, the free end of which normally stands a short distance away from contact clip *D*, but is forced into contact with it by the movement of *B*.

Roof Marking Aids in Spotting of Trip

When a locomotive has to spot a long trip so that the rear car will be at a certain point at the foot of a slope, some method of indicating the point at which the locomotive should stop is needed unless a man is stationed at the rear end to signal the motorman. When cars are all of the same length, the correct position at which the locomotive should cut loose from the trip may be indicated by signs located at points corresponding to the number of cars.

Such an arrangement is shown in the accompanying illustration made on "New Heading, Main Slope, Foot Branch," in Jermyn colliery. White lines painted on the mine roof denote the correct locomotive positions for the lengths of trips ordinarily hauled. Opposite each white mark is a sign on which the number of cars is painted. The numbers are illuminated by the lighting unit shown at the upper left of the illustration, the reflector of which unit is mounted in a vertical position.

Trip Length Numbers Show Where to Stop



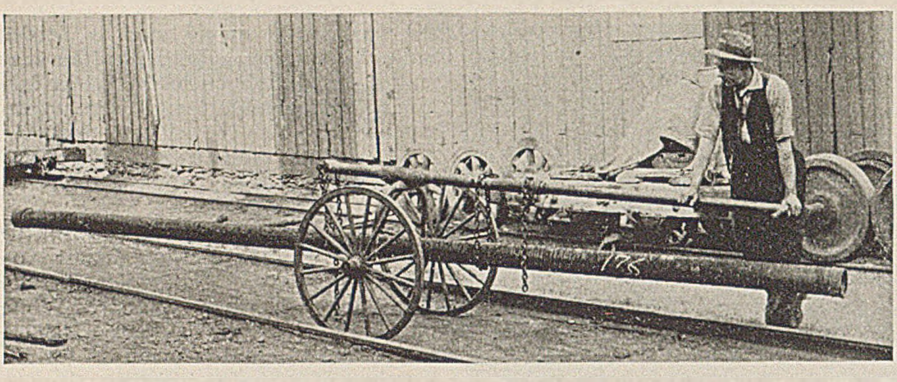
Truck Handles Material Cheaply and Safely

On any maintenance job it is important that tools well fitted for the kind of work to be done be provided. Some foremen do not limit themselves to standard tools of general application but instead complete the assortment by making up special tools for certain jobs.

In the illustration, W. H. Bell, mechanical maintenance foreman, Pine Ridge colliery of The Hudson Coal Co., is demonstrating a material-carting truck which he built to avoid calling for six or eight men whenever he needed to transport heavy material a short distance to a repair job about the plant. The truck is shown handling a 4-in. pipe.

The wheels and axle, the latter bent to an inverted "U", were taken off an obsolete horse-drawn ambulance. The tongue is welded to the axle, and one

Operating Ideas from PRODUCTION, ELECTRICAL *and* MECHANICAL MEN



Strong Backs Displaced by Narrow-Gage Truck

end of each lifting chain is welded to the tongue. Opposite each chain weld is a heavy forked hook to which the chain is fastened to form any length of loop.

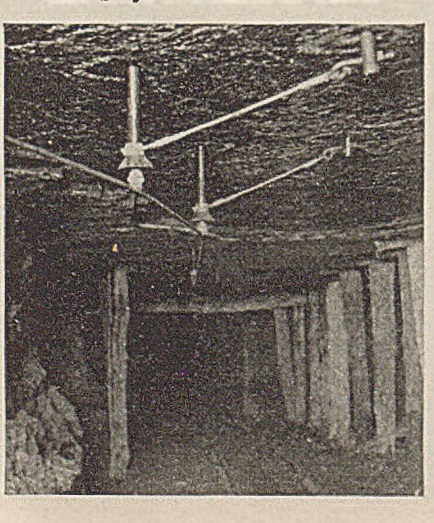
When a length of pipe, locomotive axle, piece of shafting or the like is to be picked up, the tongue is raised as high as a man can reach and the rear chain looped around the load to be carried at a point near its center of gravity. The tongue is then pulled down and the front chain attached so as to balance the load.

Extensions and Guys Position Wire

Cheap haulage cannot be attained if the trolley-wire construction is slipshod. Though no expenditure should be made greater than the life of the haulway would justify, the wire should be supported in a manner which will result in the fewest interruptions, included among which is that provoking occurrence described as "pole off the wire." In practically every case where a trolley wire is erected, the best available construction is justified.

The accompanying illustration from a photograph made on heading No. 7, Fourth Vein, Olyphant colliery, shows a method used by The Hudson Coal Co. for erecting the wire at a uniform height above the rail regardless of roof variations, and of anchoring the hangers on curves so that the wire will be kept tight and in alignment. Pieces of 1¼-in. black pipe, usually reclaimed from steam, water or air-line service, are cut to suit the particular roof height at the point where the individual hanger is to be placed. The upper end of these pipes are split for a distance of 5 in. by two cuts on diametrically opposite sides. A hole of 1¾-in. diameter and 6 to 8 in. deep is drilled into the roof and before the split end of one of these pipes is driven into it a wood plug 6 in. long and tapering from 1⅛ in. at one end to 1¾ in. at the other, is inserted loosely into the end of the pipe. As the pipe is driven into the hole in the roof the plug expands the split portion wedging it tightly against the sides.

Wire Is Carried at Uniform Height And Stays in Position on Curves



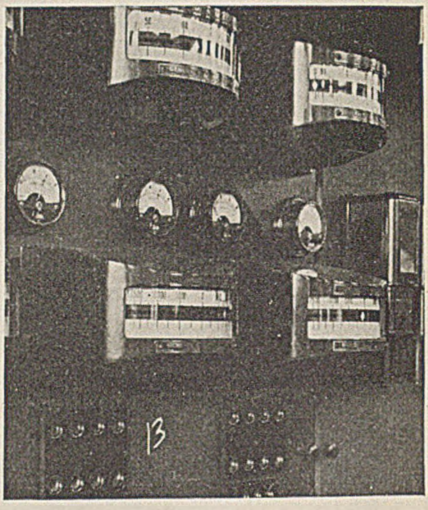
Usually a number of pipes cut to various standard lengths and graduated by steps of but a few inches are stocked at the blacksmith shop. When the roof is marked for the drilling of hanger holes the height at each is recorded so that the correct lengths can be selected from the stock or can be made up in the shop to suit.

Type "U" hangers and "Bulldog" clamps, both made by the Ohio Brass Co., are used. Where the roof height is such that the hanger can be attached without an extension, a type "A" expansion bolt of 1¼-in. shell diameter displaces the pipe. Where pipe extensions are used on curves the hanger is guyed to a short pipe fastened in the roof by the same wood-plug method.

Exhibits Condition of Relay Circuits

In most classes of service conditions seldom arise which test the protective value of overload relays of oil circuit breakers. For this very reason it is advantageous to have visual indications that the current transformer secondary circuits through the relay coils are not broken.

In the Olyphant power plant of The Hudson Coal Co. this is accomplished by having miniature a.c. ammeters of switchboard type mounted on the control panels. Those pictured in the accompanying illustration are on the control panel of 23,000-volt feeder lines outgoing from the step-up transformers.



Two Miniature Meters for Each Feeder Circuit

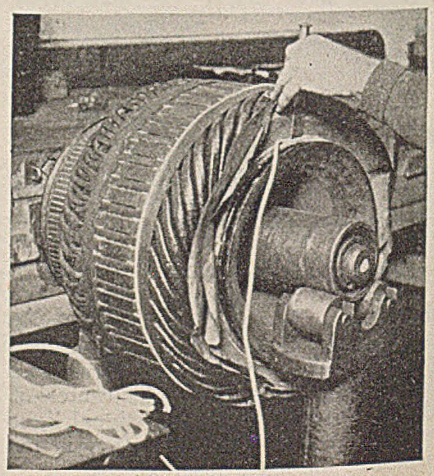
These meters are connected in the circuit of the bushing-type current transformers and the overload relay coils.

When there is a load on the line a glance at the meters tells if the secondary circuit is in normal condition. This is not an actual test such as opening the breaker affords but it is, nevertheless, a continuous indication that one important feature of the protective apparatus is in good condition.

Spacer of Braided Cord Cuts Motor Failures

Failures of type HM 801 and other locomotive armatures having the same shape of coil were made less frequent at mines of The Hudson Coal Co. by an

Forcing the Cord Between the Two Disks of Horn Fiber



Operating Ideas from PRODUCTION, ELECTRICAL and MECHANICAL MEN

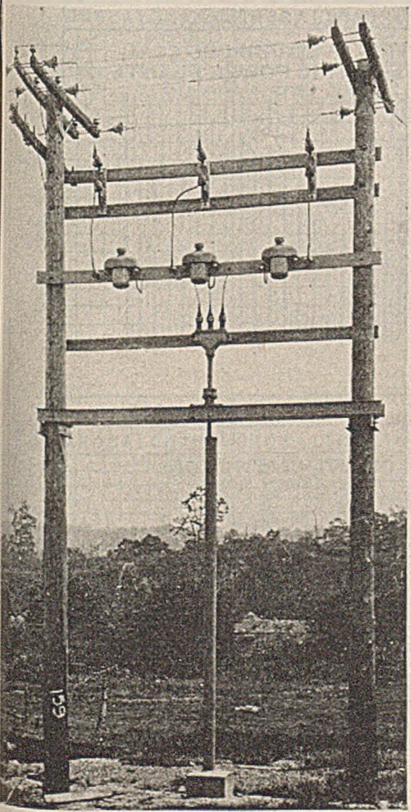
improved practice adopted in their rewinding at the central repair shop. It consists of bracing the coil end to prevent their expansion and consequent rubbing against the bearing housing. This is accomplished by including two disks of horn fiber in the spider insulation next to the oil deflector and after the armature coils are in place forcing a heavy cord between the two. The extra clearance, which is nearly $\frac{1}{16}$ in., is obtained by using a No. $4\frac{1}{2}$ Samson braided cord.

Simple Cable Terminal Cuts Erection Costs

Fencing is eliminated and the cost is reduced almost 50 per cent by a new type of borehole entrance for armored cables used by The Hudson Coal Co. Instead of a separate low structure for sustaining the armored cable the supporting structure is attached to the poles and is high above the ground.

The installation shown in the accompanying illustration feeds two 112-hp. hoists in Delaware colliery. The borehole is 125 ft. deep and the cable No. 2/0, 3-conductor is insulated with varnished cambric for 5,000 volts and protected by lead and wire armor. It operates at 2,300 volts. The borehole is lined the entire depth with 5-in. steel casing surrounded by concrete. This casing is carried to a point 12 ft. above the surface in order that no fence need be erected.

Safe, Simple and Sturdy Borehole Terminal

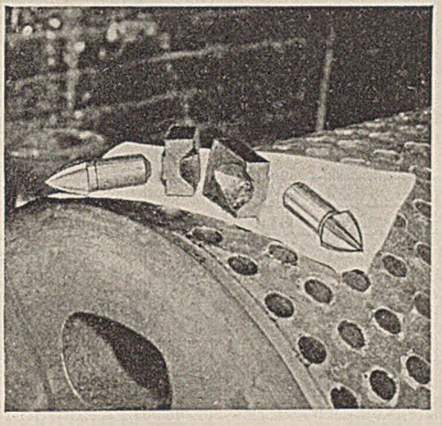


Protection for the lead cable between the armor suspension clamp and the pothead is afforded by an 18-in. length of $1\frac{1}{2}$-in. pipe. This will ward off the bullet from the gun of a mischievous boy who finds a dearth of live game. On the back of the crossbar supporting the D.&W. oil-fused cutouts, insulators are mounted for rigidly supporting the wire loops leading from the pothead to the cutouts. This will prevent the leads being broken by the vibration caused by the wind. Lightning arresters are mounted on the crossbars at the upper right, but choke coils have been eliminated from the installation because sufficient inductance is believed to be afforded by the borehole cable.

This design, which is a model of simplicity and ruggedness, was proposed by C. F. Barclay, assistant superintendent of maintenance and construction.

Jaw for Lathe Chuck Cuts Roll Cost

At best the repair of anthracite breaker rolls involves much labor for each pair has from 400 to 1,200 teeth and, when new teeth are applied, the shank of each much be machined. The labor of centering each tooth ready for

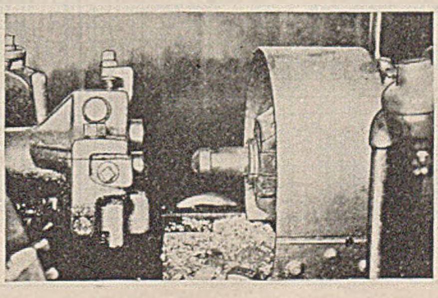


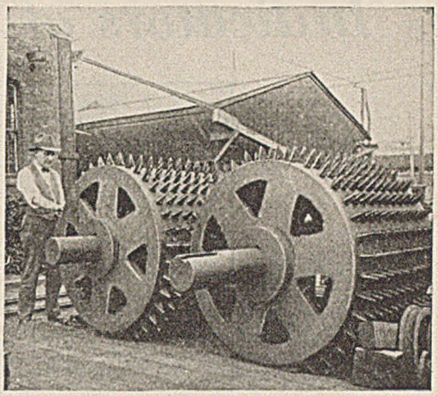
Teeth and Pair of Jaws

turning has been eliminated in the central shop of The Hudson Coal Co. by providing special jaws for the lathe chuck.

One of the illustrations shows a set of jaws for No. 2 teeth placed on top of a blank roll between a rough and a finished tooth. Another shows the shank

Tooth Shank Partly Turned





Rolls Ready for Installation

of a tooth protruding from the chuck of a turret lathe. Part of the shank has been turned.

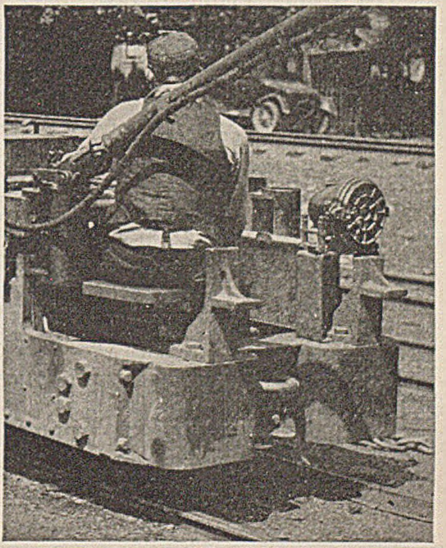
A pair of brass jaws has been provided for each of the three sizes of teeth in general use. Brass was employed because parts of this metal can be cast in the shop foundry. The cavity formed when the jaws are brought together in the chuck is tapered to fit the cutting edges of the tooth.

Anti-Climbing Guards Protect Motorman

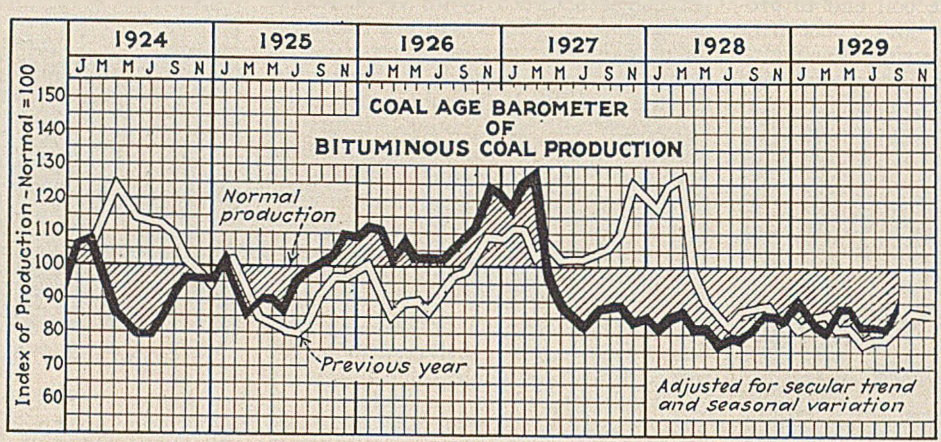
In case of a derailment or wreck there is a likelihood for serious injury to the motorman unless some provision is made on the equipment to prevent the car next to the locomotive from climbing into the cab.

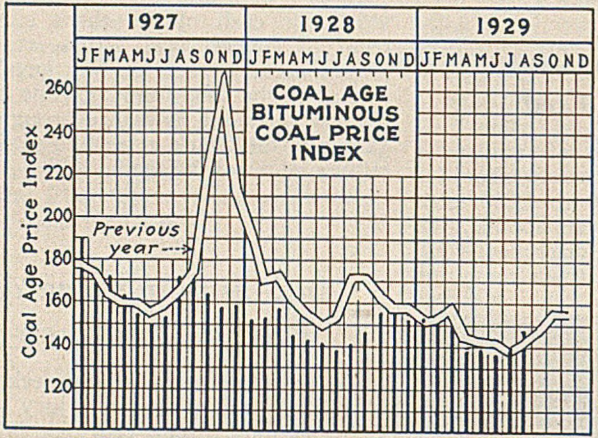
The accompanying illustration shows a locomotive equipped with anti-climbing guards. They consist of special castings bolted to the top of the bumper. The Hudson Coal Co. has standardized on this safeguard and now has every one of the 263 electric locomotives so equipped.

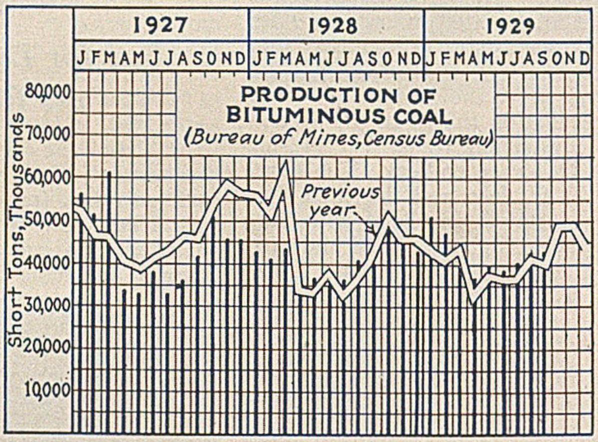
Guard Castings Bolted to Bumper

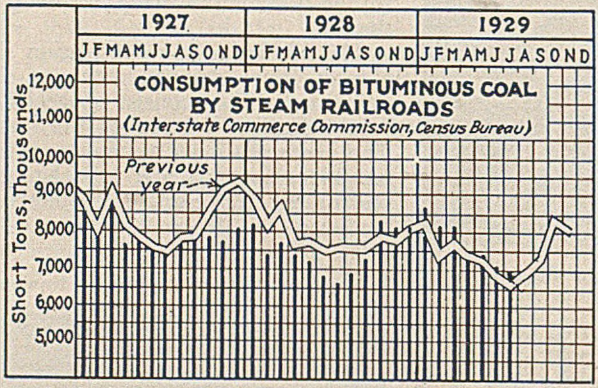


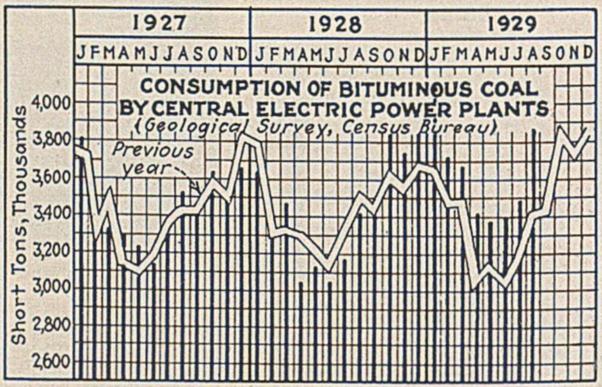
Indicators of Activities in the Coal Industry

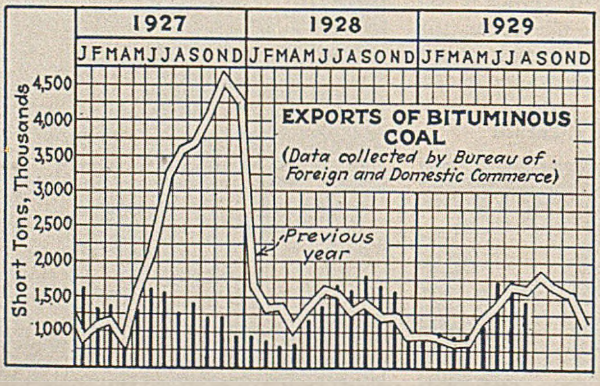


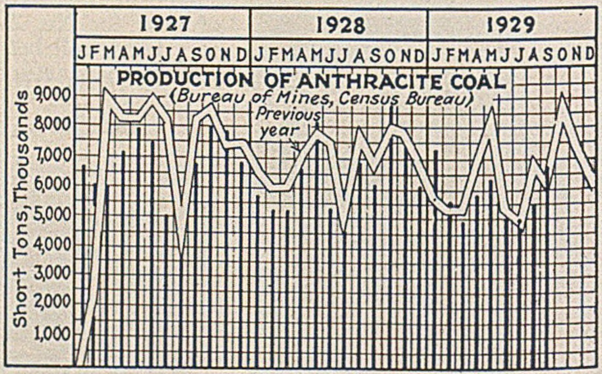












MARKETS *in Review*

THE UPWARD SWING in the bituminous coal markets of the United States continued throughout the month of September. Buying for domestic use, fostered by approaching cold weather, took on new life and was accompanied by a general rise in the price level. Retailers also showed more disposition to replenish stocks, but large industrial users and the railroads seemingly were still reluctant to lay in such supplies as characterized past years.

Screenings and, to some extent, mine-run coal, failed to share in the generally improved market conditions. Prices on screenings declined in practically all the markets; in the Middle West in particular this size was sold for almost anything it would bring. A shortage of railroad cars was not evident in the month of September, but the number of surplus cars, as reported by the Car Service Division, American Railway Association, declined from 47,131 on Aug. 23 to 21,345 on Sept. 23, a total decrease of 25,776 cars.

September production is estimated by the U. S. Bureau of Mines at 44,480,000 net tons, an increase of 591,000 tons over August and 3,179,000 tons over September of last year. Prices increased materially in response to the increased demand for domestic coal. *Coal Age* Index of spot bituminous prices (preliminary) was 148, Sept. 7; 150, Sept. 14; 151, Sept. 21, and 154, Sept. 28. The corresponding weighted average prices were as follows: $1.79, Sept. 7; $1.81, Sept. 14; $1.83, Sept. 21; $1.87, Sept. 28. The revised Index figures for August were 146, Aug. 3; 145, Aug. 10; 146, Aug. 17; 147, Aug. 24, and 148, Aug. 31. The corresponding weighted average prices were $1.77, Aug. 3; $1.76, Aug. 10; $1.77, Aug. 17; $1.78, Aug. 24, and $1.79, Aug. 31. The monthly Index for August was 146⅗, as compared to the unrevised figure of 150½ for September.

Shipments to the lakes in the first half of the month continued at a slightly higher rate than for the corresponding season last year. Dumpings at the lower lake ports for the season to Sept. 23 were 28,489,614 net tons, an increase of 4,130,919 net tons over the corresponding period in 1928 and a new record. Cargo dumpings to Sept. 23 were 27,428,683 tons and bunker fuel loadings were 1,060,931 net tons.

ANTHRACITE demand on the whole manifested more activity in September than in the previous summer months. Domestic sizes were the leaders, though buckwheat among the steam coals was in increased demand. Practically every anthracite colliery in the Wilkes-Barre district had resumed at the end of the month and mine running time in the other anthracite fields picked up materially. Indications are that the anthracite industry may expect better business from now on.

New domestic business in the Chicago market in September fell off slightly after the middle of the month, but orders continued to come in at a satisfactory rate, particularly to high-grade producers. Impending cold weather, however, is expected to revive the demand in the near future. Operators in Indiana, Illinois and western Kentucky were sold ahead from ten days to two weeks as a rule, with lump leading and egg and nut running second and third.

Mine-run and screenings from the Midwestern fields moved with great difficulty and at extremely low prices. This situation resulted from the operation of the demurrage rule in southern Illinois, forcing operators in that district to get rid of small sizes at all costs. Consequently operators in Indiana and western Kentucky were unable to find an outlet for their production and prices slipped rapidly. West Kentucky screenings sold at 5c.; Indiana No. 4, 85c.@$1.25; southern Illinois, 90c.@$1.60; Indiana No. 5, central Illinois and Standard, $2.10@$2.25, f.o.b. Chicago. Operators in western Kentucky were compelled to advance prices on domestic sizes twice during the month because of the disappointing returns on screenings, the increases totalling 50c. on lump and egg. Advances also were made on both Indiana No. 4 and No. 5 domestic.

SMOKELESS lump, egg and stove moved freely in response to a brisk demand, leaving the retailers with small stocks and the prospect of inadequate shipments when cold weather sets in. Smokeless producers were oversold on all prepared sizes and shipments on contracts were made at 100 per cent capacity. Retailers endeavored throughout the month to replenish their stocks of domestic sizes. Smokeless quotations were as follows: lump and egg, $3.75@$4; stove, $2.75@$3; mine-run, $2.10@$2.25.

Tightness also was noted in the Eastern high-volatile market. Shipments on the premium grades of block and egg were far behind the demand.

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

	Market Quoted	Week Ended Sept. 7, 1929		Sept. 14, 1929		Sept. 21, 1929		Sept. 28, 1929	
		Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken	New York	....	$8.00@$8.40	....	$8.00@$8.40	....	$8.00@$8.40	....	$8.00@$8.40
Broken	Philadelphia	$8.40@$8.50	8.40	$8.40@$8.50	8.40	$8.40@$8.50	8.40	$8.40@$8.50	8.40
Egg	New York	8.50@ 8.60	8.60	8.50@ 8.60	8.60	8.40@ 8.60	8.60	8.50@ 8.60	8.60
Egg	Philadelphia	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60
Egg	Chicago*	7.68	7.68	7.68	7.68	7.68	7.68	7.68	7.68
Stove	New York	9.00@ 9.10	9.10	9.00@ 9.10	9.10	8.90@ 9.10	9.10	9.00@ 9.10	9.10
Stove	Philadelphia	9.10@ 9.35	9.10	9.10@ 9.35	9.10	9.10@ 9.35	9.10	9.10@ 9.35	9.10
Stove	Chicago*	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13
Chestnut	New York	8.50@ 8.60	8.60	8.50@ 8.60	8.60	8.40@ 8.60	8.60	8.50@ 8.60	8.60
Chestnut	Philadelphia	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60
Chestnut	Chicago*	7.68	7.68	7.68	7.68	7.68	7.68	7.68	7.68
Pea	New York	4.60@ 4.90	4.90	4.60@ 4.90	4.90	4.60@ 4.90	4.90	4.75@ 4.90	4.90
Pea	Philadelphia	4.90@ 5.15	4.90	4.90@ 5.15	4.90	4.90@ 5.15	4.90	4.90@ 5.15	4.90
Pea	Chicago*	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38
Buckwheat	New York	2.65@ 2.75	†2.75	2.65@ 2.75	†2.75	2.65@ 2.75	†2.75	2.65@ 2.75	†2.75
Buckwheat	Philadelphia	2.75@ 3.00	2.75	2.75@ 3.00	2.75	2.75@ 3.00	2.75	2.75@ 3.00	2.75
Rice	New York	1.85@ 2.00	2.00	1.85@ 2.00	2.00	1.85@ 2.00	2.00	1.85@ 2.00	2.00
Rice	Philadelphia	2.00@ 2.25	2.00	2.00@ 2.25	2.00	2.00@ 2.25	2.00	2.00@ 2.25	2.00
Barley	New York	1.40@ 1.50	1.50	1.40@ 1.50	1.50	1.40@ 1.50	1.50	1.40@ 1.50	1.50
Barley	Philadelphia	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50

*Net tons, f.o.b. mines. †Domestic buckwheat, $3.25 (D., L. & W.).

Premium block commanded $3.25@$3.75, and egg sold at $2.25@$2.75. Ordinary grades were quoted as follows: block, $2.25@$2.50, with some at $2.75; egg, a trifle slow, $1.75@$2. Eastern high- and low-volatile screenings held firm throughout the month in contrast to the Midwestern product. Prices were as follows: byproduct smokeless, $1.25@$1.50; high-volatile, $1@1.25, and ordinary grades at 40c. up.

September proved to be a good domestic month in the St. Louis market, though the demand for steam sizes suffered a slump. Unusually late domestic buying is expected to result in a rush which will tax the facilities of the shippers and retailers. Prices were generally uniform throughout the month, as follows: Mt. Olive lump and egg, $2.50@$2.65; nut, $1.60@$2; mine-run, $1.75, screenings, 60c.; Standard lump and egg, $2.15, steam egg, $1.85; nut, $1.50@$1.75; mine-run, $1.65, and screenings, 40c.@60c.

GENERAL satisfaction with the status of the trade pervaded the Head of the Lakes coal market in September. Shipments continued at a substantial rate and a good volume was disposed of on contracts and in the spot market. Steam coal was in increasing demand, reflecting larger buying on the part of the iron mining companies and public utilities. August receipts from the Lake Erie ports were 1,567,742 tons, making the season's total 7,995,428 tons. Stocks of coal on the docks as of Sept. 15 were approximately 6,500,000 tons of bituminous and 750,000 tons of anthracite. Smokeless coals were in increasing demand and advances of 10c.@20c. were scheduled for Oct. 1.

Prices on bituminous coals at the docks remained firm throughout the month, as follows: Pocahontas lump, egg, stove and nut, $7.90; mine-run, $5; screenings, $4.10; Kentucky block and lump, $6.65@$7.25; stove and egg, $5.90; egg and dock-run, $6.65; stove, $5.80; dock-run, $5.40; screenings, $4.10; splint block, $5.85; egg, $5.35; lump and egg, $5.60; dock-run, $4.75; screenings, $3.85; Youghiogheny block, lump and egg, $5.75; stove, $5.40; dock-run, $4.50, screenings, $3.85; Hocking block, $5.60; lump and egg, $5.35; stove, $5.10, dock-run, $4.50; screenings, $3.85.

SEASONAL improvement in the Southwestern market reached sufficient proportions by the middle of September to cause price advances of as much as 25c. on Kansas deep-shaft lump and Arkansas semi-anthracite coals, final prices being $3.75@$4.50 and $4.50@$4.75, respectively. Under increased production, the price of screenings was adjusted on a lower basis, the decrease reaching 25c. in some instances. Quotations on Kansas screenings were $1.50@$1.75, as compared to $1.75 for August.

A good demand for all sizes of coal, particularly lump and nut, featured the Colorado market in September. Stocking increased as the fall business began to grow. Prevailing prices were as follows: Walsenburg-Canon City lump, $5.25; nut, $4.30; washed chestnut, $3.25; Trinidad coking lump, nut and chestnut, $3.25; Crested Butte anthracite furnace and egg, $8.25; bituminous lump, $5.25; nut, $4.30; Rock Springs-Kemmerer lump, $4.25; nut, $3.75, steam sizes, $1.50; Colorado steam sizes, $1.40.

Chilly weather over much of September resulted in a good demand for domestic sizes in the Louisville market. Block was particularly sought after and egg and lump sold fairly well. Nut tended to drag, however, and mine-run was in the doldrums as a result of the screenings situation. Screenings were a drug on the market and drastic price cuts were necessary to keep them moving. This situation resulted more from the heavier offerings of this size than from any diminution in demand, though industrial consumers still showed no disposition to replenish stocks. Quotations were as follows: eastern Kentucky block, $2.25@$2.75; lump and egg, $1.65@$2; nut, $1.40@$1.60; mine-run, $1.25@$1.65; screenings, 50c.@$1; western Kentucky block, $1.75@$2.25; lump and egg, $1.50@$1.75; nut, $1.25@$1.50; mine-run, 90c.@$1.30, and screenings, 25c.@50c. Advances in domestic sizes are expected, notably in the Harlan field, where producers will price block at $3 for the first ten days in October.

THE upward swing in the Cincinnati market gained momentum during the month of September, with prices rising steadily under the influence of an active demand. Smokeless producers shared in the increased business and by the middle of the month the mines were oversold or had accounted for their surplus. October circulars contained a 50c. increase in prices, the largest in many months. Premium high-volatile shippers had no trouble in disposing of their product, but those producing the lower grades did not get into a favorable position until the last of the month. Some premium coals began the month of October at $4, and the better grades ranged from $3 up. Egg was draggy, though mine-run and screenings picked up during September. Retail business speeded up with the mid-month advances on smokeless coals. Current prices in the last half were as follows: smokeless lump, $8@$8.25, mine-run $6@$6.25; bituminous lump, $6@$6.25; slack, $4.

A demand for domestic sizes was the chief feature of the Columbus market in September. Retailers were busy with orders from householders and, because of small stocks, bought freely throughout the month. Smokeless and splint varieties were in the best demand, though Kentucky block moved freely. Hocking and Pomeroy coals, however, did not command the same favor as the others. Mine prices were firm, with some advances in various districts. Steam sizes, however, showed little strength and screenings weakened materially in response to the increased production of large sizes. Industrial consumers, as a rule, took minimum tonnages on contracts and resorted to the spot market for part of their needs. Slack prices declined during the month to the following: splint slack 50c.@$1; smokeless, $1.25. Retail prices were unchanged, with smokeless lump and egg at $8.25; premium splint lump and egg, $6.25@$6.75; Hocking and Pomeroy lump, $5.50.

Prices in the Pittsburgh market stiffened somewhat in the month of

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

LOW-VOLATILE, EASTERN	Market Quoted	Week Ended Sept. 7, 1929	Sept. 14, 1929	Sept. 21, 1929	Sept. 28, 1929
Smokeless lump	Columbus	$3.00@$3.25	$3.25@$3.50	$3.25@$3.50	$3.25@$3.50
Smokeless mine-run	Columbus	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.30
Smokeless screenings	Columbus	1.15@ 1.30	1.15@ 1.30	1.15@ 1.25	1.15@ 1.25
Smokeless lump	Chicago	3.25@ 3.75	3.25@ 3.75	3.25@ 3.75	3.25@ 3.75
Smokeless mine-run	Chicago	1.85@ 2.25	1.85@ 2.25	1.85@ 2.25	2.10@ 2.25
Smokeless lump	Cincinnati	3.00@ 3.50	3.00@ 3.75	3.00@ 3.75	3.25@ 4.00
Smokeless mine-run	Cincinnati	2.00@ 2.25	2.10@ 2.25	2.15@ 2.25	2.25@ 2.50
Smokeless screenings	Cincinnati	1.25@ 1.35	1.25@ 1.35	1.25@ 1.35	1.25@ 1.35
*Smokeless mine-run	Boston	4.25@ 4.35	4.30@ 4.40	4.35@ 4.50	4.35@ 4.60
Clearfield mine-run	Boston	1.60@ 1.85	1.60@ 1.85	1.65@ 1.85	1.65@ 1.85
Cambria mine-run	Boston	1.75@ 2.00	1.75@ 2.00	1.80@ 2.00	1.80@ 2.10
Somerset mine-run	Boston	1.70@ 1.90	1.70@ 1.90	1.75@ 1.90	1.75@ 1.95
Pool 1 (Navy Standard)	New York	2.10@ 2.35	2.10@ 2.45	2.10@ 2.45	2.10@ 2.45
Pool 1 (Navy Standard)	Philadelphia	2.25@ 2.60	2.25@ 2.60	2.25@ 2.60	2.25@ 2.60
Pool 9 (super. low vol.)	New York	1.70@ 1.90	1.70@ 2.15	1.70@ 2.15	1.70@ 2.15
Pool 9 (super. low vol.)	Philadelphia	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pool 10 (h. gr. low vol.)	New York	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Pool 10 (h. gr. low vol.)	Philadelphia	1.55@ 1.75	1.55@ 1.75	1.55@ 1.75	1.55@ 1.75
Pool 11 (low vol.)	New York	1.35@ 1.40	1.35@ 1.40	1.35@ 1.40	1.35@ 1.40
Pool 11 (low vol.)	Philadelphia	1.45@ 1.65	1.45@ 1.65	1.45@ 1.65	1.45@ 1.65
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.)	New York	$1.20@$1.35	$1.20@$1.35	$1.20@$1.35	$1.20@$1.35
Pool 54-64 (gas and st.)	Philadelphia	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40	1.15@ 1.40
Pittsburgh sc'd gas	Pittsburgh	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00
Pittsburgh gas mine-run	Pittsburgh	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
Pittsburgh mine-run	Pittsburgh	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75
Pittsburgh slack	Pittsburgh	1.00@ 1.10	1.00@ 1.10	1.00@ 1.10	1.00@ 1.10
Kanawha lump	Columbus	1.90@ 2.10	2.00@ 2.25	2.00@ 2.25	2.00@ 2.30
Kanawha mine-run	Columbus	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60
Kanawha screenings	Columbus	.60@ .90	.60@ .85	.50@ .80	.50@ .75
W. Va. lump	Cincinnati	1.75@ 2.50	2.00@ 2.75	2.10@ 2.75	2.25@ 3.00
W. Va. gas mine-run	Cincinnati	1.35@ 1.50	1.40@ 1.60	1.35@ 1.60	1.40@ 1.60
W. Va. steam mine-run	Cincinnati	1.15@ 1.35	1.15@ 1.35	1.15@ 1.40	1.20@ 1.40
W. Va. screenings	Cincinnati	.50@ 1.00	.50@ 1.00	.60@ 1.00	.60@ 1.00
Hocking lump	Columbus	1.75@ 2.10	1.80@ 2.10	1.90@ 2.25	1.90@ 2.25
Hocking mine-run	Columbus	1.35@ 1.60	1.35@ 1.65	1.35@ 1.65	1.35@ 1.65
Hocking screenings	Columbus	1.00@ 1.15	.90@ 1.10	.90@ 1.10	.90@ 1.10

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

September and retailers scheduled an advance of 25c., effective Oct. 1. Mine prices on domestic sizes also advanced slightly and are expected to go higher in the future, but steam and gas coals failed to improve, due, it is said, to the desire of some producers to operate at capacity. Movement from the district during the month was somewhat heavier, though shipments were mostly on old orders and new buying was of the hand-to-mouth variety. No general slackening is expected at the close of the lake season, despite the heavy movement in that direction. Screenings, particularly those for steam use, varied throughout the month, being $1 at first and declining to 80c.@90c. at the last. Quotations on gas slack, mine-run and ¾-in. lump remained practically uniform.

CENTRAL PENNSYLVANIA operators were hopeful of getting increased prices for their product in the near future as a result of increased demand in September. Quotations at the last of the month were as follows: Pools 11 and 18, $1.70@$1.85; Pool 10, $1.95 @$2.10; Pool 9, $2.15@$2.25; Pool 71, $2.25@$2.35; Pool 1, $2.40@$2.65.

Ascending prices and a mild scramble for coal featured the New England market in September. No. 1 Navy Standard smokeless mine-run was quoted at $4.35@$4.60, f.o.b. vessels, Virginia terminals, and in some instances $4.70 was asked. Nut and slack did not show as great an advance but passed the $4 mark. On cars at Boston and Providence for inland delivery, the price of mine-run was $5.75. Stoker coals for prompt shipment went at $5@$5.10 on cars. All-rail shipments from Pennsylvania also developed signs of strength, fostered by the advances in tidewater prices.

Slight but distinct gains in demand from week to week were registered in the Philadelphia market in September. Storage business showed signs of picking up to the encouragement of dealers. The tidewater situation improved slightly and seven export cargoes were cleared, as against three in August. Bunkering showed little changed. Prices were still too low in the opinion of the trade, but a brisker market is expected to correct this situation.

IMPROVEMENT in the domestic situation featured the Birmingham market in September. Standard grades moved easily but those of lower quality were draggy. Cool weather in the latter part of the month caused an increase in inquiries and storage on the part of householders to the benefit of the retail dealers. Although price schedules in the main covered only the month of September, little advance is expected in the future. Steam coal moved very slowly throughout the month. Industrial users and railroads confined their tonnages to the minimum but byproduct coke plants absorbed a larger supply. Prices showed little change over the month.

Conditions in the New York market in September were satisfactory, with consumers showing more inclination to buy more than their actual requirements. Coal moved more rapidly than in the previous month and many new orders were received, resulting in a generally better tone throughout. Prices did not, however, change much from those of previous weeks. Optimism prevailed as the future and producers expect a busy fall and winter.

Considerable activity was manifested in the New York anthracite market in September. Dealer demand was particularly strong in the last two weeks in anticipation of advances of 10c. a ton on domestic sizes and 25c. on No. 1 buckwheat, scheduled for Oct. 1. Expiration of the special summer discount, which was designed to assist the retailer in merchandising his coal during the summer months, on Sept. 30 also was a factor in the increased buying. All the larger sizes with the exception of pea coal moved steadily throughout the month. No. 1 buckwheat was in particular demand, some of the larger independents refusing orders for immediate delivery. Quotations on this size for tidewater shipment were $2.75. October started off with a heavy demand and a brisk trade is predicted for the balance of the year.

PREVIOUS price advances and warm weather tended to slow up the Philadelphia anthracite market in the month of September. Cool weather at the last, however, stimulated buying and the situation on the whole showed some improvement. Improved demand and discontinuance of the summer discount are expected to result in some immediate increase in buying. Stove and nut were very active among the domestic sizes and buckwheat set the pace in the steam range. Other sizes in both domestic and steam coals exhibited about the usual activity of the season.

Exports of bituminous coal from the United States in August—the latest month for which figures are available—were 1,440,952 gross tons, as compared with 1,734,565 gross tons in the preceding month and 1,606,021 gross tons in August, 1928. Anthracite exports in August, 1929, materially exceeded those for the same month last year, the figures being 1,748,777 and 277,771 gross tons, respectively. Coke exports were 85,912 gross tons in August, 1929, as compared to 69,890 tons in August of last year. Canada was, as usual, the best customer, taking 1,232,810 gross tons of bituminous coal as compared to 1,461,508 tons in July and 1,470,356 tons in August, 1928. Italy was second, with 45,814 gross tons of bituminous coal as compared to 15,171 tons in August a year ago.

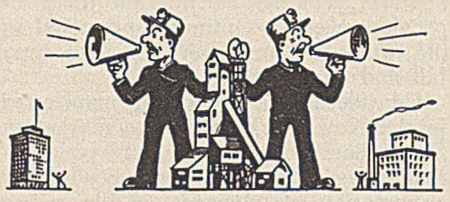
EFFORTS are being made in Canada to increase the use of British-mined coal. J. H. Thomas, of the British Cabinet, recently returned to England with promises that the British product would be used wherever it would displace other foreign coals. No effort, however, will be made to substitute coal from Great Britain for the Canadian product. The tentative plan involves the exchange of Canadian wheat for British coal.

Imports of coal into the United States in the month of August were 30,982 gross tons of bituminous coal, 24,835 gross tons of anthracite and 14,750 tons of coke. The figures for July a year ago were: Bituminous coal, 36,830 gross tons, anthracite, 22,627 tons, and coke, 19,190 tons.

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

		Week Ended			
MIDDLE WEST	Market Quoted	Sept. 7, 1929	Sept. 14, 1929	Sept. 21, 1929	Sept. 28, 1929
Franklin, Ill. lump	Chicago	$3.15	$3.15	$3.15	$3.15
Franklin, Ill. mine-run	Chicago	2.15	2.15	2.15	2.15
Franklin, Ill. screenings	Chicago	1.00@ 1.60	1.00@ 1.60	.90@ 1.60	.90@ 1.60
Central, Ill. lump	Chicago	2.40@ 2.65	2.40@ 2.65	2.40@ 2.65	2.40@ 2.65
Central, Ill. mine-run	Chicago	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85	1.75@ 1.85
Central, Ill. screenings	Chicago	.80@ 1.25	.80@ 1.25	.80@ 1.25	.80@ 1.25
Ind. 4th vein lump	Chicago	2.25@ 3.40	2.25@ 3.40	2.25@ 3.40	2.75@ 3.40
Ind. 4th vein mine-run	Chicago	1.50@ 1.90	1.50@ 2.10	1.50@ 2.10	1.50@ 2.10
Ind. 4th vein screenings	Chicago	1.00@ 1.40	.85@ 1.35	.85@ 1.35	.85@ 1.25
Ind. 5th vein lump	Chicago	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	2.00@ 2.25
Ind. 5th vein mine-run	Chicago	1.00@ 1.75	1.15@ 1.75	1.15@ 1.75	1.25@ 1.75
Ind. 5th vein screenings	Chicago	.70@ 1.10	.50@ 1.10	.50@ 1.10	.50@ .90
Mount Olive lump	St. Louis	2.50@ 2.65	2.50@ 2.65	2.50@ 2.65	2.50@ 2.65
Mount Olive mine-run	St. Louis	1.75	1.75	1.75	1.75
Mount Olive screenings	St. Louis	.60	.60	.60	.60
Standard lump	St. Louis	1.85@ 2.15	1.85@ 2.15	1.85@ 2.15	1.85@ 2.15
Standard mine-run	St. Louis	1.65	1.65	1.65	1.65
Standard screenings	St. Louis	.40@ .60	.40@ .60	.40@ .60	.40@ .60
West Ky. block	Louisville	1.60@ 1.80	1.60@ 1.85	1.60@ 1.85	1.75@ 2.25
West Ky. mine-run	Louisville	.85@ 1.25	.90@ 1.30	.90@ 1.30	.90@ 1.30
West Ky. screenings	Louisville	.50@ .75	.35@ .50	.35@ .50	.25@ .50
West Ky. block	Chicago	1.40@ 1.85	1.75@ 1.85	1.75@ 2.00	2.00@ 2.25
West Ky. mine-run	Chicago	.85@ 1.00	.85@ 1.25	.85@ 1.25	.85@ 1.25
SOUTH AND SOUTHWEST					
Big Seam lump	Birmingham	$2.25	$2.25	$2.25	$2.25
Big Seam mine-run	Birmingham	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Big Seam (washed)	Birmingham	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
S. E. Ky. block	Chicago	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
S. E. Ky. mine-run	Chicago	1.20@ 1.60	1.20@ 1.60	1.20@ 1.60	1.30@ 1.60
S. E. Ky. block	Louisville	2.15@ 2.50	2.25@ 2.65	2.25@ 2.65	2.25@ 2.75
S. E. Ky. mine-run	Louisville	1.25@ 1.60	1.30@ 1.60	1.30@ 1.60	1.25@ 1.65
S. E. Ky. screenings	Louisville	.60@ 1.00	.60@ 1.00	.50@ 1.00	.50@ 1.00
S. E. Ky. block	Cincinnati	1.85@ 2.50	2.00@ 2.75	2.25@ 3.00	2.25@ 3.00
S. E. Ky. mine-run	Cincinnati	1.15@ 1.50	1.20@ 1.55	1.20@ 1.60	1.25@ 1.60
S. E. Ky. screenings	Cincinnati	.50@ 1.00	.50@ 1.00	.50@ 1.00	.60@ 1.00
Kansas shaft lump	Kansas City	3.75	3.75@ 4.00	3.75@ 4.00	3.75@ 4.00
Kansas strip lump	Kansas City	3.00	3.00	3.00	3.00
Kansas mine-run	Kansas City	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75
Kansas crushed mine-run	Kansas City	1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Kansas screenings	Kansas City	1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75

WORD *from the* FIELD



Lehigh & Wilkes-Barre Sold to Glen Alden

Acquisition of the Lehigh & Wilkes-Barre Coal Co. by the Glen Alden Coal Co., subject to the approval of the stockholders of both companies, was announced Sept. 24, by Major W. W. Inglis, president of the Glen Alden company. Major Inglis, in a statement, said that "Negotiations have been completed whereby, subject to the approval of the stockholders of both companies, the Glen Alden Coal Co. will take over the physical property of the Lehigh & Wilkes-Barre Coal Co., located in the State of Pennsylvania, paying therefor 676,700 shares of Glen Alden company stock." No statement was made as to the price of the stock.

According to the Pennsylvania State Department of Mines, the Glen Alden production in 1928 was 8,442,559 gross tons and that of the Lehigh & Wilkes-Barre was 5,267,854 gross tons, or a total of 13,710,413 gross tons. If the purchase is approved, the Glen Alden company will be the largest producer in the anthracite region, the Philadelphia & Reading Coal & Iron Co. being second in 1928, with a production of 9,188,425 gross tons.

In commenting on the proposed merger, Charles F. Huber, president, Lehigh & Wilkes-Barre Coal Co., said: "The opportunity for economy in management was one of the controlling factors in what is now proposed."

Mine Timber Committee To Set Standards

Committees of the coal and metal mining branches of the standardization division of the American Mining Congress have been combined and enlarged to include representatives of all interests desiring participation in the development of a national standard covering the preservative treatment of mine timbers.

Members of the committee are as follows: George M. Hunt, Forest Products Laboratory, Madison, Wis., chairman; R. L. Adams, Old Ben Coal Corporation, Christopher, Ill.; W. L. Affelder and M. E. Haworth, Hillman Coal & Coke Co., Pittsburgh, Pa.; R. W. Austin, American Mond Nickel Co., Clearfield, Pa.; Dr. H. C. Gardiner, Anaconda Copper Mining Co., Anaconda, Mont.; J. H. Hensley, Miami Copper Co., Miami, Ariz.; J. L. Hyde, Cleveland-Cliffs Iron Co., Ishpeming, Mich.; J. C. Quade, Saline County Coal Corporation, Harrisburg, Ill.; M. H. Sellers, Chicago, Wilmington & Franklin Coal Co., Chicago, Ill.; D. A. Stout, Colorado Fuel & Iron Co., Pueblo, Colo.; C. N. Kerr, American Wood Preservatives Association, Chicago; Gerald Sherman, Phelps Dodge Corporation, Douglas, Ariz.; J. A. Helson, Joyce-Watkins Co., Metropolis, Ill.; D. C. Jones, Ayer & Lord Tie Co., Chicago, and H. E. Tufft, Grasselli Chemical Co., Cleveland, Ohio.

Illinois and Iowa Push Home-Mined Coal

Coal dealers in Illinois were asked to push the sale of Illinois-mined coal and the public was requested by Governor Louis L. Emmerson, in a letter dated Sept. 23, to co-operate by specifying Illinois coal in its orders. Pointing out that the consumption of coal in the state was approximately 76,000,000 tons a year, of which 54,000,000 tons was produced within the borders of the state, Governor Emmerson said that "through united effort, consumption of Illinois coal might be increased 20,000,000 tons a year. Each million added tons produced would afford a living for 1,000 families."

Continued efforts to rehabilitate the Iowa coal-mining industry resulted in the formation, at Albia, Ia., Sept. 14, of the Iowa Coal Institute, a permanent organization with a board of directors of fifteen members. C. S. Harper, Ottumwa, head of the investigating committee appointed at the Albia conference last July, was made president. Eight suggestions for the use of the new organization were offered, as follows: Inauguration of a good-will campaign through the chambers of commerce; initiation of an advertising campaign to stress the economy and merit of Iowa coal; assistance to operators in putting over a concentrated sales drive; institution of dealer service; more thorough preparation; co-operation with Governor Hammill's committee for research on Iowa coal; reduction of intrastate freight rates, and the formation of a permanent committee with a paid secretary.

Merchandising to Be Theme Of N. C. A. Meeting

Merchandising will be the principal subject of discussion at the twelfth annual meeting of the National Coal Association, to be held at the Hotel Sinton, Cincinnati, Ohio, Oct. 23-25. However, the program will be sufficiently broad to interest everyone connected with coal mining. Among the other subjects singled out for attention are safety, trade-practice codes and anti-injunction legislation.

Automatic heating, the problems of retail merchandising and the history of the trade-practice movement will be taken up on Oct. 23. Safety will be discussed Oct. 24 by an operator from each of the major producing fields. On the same day, Walter Barnum, chairman, Market Research Institute, will report on a survey of the trade-practice movement, followed by representatives from each of the districts which have adopted codes.

The afternoon of Oct. 24 will be devoted to a discussion of "The Producer's Marketing Problems," under the direction of J. B. Pauley, chairman of the board, Miami Coal Co., Chicago, Ill. All the ramifications of the merchandising situation will be taken up at that time. The last session, Oct. 25, will be marked by a general discussion of the legislative situation today, the distinction between government and business, recent tax decisions of the federal courts and anti-injunction legislation. Among the speakers at that session will be Walter Gordon Merritt, counsel, Anthracite Operators' Conference and the League for Industrial Rights; William H. Coolidge, chairman of the board, Island Creek Coal Co., and Col. W. M. Wiley, vice-president, Boone County Coal Corporation, and a member of the board of directors, United States Chamber of Commerce.

Anthracite Strip Miners Get 8-Hour Day

Anthracite stripping contractors and their employees are under the terms of the general agreement between the hard-coal operators and the miners, according to a ruling by James A. Gorman, umpire, Anthracite Conciliation Board. This decision settles a long controversy between the miners and contractors in District 9, where certain contractors have insisted on the 9-hour day. Under its terms the 8-hour basis is made the standard and overtime can be worked only as provided in the general agreement.

How to Minimize Hazards in Mines Features Safety Council Sessions

HOW to make the mines of the country less hazardous was the topic which again engaged the attention of the Mining Section of the National Safety Council at the eighteenth annual meeting held at Chicago, Sept. 30-Oct. 4. The meetings of the Mining Section, which opened at the Congress Hotel on Oct. 1 and closed two days later, were presided over by George Martinson, safety engineer, Pickands, Mather & Co., Hibben, Minn., chairman.

Compulsory examination of workers and reallocation of men unfitted by accident, age or disease for one class of labor to easier work were the features of the address of A. T. St. Clair, Federal Mining & Smelting Co., Baxter Springs, Kan., which provoked the greatest discussion. His company, explained Mr. St. Clair, had no age limits and some men now at work were over 60, but it did avoid hiring old men. The company also was endeavoring to eliminate the man in bad health where and when the elimination could be effected without undue hardship.

The opposition of organized labor to compulsory examinations was stressed by a representative of one of the anthracite companies who sought further light on the question of occupational diseases. "Miners' asthma," he said, was becoming a real problem. Bituminous operators, Dan Harrington, U. S. Bureau of Mines, insisted, are deluding themselves when they think they are not affected by occupational diseases. British miners brought to Canada, he added, had been found to be afflicted with pneumocosis. The day will come, he warned, when workmen's compensation laws will cover dust diseases in the mines. There need be no fear, however, of such diseases arising from rock-dusting.

In the absence of the author, a paper on rock-dusting by F. C. Miller, safety director, Colorado Fuel & Iron Co., was briefed by Mr. Harrington. This paper covered the same ground as the address made by Mr. Miller before the Rocky Mountain Coal Mining Institute at Salt Lake City, Utah, last March (*Coal Age*, Vol. 34, p. 223).

Remarks by J. J. Forbes, U. S. Bureau of Mines, on 100 per cent first-aid training, gave rise to considerable discussion as to whether first-aid training should be made compulsory and whether the training should be taken on company time. Both Mr. Harrington and Mr. Forbes expressed the belief that such training should be on the men's time, although directly the Bureau is not concerned with that phase of the question. Jack Berry, Bethlehem Mines Corporation, stated that in the sections where foremen had been trained his company had fewer accidents and training had prevented simple fractures from developing into compound fractures.

Discipline plays a large part in accident prevention, according to A. W. Dickinson, Union Pacific Coal Co., Rock Springs, Wyo., whose paper was read at the second session of the Mining Section. The increasing number of accidents chargeable to locomotives and mine cars suggests legislative action on brakes. "The major percentage of mine cars in use in the United States are not equipped with brakes. This is criminal." Ventilation must not be neglected if the country is to have safe mines. Rock-dusting must be employed, safe shooting methods used, faces well wet down and water freely used on cutter bars. There is a field for further development in mine illumination as a safety agent. Although mechanization has introduced new hazards, "we in Wyoming," said Mr. Dickinson, "regard mechanical loading as the salvation of the coal industry from all angles, including that of safety."

In presenting the slate of sectional officers for 1929-30, John Ryan, Mine Safety Appliances Co., acting for the nominating committee, suggested that in the future a definite effort be made to select several from the same district so that meetings with the chairman may be facilitated. The slate presented and elected was as follows:

Chairman: H. C. Henry, Phelps Dodge Corporation.

First Vice-Chairman: Rush N. Hosler, Pennsylvania Compensation Rating and Inspection Bureau.

Second Vice-Chairman: H. G. Hensel, Youngstown Sheet & Tube Co.

Third Vice-Chairman: R. N. Shaub, Oliver Mining Co.

Fourth Vice-Chairman: Thomas E. Lightfoot, Koppers Coke Co.

Secretary: Daniel Harrington, U. S. Bureau of Mines.

Accident-prevention work is hampered, suggested D. D. Wilcox, Superior Coal Co., Gillespie, Ill., because it has been common to accept injury as a natural hazard of the industry. Another pet superstition is that speed necessarily causes accidents. The inherent hazards of mining vary with each operation, but there are four things, said Mr. Wilcox, "which require constant care in Illinois: (1) Gases and ventilation; (2) illumination; (3) clearance; (4) falls of roof and coal. None of these is beyond the control of competent men."

Tonnage is increased and accidents prevented by better supervision, better equipment and education. Better management, better ventilation, better track, better machines, better control of roof and better electric wiring are part of the program to prevent accidents. Tracing every accident to its cause is another and important aid. Every accident should be accepted as an object lesson and enough time and effort given to an investigation of it so that the object lesson may be used in the prevention of other accidents.

Citing a specific case, Mr. Wilcox said that a trip rider was injured at one of his company's mines and a report turned in showing a fall of slate as the cause of the injury. Investigation revealed that a car had jumped the track and knocked out a prop which let the slate down. The track was in good condition, but further investigation showed that the wheels on the car were in bad condition because of lack of lubrication.

Safety and efficiency go together, asserted Mr. Wilcox. "In fact, in industrial life there are two useless characters: the safety engineer who gives no thought to production and the manager who gives no thought to safety. A plant with either of these is not a safe or efficient place in which to work." To prove his point that safety and efficiency are not incompatible Mr. Wilcox cited a number of records, including that of his own company, where four mines between Dec. 28, 1926, and Aug. 28, 1929, had produced 7,468,013 tons with only one fatal accident.

Anthracite Institute Is Organized

Recognizing the need of a better public understanding of its objects and problems, the anthracite industry has formed the Anthracite Institute "to keep the consuming public posted on all developments in the industry, with special reference to the research work now being conducted for the benefit of domestic and commercial consumers; to protect anthracite users against unfair practices, and to promote the best interests of the anthracite industry and all engaged therein."

S. D. Warriner, president, Lehigh Coal & Navigation Co., is president of the new organization, and Eliot Farley, president, Delaware, Lackawanna & Western Coal Co., is chairman of the executive committee. Included in the membership are the head of every big hard-coal producing company and every large individual anthracite operator. Headquarters have been established in New York City and the Institute announces that it will proceed immediately on its program.

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations reported in September include the following:

Buckeye Coal & Coke Co., Devils Fork, W. Va.; contract closed with the Kanawha Mfg. Co. for four-track tipple, capacity 150 tons per hour.

Glogora Coal Co., Red Dragon, W. Va.; contract closed with the Fairmont Mining Machinery Co. for rope and button conveyor and four-track tipple, capacity 250 tons per hour; to be completed March 1, 1930.

Pittsburgh Coal Co., Pittsburgh, Pa.; contract closed with the Morrow Mfg. Co. for shaker screen installation at Eureka mine, capacity 150 tons per hour.

Rail & River Coal Co., Cleveland, Ohio; contract closed with the Morrow Mfg. Co. for steel tipple at No. 3 mine, Bellaire, Ohio, capacity 400 tons per hour. Equipment consists of weigh pan, feeder, shaker screens, loading booms, mixing conveyor and crusher.

Conference Discusses When Rope Should Be Replaced

"Rejection of hoisting rope when it has developed its second stretch" was suggested by G. P. Boomsliter, professor of mechanics, West Virginia University, Morgantown, W. Va., at the Third Conference on Wire Rope Research held in the Engineering Societies Building, New York, Sept. 13. Professor Boomsliter declared that this second stretch recalled the extension of a bar that was strained beyond its elastic limit, the greater stress being due not to any greater load in aggregate but to the greater load on the individual resistant wires due to the failure of some of them. The suggestion that the second stretch should be chosen as the point of rejection was itself made by J. S. Miller, director, research department, Lehigh Coal & Navigation Co., in a letter quoted by Professor Boomsliter and also in a letter from E. T. Sederholm, Nordberg Manufacturing Co., Los Angeles, Calif.

Mr. Miller declared that the second stretch is caused by the strands pulling into the core or by the overlapping strands changing the diameter about $\frac{1}{16}$ in. In his view this indicates that the safety limit has been reached. However, Mr. Miller would not rely on the second stretch alone but would condemn any rope that had a number of broken wires in each strand or that had a considerable number of broken wires in a short space.

Rudolph Kudlich, U. S. Bureau of Mines, Washington, D. C., declared that some had advocated the rejection of a rope as soon as it had ceased to stretch and before it commenced to stretch a second time, but he was not sure but that the difference between this and Mr. Miller's point of rejection could be easily explained. Where electric hoists are used the stresses are less than with steam hoists and therefore the rope may be rejected at a later stage; namely, when the second stretch develops.

Professor Boomsliter said that reports from 98 coal mines using wire rope show that about one-half have electric-driven hoists and one-half steam-driven. Factors of safety based on a consideration of acceleration stresses ranged from 2 to 22, the latter figure being for a man hoist. The average factor of safety for coal hoists was 3.6. The acceleration ranged between 1 ft. per second per second and 12 ft. per second per second. Many of the ropes were of superior quality, only a few being of so-called carbon steel. Two were Lang lay and five flattened strand.

The average life of rope ranged from six months to seven years. It is noteworthy that the ropes averaging seven years of life had a safety factor of 10.7 and those of six months life had a factor of safety of 2.1. The number of trips per day varied from 25 to 2,200. The rope that had the longest life made 800 trips per day. One of the mines which changed ropes every six months made 2,200 trips per day, hoisting $10\frac{1}{2}$ tons per load each trip. The ratio of diameter of drum or sheave to diameter of rope ranged from 50 to 80.

It was found that there were two critical points in a rope in regard to failure—one at the point of contact of the rope with the drum at starting and the other at the clamp at the top of the cage. The first indicates one of two things: either that the acceleration stresses are high or that the cage starts with a jerk. The other suggests that clamping is a possible weakness or that the whipping action caused by a slack rope is a cause of distress.

According to the reports received, much care is taken at mines in keeping ropes taut. One company adjusts ropes twice on the first day and once a week or oftener thereafter. Another takes them up twice shortly after being installed and no more thereafter. Another takes them up about every seven months. Still another takes up stretch whenever it amounts to 4 in.

One company reports that the underwind rope has a shorter life than the overwind, another finds little difference. Professor Boomsliter, commenting on the first experience, said it might be due to slackness in the underwind rope. He declared that apparently carelessness in socketing a rope cometimes put it out of line and weakened it.

Dr. E. A. Sperry, president, American Society of Mechanical Engineers, said that he had been studying the possibility of adapting his non-destructive weld and rail tester to the condition of ropes. He remarked that he had successfully ascertained the flaws in rope despite coatings of oil, grease, and dirt.

J. R. McCausland, superintendent, Coal Bureau, the Philadelphia Electric Co., Philadelphia, Pa., said that the men employed to use wire rope could do much to lengthen its life and that his company was having great success and the hearty co-operation from its employees to this end.

Massachusetts Gas Sold

Acquisition of 85 per cent of the common stock and more than a majority of the preferred shares of the Massachusetts Gas Co. has been announced by the Koppers Co., Pittsburgh, Pa. The Massachusetts company owns the Boston Consolidated Gas Co. and other corporations supplying gas to Boston and near-by communities, as well as the C. C. B. Smokeless Coal Co., Mount Hope, W. Va., and the New England Fuel & Transportation Co., Grant Town, W. Va.

Sues to Restrain Use Of Term "Dustless"

Claiming that he registered the word "dustless" for exclusive trade use, George W. Curran, president, Curran Coal Co., St. Louis, Mo., petitioned the circuit court on Sept. 27 to restrain the Century Coal Co., another St. Louis firm, from using the term in its advertising and also asked for $10,000 damages.

Anthracite Angles Studied By Scranton Engineers

"Stabilization of price will bring stabilization of production," said J. S. Jennings, of Thorne, Neale & Co., at the joint September meeting of the Engineers' Society of Northeastern Pennsylvania and the Anthracite-Lehigh Valley Section of the American Society of Mechanical Engineers, held at Scranton, Pa., Sept. 26. Nothing, said he, was more conducive to a delay in purchasing than a doubt in the mind of the purchaser as to whether the price quoted was the lowest he would be able to obtain during the current season. With sales below circular, business would always be delayed.

Mr. Jennings said that coal could be handled with a 1 per cent degradation. He also stated that $200,000,000 would suffice to meet all the charges of carrying consumers' coal accounts if anthracite were sold on the instalment plan.

C. R. Seem, electrical engineer, Glen Alden Coal Co., discussed in a paper the possibilities of the fine sizes of anthracite and their relation to the future of the coal business. He described the use of a worm feed for feeding coal to the domestic fire and the use of a conveyor for removing ash.

The excellent results being obtained with both kinds of equipment made it certain that in 10 years it would be generally adopted. He advocated that engineers, rather than wait for the future, should design tipples and breakers now with an eye toward the needs of 10 years hence if those needs could be determined.

New York Coal Merchants Study Trade Problems

Study of the calcium chloride treatment of anthracite by the New York State Coal Merchants' Association and of treatment of bituminous coal by the National Retail Coal Merchants' Association was recommended by the first named organization in a resolution adopted at its annual convention at Saranac Inn, N. Y., Sept. 26-28. Retailers in anthracite-consuming territory are interested not only in the dust-laying properties of the treatment but also in its anti-freeze effects.

The state association renewed its recommendation to the anthracite operators that the coal year begin May 1 instead of April 1. The retailers also asked that the spring differential be made larger next year, suggesting that it be in the neighborhood of $1 per ton. Protest against the abolition of the cash discount system inaugurated by the producers this spring and withdrawn a few days ago also was voiced.

Automatic heat through coal as the solution of the industry's competitive problems in the domestic field was advanced by Caroll B. Huntress, assistant to the executive secretary, National Coal Association. He urged a closer relationship between the sale of coal and the sale of domestic coal-burning equipment.

Coal-Mining Teams Win Safety Honors In International Meet

FORTY first-aid teams and nine mine-rescue teams, representing eighteen different states, took part in the eighth annual International First-Aid and Mine Rescue Contest, held at Kansas City, Mo., Sept. 12-14, under the auspices of the U. S. Bureau of Mines. The meet was sponsored by mining, industrial and civic organizations of Kansas City and the states of Arkansas, Iowa, Kansas, Missouri and Oklahoma.

After three days of competition the team of the Utah Copper Co., Bingham Canyon, Utah, captured first place in the first-aid contest. Second and third places went to the Colorado Fuel & Iron Co., Pueblo, Colo., and Pickands, Mather & Co., Bessemer, Mich., respectively. The Consolidation Coal Co. team from Frostburg, Md., took first place in the mine rescue event. Coal-mining teams representing the Northwestern Improvement Co., Roslyn, Wash., and the Madison Coal Corporation, Mount Olive, Ill., were, in order named, second and third.

In the combination first-aid and mine rescue contest, first honors went to the Northwestern Improvement Co., winners of the first-aid and combination first-aid and mine rescue contests last year. Second place in this contest was taken by the Madison Coal Corporation, and third by the Buckeye Coal Co., Nemacolin, Pa.

Prizes were awarded at a banquet held in the evening of Sept. 14, the last day of the meet. C. H. Mann, president, Kansas City Chamber of Commerce, spoke on "Safety and Accident Prevention," after which the prizes were awarded. Banners, cups and trophies were presented to the winning teams by Dr. R. R. Sayers, chief, health and safety branch, U. S. Bureau of Mines. Major T. J. Strickler, president, Kansas City Safety Council, presented the National Safety Council medals to the teams taking first, second and third places in the first-aid and mine rescue contest; A. W. Cantwell, assistant director, first aid and life saving, midwestern branch, American National Red Cross, presented Red Cross medals to the winning team in the first-aid contest and certificates to those taking second and third places, and Harry L. Gandy, Jr., executive secretary, National Coal Association, presented the National Coal Association cup to the winning first-aid team.

Prizes won by the Utah Copper Co. for taking first place in first aid included the Congressional Bronze Medallion, silver cup presented by *Coal Age;* silver cup presented by the Illinois Coal Operators' Association, Central Illinois Coal Operators' Association, Fifth and Ninth Districts Coal Operators' Association of Illinois, and District 12, United Mine Workers, and a silver cup presented by the National Coal Association. Individual members of the team received gold medals from the National Safety Council and bronze medals from the American Red Cross. Silver and bronze medals were presented to the teams taking second and third places. A banner also was awarded the winning team, as well as the high-scoring team from each state.

The Consolidation Coal Co. team, which took first place in the mine rescue contest, received the Congressional Bronze Medallion, a silver cup presented by *Coal Age,* silver cup presented by *Coal Mining* and a silver cup presented by the Concordia Electric Co. Members of the team received gold medals from the National Safety Council. Silver medals were presented to members of the team taking second place in mine rescue and bronze medals were awarded members of the team winning third place. Banners were presented the teams taking first, second and third places, and also to the high-scoring team from each state represented at the meet.

Prizes won by the team representing the Northwestern Improvement Co., which placed first in the combined first-aid and mine rescue contest, included the Joseph A. Holmes Challenge Trophy, awarded by the Joseph A. Holmes Safety Association; silver cup presented by the National Safety Council and a silver cup presented by the Mine Safety Appliances Co. Awards to individual members of the team included replicas of the Mine Safety Appliances cup. Members of the teams taking second and third places received automobile kits from the Mine Safety Appliances Co. and banners were awarded the three winning teams.

Officials of the meet were as follows: Chief judges of the first-aid contest, J. V. Berry, chief of mine safety, mine rescue and first aid, Bethlehem Mines Corporation, Johnstown, Pa.; Dr. R. W. Holbrook, president, Jackson County Medical Society, Kansas City, Mo.; A. W. Cantwell, assistant director, first aid and life saving, midwestern branch, American National Red Cross, St. Louis, Mo.; chief judge, mine rescue contest, W. G. Duncan, associate professor of mining extension, Pennsylvania State College, State College, Pa.; chief recorder, Dr. A. R. Knoeful, Terre Haute, Ind.; chief timekeeper, W. E. Holland, state mine inspector, Centerville, Iowa.

Scott Turner

Director of the U. S. Bureau of Mines, will sail Oct. 10 to attend the World Engineering Congress, Tokyo, Japan. Mr. Turner was appointed by President Hoover as one of five federal engineers to represent the United States government. He also will represent the American Committee of the World Power Conference and has been appointed official representative of the Canadian Institute of Mining and Metallurgy, the University of Michigan and the Michigan College of Mining and Technology. In addition, Mr. Turner is listed as a member of the official party representing the American Institute of Mining and Metallurgical Engineers.

Safety Meets Held

First prize in the twenty-third annual first-aid meet of the Pennsylvania Coal Co. and the Hillside Coal & Iron Co., held at Pittston, Pa., on Sept. 21, was won by the team representing the No. 7 shaft, Ewen Colliery, Pennsylvania Coal Co. The winning score was 99 per cent.

Seven teams were entered in the Routt County First-Aid Contest, held at Hayden, Colo., Sept. 12, under the auspices of the Routt County Coal Operators' Association. A team representing the P.K. mine of the Pinnacle Kemmerer Fuel Co. won first place with a score of 99.25 per cent.

Davis Estate Sues

Suit against five former directors of the now insolvent West Virginia Coal & Coke Co. to recover $197,768 in stock dividends with interest from 1917 was begun in the Supreme Court Sept. 23, by trustees under the will of Henry Gassaway Davis, late Senator from West Virginia. The action is based on a decree in the Circuit Court of Randolph County (West Virginia) last November, which establishes the plaintiffs' title to accumulated dividends on their preferred stock in the former company. The complaint asserts that the money made available for dividends was misapplied and dissipated, and asks that the directors reimburse the plaintiffs.

Miners Urge Commission

Adoption of pending legislation for a federal coal commission similar to the Interstate Commerce Commission to deal with coal as a public utility was urged upon President Hoover and Congress in a resolution adopted at a convention of District 31, United Mine

Workers, held Sept. 8, at Osage, in the Scotts Run region of West Virginia.

The convention also passed resolutions indorsing shorter working hours and fewer working days per week to combat overproduction and condemned the alleged policy of some operators to refuse employment to workers over 40 years old. Delegates pledged themselves to continue efforts to complete the organization of the United Mine Workers in West Virginia and asked President Hoover to call a conference of railroad officials, mine workers and coal operators to work out a "reasonable rate" for fuel coal sold to railroads.

Earnings and Employment Decrease in June

Employment in coal mining—anthracite and bituminous coal combined—decreased 4.2 per cent in July, 1929, as compared with June, and payroll totals were 10.7 per cent smaller, according to the monthly *Labor Review* of the U. S. Department of Labor. The 1,317 mines reporting had in July 274,205 employees, whose combined earnings in one week were $6,246,650.

Adverse seasonal market conditions prevailed in the anthracite industry and employment fell off 10.4 per cent in July, while payroll totals decreased 19.8 per cent. Employment in bituminous coal mines was 0.7 per cent lower in July, 1929, than in June, and payroll totals were 4.8 per cent lower. These figures are based upon reports from 1,155 mines, in which there were in July 180,489 employees, whose combined earnings in one week were $4,148,196. The South Atlantic, West South Central and Pacific geographic divisions each reported increased employment, while there were fewer employees in the five remaining divisions for which bituminous coal is reported.

Employment and Payrolls in Identical Bituminous Coal Mines In June and July, 1929

		Number on Payroll			Amount of Payroll		
	Mines	June, 1929	July, 1929	Per Cent Change	June, 1929	July, 1929	Per Cent Change
Middle Atlantic	368	60,176	59,708	—0.8	$1,521,385	$1,478,202	—6.1
East North Central	169	26,902	26,553	—1.3	636,860	602,161	—5.4
West North Central	53	4,058	3,885	—4.3	94,445	83,843	—11.2
South Atlantic	249	40,121	40,258	+0.3	979,335	940,335	—4.0
East South Central	206	39,621	39,434	—0.5	825,277	794,861	—3.7
West South Central	26	1,341	1,362	+1.6	27,687	25,404	—8.2
Mountain	74	8,179	7,492	—2.9	233,543	233,109	—0.2
Pacific	10	1,343	1,347	+0.3	38,499	39,714	+3.2
All divisions	1,155	181,741	180,489	—0.7	$4,357,279	$4,148,196	—4.8

Per Cent Change in Each Line of Employment, June to July, 1929

		Employment			Payroll in One Week		
	Establishments	June, 1929	July, 1929	Per Cent Change	June, 1929	July, 1929	Per Cent Change
Manufacturing	12,572	3,586,335	3,571,163	*—0.6	$99,362,798	$94,503,231	*—4.5
Coal mining	1,317	286,373	274,205	—4.2	7,198,908	6,426,650	—10.7
Anthracite	162	104,632	93,716	—10.4	2,841,629	2,278,454	—19.8
Bituminous	1,155	181,741	180,489	—0.7	4,357,279	4,148,196	—4.8
Metalliferous mining	354	63,780	62,346	—2.2	1,948,118	1,825,632	—6.3
Quarrying and non-metallic mining	656	39,085	38,374	—1.8	1,058,663	1,003,663	—5.2
Public utilities	9,017	710,065	718,539	+1.2	20,846,352	21,275,568	+2.1
Trade	6,630	260,042	252,796	—2.8	6,579,757	6,475,040	—1.6
Wholesale	1,530	54,191	54,827	+1.2	1,641,573	1,672,061	+1.9
Retail	5,100	205,851	197,969	—3.8	4,938,184	4,802,979	—2.7
Hotels	1,828	145,467	148,047	+1.8	†2,438,128	†2,464,339	+1.1
Canning and preserving	353	24,924	41,256	+65.5	411,916	625,689	+51.9
Total	32,892	5,116,071	5,106,726	—0.2	$139,844,640	$134,599,602	—3.8

*Weighted per cent of change for the combined 54 manufacturing industries; the remaining per cents of change, including total, are unweighted. †Cash payments only.

Percentage Depletion Urged

Depletion based on a percentage of net income in lieu of 1913 value or discovery value has been recommended to the joint House and Senate Committee on Internal Revenue Legislation by the division of investigation of that committee, L. H. Parker, chairman. The report states that a comparison of the depletion allowed the coal-mining industry and that allowed other extractive industries is unfavorable to coal mining. "The present system results in taking away from the bituminous coal industry a large percentage of its profits in taxes in the infrequent years of prosperity. It appears, therefore, that a substitute method is desirable." Salient facts included in the report are shown in the accompanying tables.

The report states that the taxable net income is reduced by depletion on an average of 44.5 per cent in the case of metal mines and only 16.4 per cent for coal mines. Instability of revenue and inequities as among the different taxpayers under the usual accounting theory were discussed by the investigators and the conclusion reached that uniformity and equity of allowance would be advanced and administration of the tax laws simplified if one general yardstick be used to measure allowable depletion reduction.

Three possible plans were considered by the investigators. These were: (1) a fixed rate per unit of product; (2) a percentage of the gross earnings, and (3) a percentage of the net earnings before depletion. The conclusion reached was that the last plan is best. For purposes of obtaining comparative figures for the various mining and quarrying industries two rates were applied to income statistics available in the income tax returns of past years. In the one case the rate of 33⅓ per cent was applied to the net income before depletion; in the second case a rate of 40 per cent was applied to net income after it had been adjusted by an amount equal to 6 per cent upon the plant investment. Application of the second plan was found by the investigators to iron out many of the inequities shown by the first.

Study of past returns showed that 31.7 per cent was the actual average deduction allowed mines and quarries for depletion under the present statutory requirements. This fact gave rise in

Percentage of Tax Paid

	Coal Mining	Metals	Oil and Gas
1916	15	48	30
1917	..	..	..
1918	40	12	31
1919	24	4	51
1920	61	2	23
1921	48	2	33
1922	50	7	15
1923	50	11	15
1924	20	11	38
1925	10	14	61
1926	19	20	43

Percentage of Depletion to Net Income Before Depletion

	1924	1925	1926
Mining and quarrying	41.8	32.6	31.5
Coal mining	20.0	13.6	15.7
Copper	64.0	....	....
Iron	77.2	....	....

Ratio of Depletion to Capital Stock

	1924	1925	1926
Coal mining	1.03	1.35	1.19
Metals	4.73	5.63	5.18
Oil and gas	7.47	7.13	7.30
Quarrying	0.63	0.96	0.80

Ratio of Cash Dividends to Capital Stock

	1924	1925	1926
Coal mining	....	2.38	3.25
Metals	....	4.75	7.25
Oil and gas	....	7.38	8.38
Quarries	....	5.63	5.10

Ratio of Profit to Fair Value of Capital Stock

	1924	1925	1926
Coal mining	....	....*	2.75
Metals	....	3.38	5.38
Oil and gas	....	10.38	8.10
Quarrying	....	11.38	10.75

*Loss of 0.75 per cent.

the report to the statement that the use of a uniform rate applicable to all classes of mining would increase materially the depletion allowance to coal mining and decrease it for oil and gas and for metals, effecting a material change in the distribution of the tax burden. The investigators concluded that "The copper industry receives too much depletion, while the coal industry receives inadequate allowance."

Tables were introduced to show for the five-year period ending in 1926 the percentage of net profits distributed in dividends. This figure for all industry was 59 per cent; mining and quarrying, 187 per cent; metals, 174 per cent; oil and gas, 112 per cent; coal mining (three years), 81.35 per cent, and coal mining (1926), 118 per cent. In coal mining, losses were incurred in 1924 and 1925. The year 1926 showed a gain of $53,534,970 and distributions of $63,145,603, giving a ratio of 118.

Obituary

William A. Paine, president, West Virginia Pittsburgh Coal Co., with headquarters in Cleveland, Ohio, and mines in the Panhandle of West Virginia, died Sept. 24 at his summer home, Beach Bluffs, Mass. Mr. Paine, who was 74 years old, also was the senior member of the Boston investment banking house of Paine, Webber & Co.

Alabama Institute Studies Trade Practices

Members of the Alabama Mining Institute considered the trade-practice situation at their twenty-first annual meeting, held Sept. 30, at the Hotel Tutweiler, Birmingham. After hearing E. C. Mahan, president, National Coal Association, on the operation of the trade-practice movement in the southern Appalachian fields, and R. E. Howe, secretary, Southern Appalachian Coal Operators' Association, the Institute decided that as soon as material could be gathered from other fields a special meeting would be called at which affirmative action on a plan would be taken.

C. B. Huntress, assistant to the executive secretary, National Coal Association, urged the advisability of a united advertising campaign on the part of the industry as a means of selling itself to the public. Calling on the industry to "let the world know that heating in an ultra-modern sense can be had through coal," Mr. Huntress said that "coal heat, rather than coal, must be sold, and it is up to the producers to work out a feasible plan along that line with the retailers."

At the annual election the following members of the board of governors were chosen for three-year terms: D. E. Wilson, vice-president, Woodward Iron Co., Woodward, Ala.; Howard N. Brooks, vice-president and sales manager, Alabama Fuel & Iron Co., Birmingham, and Harold McDermott, vice-president and general manager, New Castle Coal Co., Birmingham.

Stocking Results in Rise In Coal Reserves

Stocks of anthracite and bituminous coal in the hands of industrial consumers in the United States and Canada on Sept. 1 totalled 34,289,000 tons, according to the monthly report of the National Association of Purchasing Agents. This is an advance of approximately 1,500,000 tons over Aug. 1. Total consumption was reduced slightly in August to 34,361,000 tons. Stocking, however, increased, the number of days' supply on hand rising from 29 to 31 days as of Sept. 1.

Equipment Firm to Enlarge

A program of expansion involving the immediate expenditure of $100,000 has been announced by C. H. Drazy, vice-president, Fairmont Mining Machinery Co., Fairmont, W. Va. New machinery will be purchased, the structural steel shop enlarged, a modern foundry equipped with overhead cranes will be built and the steel storage enlarged. These improvements are expected to double the present output and others will be added as the volume of business justify them.

Improvements in manufacturing practice also are contemplated. The mining industry, according to the announcement, is to be offered a standard line of tipple equipment with finer than usual specifications, and the number of specialties, such as mine pumps and mine ties, is to be increased. Steps also are being taken to offer a complete preparation service, including, in addition to sizing equipment, the Peale-Davis pneumo-gravity system of cleaning coal.

Labor Dissension Grows In Illinois

Innuendo has given way to open charges of corruption in the bitter fight between the international organization of the United Mine Workers and District 12.

Despite this warfare, however, both factions seem to be supporting the wage agreement. A rumor that the agreement had not been officially signed by the labor leaders threatened a strike, but at a recent mass meeting in West Frankfort, Ill., the provisional subdistrict officials named by John L. Lewis some time ago disabused the men of that idea.

Miners employed by the National Fuel Co., the Boulder Valley Coal Co. and the Russell Coal Co., in northern Colorado, have filed petitions with the Colorado Industrial Commission asking for the same rates of wages now being paid by the Rocky Mountain Fuel Co., which some time ago recognized the union. The campaign, it is reported, has received the indorsement of the executive board of the international union.

Organization activities are continuing in southern West Virginia. Rallies were recently held in Boone and Kanawha counties, where Capt. Percy Tetlow, president of District 17, is in charge of the work. The union also claims that over 1,000 men joined the organization in northern West Virginia at a meeting at Osage on Sept. 8.

Urge Coal Storage Month

A campaign for a National Coal Storage Month next year has been launched by the directors of the National Retail Coal Merchants' Association. Indorsement of the idea was given at a meeting held at Saranac Inn, N. Y., Sept. 26. The proposal is to enlist all interests in a campaign to concentrate some time next year in promotional work to induce more early buying by the consumer.

Personal Notes

J. W. Bischoff, formerly general superintendent, West Virginia Coal & Coke Co., Omar, W. Va., has been made general manager of the new West Virginia Coal & Coke Corporation.

William P. Cayton, formerly auditor and assistant to the president, has been elected president of the Rail & River Coal Co., Cleveland, Ohio. Mr. Cayton entered the service of the Pittsburgh Coal Co. in 1902 and in 1910 went with the Rail & River company.

D. H. Pape, formerly assistant to the president, Cosgrove-Meehan Coal Co. of Pennsylvania, Johnstown, Pa., has been elected vice-president in charge of sales, Eastern division, Cosgrove & Co., Inc.

Charles Gottschalk, vice-president in charge of operations, Big Vein Coal Co., Indianapolis, Ind., has been appointed a member of Indiana Mining Board, vice William Johnson, Vincennes, Ind., resigned. Michael Ferguson, Terre Haute, was appointed as representative of the mine workers to succeed Harvey Cartwright.

F. B. Dunbar, formerly general superintendent, Hillman Coal & Coke Co., Pittsburgh, Pa., has assumed his duties as general manager of Pickands, Mather & Co., and will make his headquarters at Mather, Pa.

Coming Meetings

Illinois Coal Operators' Labor Association; annual meeting Oct. 15, Union League Club, Chicago.

Kanawha Coal Operators' Association; annual meeting Oct. 17, at Kanawha Country Club, Charleston, W. Va.

National Coal Association; twelfth annual meeting Oct. 23-25, at Sinton Hotel, Cincinnati, Ohio.

Illinois Mining Institute; annual meeting Nov. 8 and 9, at Danville, Ill.

Southern Appalachian Coal Operators' Association; annual meeting Nov. 15, at Knoxville, Tenn.

Indiana Coal Operators' Association; annual meeting Nov. 19, at Terre Haute, Ind.

The National Industrial Traffic League; annual meeting Nov. 20-21, at the Palmer House, Chicago, Ill.

Bureau of Mines Approves Explosives

Changes in the active list of permissible explosives made by the U. S. Bureau of Mines in September are as follows:

Changes in List of Permissible Explosives During September

	Vol. Poisonous Gases	Characteristic Ingredient	Weight of 1¼x8-in. Cartridge, Grams	Smallest Permissible Diameter, Inches	Unit Deflective Charge, Grams	Rate of Detonation in 1¼-in. Diameter Cartridge, Ft. per Sec.
[1]Black Diamond No. 11.....	B	1a	123	[illegible]	228	6,860
[1]Black Diamond No. 12.....	C	1a	106	[illegible]	234	7,810
[2]*Big Red No. 8............	B	1a	124	[illegible]	207	9,640

[1]Illinois Powder Mfg. Co., St. Louis, Mo. [2]Equitable Powder Mfg. Co., East Alton, Ill.
*Same as Coalite, M, L.F.

Washington Letter

By R. E. Saunders
Special Correspondent

AS THE RESULT of labor shortages that are being reported in the coal-mining districts of France and Belgium, government trade experts believe that a situation is being created which may redound to the benefit of American equipment manufacturers. The problem faced by the mining supervisors of both of these European countries, it is stated, is to devise some means of increasing output per man, not only because of the lack of a sufficient supply of laborers but also because the heavy industries are using more coal.

The unusually cold weather last winter also probably did much to increase coal consumption. Though conditions are different in French coal mines from those in this country, it is believed that American equipment interests should be able to do much business in France if they get over their messages to the man higher up.

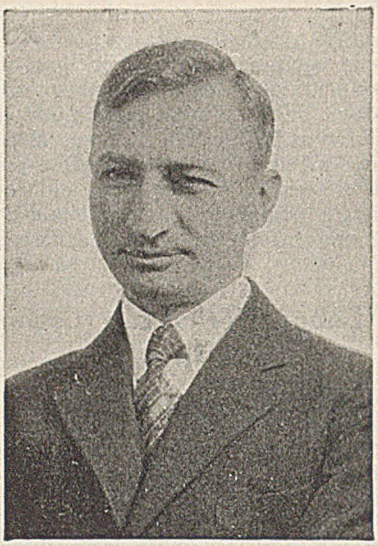
Practically all French mines require stowing, and, due to a lack of organization in the mines, the cutting is greatly slowed up. Mining engineers, therefore, do not believe that it would be possible to obtain the same efficiency with the use of a coal cutter in the French mines as in the mines of this country. As the seams in many of the French mines are very low, a cutter not over 12 in. high and capable of developing 30 hp. is required, it is stated. Both electric and air machines are now in use, the former predominating. The competition to be met is largely German and English.

It is estimated that 30 per cent of the forty or fifty million tons of coal mined annually in France could be undercut advantageously. Only about 1 per cent of the coal is mined by the use of cutters at the present time. About forty of these machines are now in use. One of the obstacles that the American equipment dealers will have to overcome in selling the French market, it is stated, is the stringency of the French laws. It is necessary to obtain special authorization from the French Bureau of Mines to use electrical mining equipment underground.

The mines are classed according to the probability of encountering gas. In mines where the gas danger is rated high, it is practically impossible to obtain permission to use electrical equipment, it is said. It is understood, however, that measures are being drafted that will liberalize the requirements for using electrical equipment underground.

Large quantities of self-rotating hand rock-hammer drills are used in the coal and iron mines of France, it is reported by trade advisers. Although 5,000 of these drills are consumed annually, it is not believed that the American producers can capture much of the market because of the cheaper manufacturing costs of the German and British producers. As to underground diamond drills, it is stated that, for the present at least, the demand is met by the Belgian and German manufacturers.

The use of drifters and stopers is reported to be limited in France, a lighter drill usually being preferred. When drifter drills are used, however, they usually are of American production. Because of its exceedingly light weight, compactness, low installation cost, and low air consumption the American small single-drum underground air-turbine hoist, known as the column or stretcher-bar type, has successfully competed in the French market with those of foreign make, it is stated. Because of the restriction on the use of electricity there is little demand for the electric portable hoist.



E. J. Mehren

Vice-president, McGraw-Hill Publishing Co., Inc., has been appointed chairman of a national committee to study traffic congestion. This committee will continue the work of the national conference on street and highway traffic in coping with one of the foremost problems before the country today.

Explosion Kills Eight

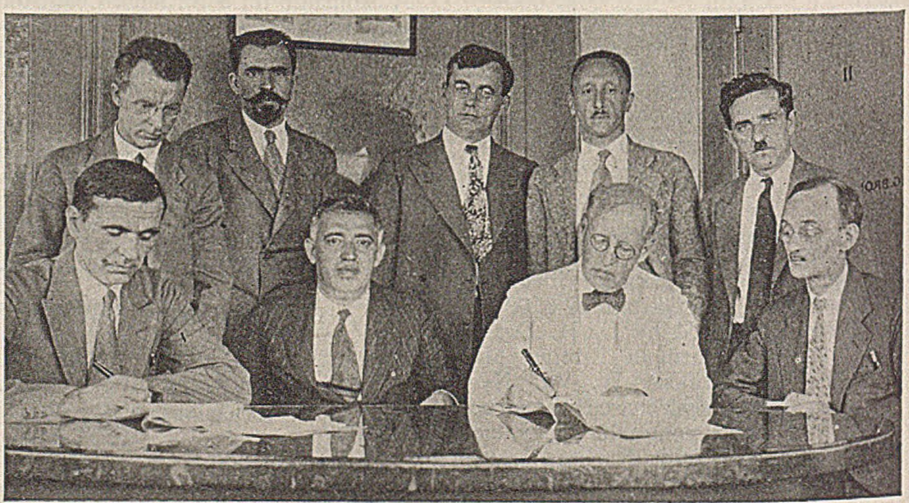
An explosion of gas in the No. 7 mine of the Covington Coal Co., near Poteau, Okla., resulted in the death of eight men on Sept. 27. Two miners were killed outright by the blast and six others overcome by carbon monoxide gas generated by the explosion.

Russian Mining to Have American Aid

A contract for technical assistance in the design and construction of new coal shafts in the Donetz Basin of Russia and in Siberia was closed Sept. 10 by the Allen & Garcia Co., Chicago, at the offices of the Amtorg Trading Corporation, New York City. N. Levchenko, vice-president, Donugol State Coal Trust, and representative of Gyproschacht, the Soviet Institute for the Designing of Mines, signed for the Soviet interests.

Under the terms of the contract, 35 engineers, specialists in mining, mechanical, structural and electrical engineering, will be sent to Russia to work with the Gyproschact on the various projects now under way. Twenty of these will be located at Kharkov, in the Donetz Basin, and 15 at Tomsk, in the Kuznetz Basin of Siberia. All operations in the development of the Russian coal industry from a yearly production of 26,000,000 tons at present to 75,000,000 tons at the end of five years will be under the personal supervision of Andrews Allen and John A. Garcia, both of whom will spend one month each year in Russia for a period of three years.

Twenty-five Russian engineers will be sent to the United States in the three-year period for training in the operating phases of coal mining. Ten of these will go to the Chicago office of Allen & Garcia and the rest will be employed in various modern American coal operations.



Signing the Technical Assistance Contract

Seated (left to right)—N. Levchenko, Donugol Coal Trust; Saul G. Bron, chairman of the board. Amtorg Trading Corporation; Andrews Allen, and John A. Garcia. Standing (left to right)—Nicholas V. Gratchov, associate director, Gyproschacht; Andre V. Volkenau, chief engineer, Donugol State Coal Trust; N. Michali and V. G. Olkhovsky, attorneys, and J. M. Budish, interpreter, Amtorg Trading Corporation.

Anthracite Shipments Rise

Anthracite shipments in August, 1929, as reported to the Anthracite Bureau of Information, Philadelphia, Pa., were 4,564,426 gross tons, a decrease of 812,117 tons as compared with the same month last year and an increase of 876,840 tons over July, 1929. Shipments by originating carriers during August, 1929, compared with the same month last year, and those of July, 1929, were as follows:

	Aug., 1929	Aug., 1928	July, 1929
	Gross Tons		
Reading Company....	847,625	1,050,137	726,867
Lehigh Valley.........	835,825	881,381	540,007
Central R.R. of N. J....	377,590	585,245	291,276
Dela., Lackawanna & Western...........	745,570	747,978	752,245
Delaware & Hudson...	587,592	789,821	506,238
Pennsylvania.........	443,313	460,655	409,439
Erie.................	408,737	517,351	324,786
N. Y., Ontario & Western................	113,093	125,985	86,802
Lehigh & New Eng'ld	205,081	217,990	49,926
Total...............	4,564,426	5,376,543	3,687,586

The Berwind-White Coal Mining Co., Philadelphia, Pa., is reported to have purchased 18,000 acres of coal land in Wyoming and McDowell counties, West Virginia, for a sum said to be in excess of $1,000,000. By this transaction the Berwind-White company secures the last virgin coal in the Pocahontas field.

A West Virginia charter has been granted the West Virginia Coal & Coke Corporation, with general offices at 14 Wall St., New York City, calling for the issuance of 750 shares of stock of no par value. The corporation took over the properties of the West Virginia Coal & Coke Co. after its sale to the bondholders' protective committee.

Edison to Light the Lamp Of Fifty Years Ago

Thomas Alva Edison on Oct. 21, the fiftieth anniversary of the invention of the incandescent lamp, will reconstruct the lamp of fifty years ago and cause it to light in the old Menlo Park laboratory, restored by Henry Ford at the Edison School of Technology, Dearborn, Mich. This ceremony will climax the observance of Light's Golden Jubilee, which has been celebrated in every part of the land throughout the summer months.

Members of the Edison party will be brought from Detroit to Dearborn on the afternoon of Oct. 21, traveling on a train fifty years old. A tour will then be made of the Edison School and Museum together with a typical American village, after which a banquet will be served in Independence Hall. In the evening, the Wizard of Menlo Park will repeat his experiment, with the actual equipment used fifty years ago, in the presence of a distinguished gathering and the general public, which will follow the ceremony over the radio.

Fire on Sept. 21 destroyed the tipple at the Hazel mine of the Chartiers Creek Coal Co., East Canonsburg, Pa., entailing a loss estimated at $50,000 and throwing 150 men out of work temporarily. Plans are under way for rebuilding the structure.

Mine Transportation Code To Be Developed

A safety code for mine transportation, to be known as American Recommended Practice for Coal Mine Transportation, is being developed under the procedure of the American Standards Association by a sectional committee composed of coal men and equipment representatives, sponsored by the American Mining Congress.

Fred Norman, Allegheny River Mining Co., Kittanning, Pa., is chairman, and the other members are as follows: E. P. Roundey, New York State Railways, Utica, N. Y.; John J. Lincoln, Upland Coal & Coke Co., Elkhorn, W. Va.; C. E. Watts, Berwind-White Coal Mining Co., Windber, Pa.; C. K. Witmer, Westmoreland Coal Co., Irwin, Pa.; H. K. Porter, Hyatt Roller Bearing Co., Harrison, N. J.; Rush N. Hosler, Pennsylvania Compensation Rating and Inspection Bureau, Harrisburg, Pa.; L. C. Ilsey, Pittsburgh station, U. S. Bureau of Mines, Pittsburgh, Pa.; Rudolf Kudlich, U. S. Bureau of Mines, Washington, D. C.; H. S. Smith, Wilkes-Barre, Pa.; Henry R. Uffer, Griffin Wheel Co., Chicago; J. H. Flory, Jeffrey Mfg. Co., Columbus, Ohio; E. A. Hitchner, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; W. C. Adams, Allen & Garcia Co., Chicago; Graham Bright, Pittsburgh, Pa.; Charles H. Partington, Cincinnati Frog & Switch Co., Cincinnati, Ohio; C. A. Alden, frog and switch department, Bethlehem Steel Co., Steelton, Pa; William G. Hulburt, William Wharton, Jr., Co., Inc., Easton, Pa., and H. N. West, Weir Kilby Corporation, Norwood, Ohio.

King Coal's Calendar for September

Sept. 6-7—Fourth Annual West Virginia Safety Day held at Laidley Field, Charleston, W. Va. First place in the first-aid contests was won by the New England Fuel & Transportation Co., Grant Town, W. Va. A team representing the Continental Coal Co., Cassville, W. Va., took first honors in the mine rescue events, staged for the first time.

Sept. 8—President Hoover and Congress requested to adopt pending legislation to set up a federal bituminous coal commission similar to the Interstate Commerce Commission in a resolution adopted at a convention of District 31, United Mine Workers, held in the Scotts Run region of West Virginia. Other resolutions indorsed shorter working days and working weeks, pledged the aid of the district in completing the organization of the United Mine Workers in West Virginia, condemned the alleged policy of certain operators of refusing to hire men over 40 years old and urged President Hoover to call a conference of operators, miners and railroad officials to work out a "reasonable rate" for fuel coal sold to railroads.

Sept. 12-14—Forty first-aid teams and nine mine rescue teams, representing eighteen states, compete at the eighth Annual International First-Aid and Mine Rescue contest, held at Kansas City, Mo. Utah Copper Co., Bingham Canyon, Utah, captures first place in the first-aid contest. Winners of the mine rescue and combined first-aid and mine rescue contests were the Consolidation Coal Co., Frostburg, Md., and the Northwestern Improvement Co., Roslyn, Wash., respectively.

Sept. 14—Seven men entombed in the Buck Mountain colliery of the Lehigh Valley Coal Co. by a fall of rock. Two were rescued immediately, but little hope is held of reaching the others while still alive.

Sept. 14—Iowa Coal Institute, C. S. Harper, Ottumwa, president, formed to push the sale of Iowa-mined coal in Iowa.

Sept. 14—Ten men known to have been killed in an explosion at Rtalj, near Zajecar, on the Bulgarian frontier. There were 1,500 miners below ground at the time.

Sept. 16—Twenty-three miners known to have been killed and 25 others injured in a series of explosions in the St. Charles shaft of the Petit Rossele coal mines, near Metz, France. The original explosions destroyed the fans and demolished the power house and boiler plant. Fire broke out in the mine as a result of the blasts, hampering efforts to penetrate the workings and making it necessary to flood the mine on Sept. 21.

Sept. 16—Fire, said to have resulted from an explosion caused by an open light, spreads throughout the Caldwell mine of the Cambridge Collieries Co., Caldwell, Ohio.

Sept. 19—Lawrence Lurch, foreman, killed and three other persons overcome by smoke and fumes when a fire of unknown origin breaks out in the Pipe Creek mine of the Powhatan Mining Co.

Sept. 23—Governor Lewis L. Emmerson, of Illinois, in a letter to coal dealers and the general public, asks that the dealers push the sale of Illinois-mined coal and urges the public to co-operate by specifying the home product in their orders.

Sept. 24—Acquisition of the Lehigh & Wilkes-Barre Coal Co. by the Glen Alden Coal Co., subject to the approval of the stockholders of the two companies, announced by Major W. W. Inglis, president, Glen Alden company. Purchase price is 676,700 shares of Glen Alden stock.

Sept. 27—Eight men killed by an explosion of gas and resultant afterdamp in No. 7 mine of the Covington Coal Co., near Poteau, Okla.

Sept. 28—Two miners killed by an explosion in the Taylor shaft of the Glen Alden Coal Co., Taylor, Pa. The men were engaged in siphoning water from the workings when the blast occurred. The cause was unknown.

Coal Mine Fatalities in August Increase Over July But Drop From Year Ago

ACCIDENTS in coal mines in the United States in August, 1929, caused the loss of 173 lives, according to information received from state inspectors by the U. S. Bureau of Mines. Of this number, 136 deaths occurred in the bituminous mines in various states, and the remaining 37 were in the anthracite mines of Pennsylvania. The death rate per million tons of coal mined during the month was 3.47, based on an output of 49,843,000 tons of coal. The rate for bituminous coal alone was 3.10, based on a production of 43,889,000 tons, and that for anthracite was 6.21, with a tonnage of 5,954,000. The death rates for August a year ago were 3.80, with a production of 47,867,000 tons and 182 fatalities for the entire industry; 3.53, with 145 deaths and 41,108,000 tons, for bituminous mines, and 5.47, with a tonnage of 6,759,000 and 37 deaths, for anthracite mines. Thus, while the rate for anthracite shows a slight increase, there has been an improvement for bituminous mines and for the industry as a whole. On the other hand, the death rates for August from the various causes noted were somewhat higher than those for July of the present year.

Reports for the first eight months of 1929 show a total of 1,319 deaths from accidents at coal mines as compared with 1,485 for the same period in 1928. The production of coal from January to August, 1929, was 385,547,000 tons, showing a fatality rate per million tons of coal of 3.42. For the same period in 1928 the production was 360,010,000 tons with a fatality rate of 4.12 per million tons.

There were no major disasters during August—that is, no disasters in which five or more lives were lost—but there were four such disasters in the preceding months of 1929 with a resulting lost of 75 lives. In 1928 there were 11 major disasters which caused the death of 308 men. Based exclusively on these disasters the death rates were 0.19 for the present year and 0.86 during the corresponding eight months a year ago.

Comparing the accident record for the period January to August, 1929, with the same months of 1928, a reduction is noted for falls of roof and coal, gas or dust explosions, and electricity, while a slight increase is shown for haulage and explosives. Comparative fatality rates from various causes for 1929 and 1928 are shown in the following table:

	Year 1928	Jan.-Aug. 1928	Jan.-Aug 1929
All causes	3.777	4.125	3.421
Falls of roof and coal	1.854	1.878	1.818
Haulage	.626	.606	.641
Gas or dust explosions:			
Local explosions	.087	.114	.075
Major explosions	.566	.855	.192
Explosives	.128	.147	.153
Electricity	.153	.170	.145
Other causes	.363	.355	.397

Colorado Fatalities Show Decline

Fatal accidents in the coal mines of Colorado in 1928 were the lowest in the history of the industry, according to a report issued by James Dalrymple, chief inspector of coal mines. During the year there were 35 fatal injuries. The accident rate also dropped to a new low level, while the tonnage produced per fatal accident was the largest ever recorded. In 1928 the number of men killed per 1,000 employed was 3.05 and the total tons produced per fatality was 283,274, The number of men injured in that year was 1,810, a decrease in the number of non-fatal accidents of 106 compared to the year 1927.

Wakenva Receivers Named

Receivers have been appointed by the U. S. District Court at Bristol, Tenn.-Va., to take charge of the Amalgamated Coal Corporation and the Wakenva Coal Co., Johnson City, Tenn., at the request of S. R. Jennings, president and largest stockholder. This action was taken, according to Mr. Jennings, to facilitate the consolidation of the Wakenva company and other properties with the Amalgamated corporation. J. R. Aimonds, attorney, Johnson City, and Carel Robinson, general manager, were appointed receivers by the court.

Coal Mine Fatalities During August, 1929, by Causes and States

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

State	Underground												Shaft					Surface							Total by States	
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of Gas and Coal Dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining Machines	Mine fires (burned suffocated, etc.)	Other causes	Total	Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip or bucket	Other causes	Total	Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	1929	1928
Alabama	1						2				1	4													4	4
Arkansas				1			1					2													2	0
Colorado	3	1									1	5													5	2
Illinois	4		1									5								1		1		2	7	8
Indiana							1					1													1	2
Iowa																									0	2
Kansas	1		1									2													2	0
Kentucky	7		5				3					15													15	13
Maryland	1											1													1	0
Michigan																									0	0
Missouri																									0	3
Montana																									0	0
New Mexico																									0	1
North Dakota																									0	0
Ohio	5		1									6													6	6
Oklahoma											1	1			1		1								2	3
Pennsylvania (bituminous)	15	4	5		2		1				1	28	1		1		2	1						1	31	46
Tennessee	3											3													3	0
Texas						2						2													2	0
Utah	3						1					4													4	0
Virginia	3		1									4													4	8
Washington																									0	0
West Virginia	17	4	9	2			4		3		1	40	2				2	1	1			1	1	4	46	45
Wyoming	1											1													1	2
Total (bituminous)	64	9	23	3	2	2	13		3		5	124	3		2		5	2	1	1		2	1	7	136	145
Pennsylvania (anthracite)	9	3	1	6	8	2	2				2	33								2			2	4	37	37
Total, August, 1929	73	12	24	9	10	4	15		3		7	157	3		2		5	2	1	3		2	3	11	173	
Total, August, 1928	77	12	36	24	1	2	13		4		3	172			1		1	3	2	1		1	2	9		182