Post-War Possibilities

of

Bituminous Coal Mining

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EXT to our fertile soils, bituminous coal is our greatest natural resource. It is the raw material for the coke used in making steel; it is the primary fuel for the country’s railroads; it produces two-thirds of the Nation’s electric power; it is a dependable, economical source of heat. Nowadays it is rapidly becoming an important raw material for industry.

Now its job had been tremendously stepped up; for, as a war commodity, bituminous coal is as important as explosives. The bituminous coal industry is coming through gloriously in our greatest hour of peril. In 1939, when war began in Europe, our production of bituminous coal was 400,000,000 tons. During 1942, the industry upped its production to 565,000,000 tons—an increase of 40 per cent. This year when an all-out effort will be made to crush the Axis, the production goal for bituminous coal is 600,000,000 tons. Obviously the attainment of this goal depends upon uninterrupted operations.

In the last analysis, it will be found that energy in its several forms, is bound to dominate the future production levels, and, therefore, the future consumption levels of any country. An industrial civilization without energy is inconceivable.

Bituminous coal is considered the greatest source of stored-up energy. Wishful thinkers tell us that our resources are virtually limitless—that they will last several thousand years. But none of these wishful thinkers speaks in terms of mineable, quality coal, nor indicates that the production curve has been generally declining since the early twenties. None of them recognizes other possible new sources of energy, such as the tides, the different temperatures of sea water, the atom, heat in the interior of the earth, cosmic rays, the stratosphere, or the sun—the source of all energy. Bituminous coal thus has competitors yet undeveloped. Whether it will hold its own will depend on many developments as yet unrealized.

Coal and Rehabilitation

Nevertheless, we must be realistic. Bituminous coal has a full share to contribute in the economic rehabilitation of the world at large in the post-war period; first as a source of energy, second as a raw material for industry. A tremendous debt will hang over our heads; there will be 25,000,000 idle munition workers, thousands of women workers will rebel against returning to home life, thousands of teen-age children must be removed from the streets, 10,000,000 service men will be home from the war, thus creating problems more spectacular, more momentous than any the United States has ever faced before. Will coal men rise to the occasion? The subject of this paper is an ultimatum to you and to me.

The subject, as I have indicated, is large and complex. Accordingly, let us consider it under these major headings:

(1) Extraction; (2) Preparation; (3) Safety; (4) Personnel; (5) Research; and (6) Economics.

Extraction

The post-war period will find many mines with their best coal reserves nearing exhaustion. Operators will look to higher recovery, new seams, and to sections in their present workings that have lain idle because of the difficulty of mining them economically with present-day equipment.

Considerable of our future coal lies in seams containing thick bands of impure coal and heavy rock-partings, and in seams overlain by soft friable draw slate. It is in these seams, chiefly because of maximum working height, that we can expect the most rapid strides in development.

To work these seams economically and efficiently, a full-scale mechanical system must be developed to mine the coal and the impurities selectively, to dispose of the waste material underground in the working section, and to prevent surface subsidence. Sufficient experimental work has been carried out to prove that properly designed equipment and good supervision will do a highly successful job under extremely difficult conditions.

In one southern West Virginia mine, standard shuttle car and caterpillar loading equipment were employed to mine a heavy rock-parting section. The coal seam consisted of 44 inches of bottom coal, 46 inches of rock parting and 36 inches of top coal. The coal and rock are mined selectively. The shuttle cars and loader are small capacity, low-seam equipment, and the auxiliary equipment is crudely adapted to the special job of selective mining and underground waste disposal. Yet, results are promising. A production of 20 tons per man on the section, with 60 percent waste disposal was achieved.

Some ideas conceived in the southern West Virginia mines experimenting with selective mining and underground waste disposal are already working successfully in a potash mine in New Mexico. Here, salt, which occurs as an impurity, is being disposed of underground by means of shuttle cars and stacking conveyors.

Pittsburgh District Methods

Many mines in the Pittsburgh district are operating in seams overlain by weak draw slate. In these mines some operators are obtaining fair results by holding the slate in place, others are getting equally good results by blasting and loading out the slate. In the mines where the practice is to load the slate, a well-planned system of mechanical underground waste disposal should prove very economical. To perform under these conditions continuously and successfully it will be necessary to have equipment that is sufficiently rugged and specially designed to each individual purpose. To date most of this work has been done with equipment designed for lighter work. It will be necessary to develop mobile rock-stacking conveyors; heavy-duty self-propelled mobile drills; more rugged loading machines; and shuttle cars capable of handling rock effectively.

A recent development which will lend itself admirably to selective mining is a specially designed “shelf-loader”; a high-capacity, caterpillar-
mounted loader capable of loading coal benches up to 8 feet above the seam floor. This loader is used to load selectively from the top down when conditions are such that the rock partings are too friable to stay in place while coal is loaded from underneath. Several of these loaders were put into operation in Alabama during 1942.

**Preparation**

It is likely that during the years immediately following the war, intense activity will take place in coal preparation similar to that of the decade 1930-1940.

During the year 1930, 38,800,000 tons of bituminous coal were cleaned mechanically, equal to 8.3 percent of the total bituminous coal production of the country. The amount cleaned mechanically increased rapidly each year and in 1940, 102,204,000 tons of mechanically cleaned coal, 22.4 percent of the total, were produced.

This tremendous increase in the amount of bituminous coal cleaned mechanically, during these years of low industrial activity and keen competition for markets, resulted from four major trends:

1. Consumers became increasingly quality-conscious. Specification purchasing became the rule rather than the exception. Many coals had to be carefully prepared to meet these specifications.

2. In order to reduce costs, many mining companies adopted mechanical methods of underground mining. Since mechanical methods of mining usually increase greatly the amount of impurities in the mined product, mechanical cleaning units had to be installed to remove the impurities.

3. There was a tremendous increase in strip mining. Coal produced at strip mines is usually dirty and requires mechanical cleaning to prepare an acceptable product for consumers.

4. Many mines operating in clean scarves were exhausted or approaching exhaustion of low impurity coal. This necessitated the mining of an increasing amount of coal containing impurities, which, to make marketable, must be mechanically cleaned.

Coincidentally and paralleling the increase in mechanical cleaning there took place a corresponding increase in other phases of bituminous coal preparation—crushing, sizing, and dustless treatment.

It is believed that the trends causing the tremendous increase in bituminous coal preparation in the decade 1930-1940 will continue and increase in importance during the post-war years. Competition within the industry for markets will be keen. Competition from competitive fuels—anthracite, oil, natural gas—will undoubtedly be very great.

New methods for burning coal, new uses, and improvements of existing coal-consuming machines will require coal prepared to exact specifications. Coal must be tailored to meet the individual needs of the consumer. Some coal may be pumped direct from mine to market.

Although developments in coal preparation have been rapid, there are yet many major problems. The problem of cleaning the slack sizes is common to most regions and is largely unsolved. Problems in reclaiming coal lost in refuse, in sludge, in washery water; problems of economically drying fine coal; of plant dust elimination, should be receiving the attention of coal producers now.
Safety

The coal industry pioneered the safety movement in this country. Perhaps the first organized effort was the enactment of inspection codes in Pennsylvania in 1870. Our precious memories of bituminous coal mine safety go back to the days when the life of a miner was not worth much more than a mule, when some of us risked our lives with negative pressure helmets, the days of the open light and black powder, when flame safety lamps and canary birds were supreme in testing for mine gases. Milestones were the establishment of the Pennsylvania Department of Mines, U. S. Bureau of Mines, Experimental Mine, American Mine Safety Association, Mine Safety Appliances Company, the advent of permissible explosives, permissible electrical equipment, electric cap lamp, scientifically controlled ventilation, and the first laws to combat the coal dust hazard.

Wars always have been great catalysts and social and scientific advancements mature under military stimulus in a fraction of the time normally consumed. World War I brought up Hopcalite and the All-Service Gas Mask. Rock dusting, continuous carbon monoxide and methane recorders, portable gas testing equipment, McCaa self-contained oxygen breathing apparatus, convergence recorders, hard hats, goggles, safety shoes, protective clothing of all kinds, National Mine rescue Association, Joseph A. Holmes' Mine Safety Association, finally the Federal Coal Mine Inspection Act, followed in a progressive safety movement.

In spite of deeper mines, mechanized programs, and increased uses of electric power underground, fatalities have decreased from 5.32 per million tons in 1910 to 2.07 (tentative) in 1942. Mine explosions are now known by their absence as they were known by their regularity 30 years ago.

But what are the possibilities of safety in bituminous coal mining in the post-war period? I venture to predict that new developments are in the offing that will tend to revolutionize methods of working. Various new scientific discoveries will find ready application in bituminous coal mine safety. Research laboratories such as the U. S. Bureau of Mines and Mine Safety Appliances Company will provide the answers. Methods of dust control in working areas must be made more effective. The general use of conveyor haulage should reduce transportation accidents. New, safer, more efficient methods will be devised to break down coal.

New, accurate types of electric methane detectors will be developed to replace the flame safety lamp which to use correctly requires so much training. It is not inconceivable that methane alarms can be designed that will be sufficiently rugged, simple, and inexpensive to justify their wide-spread adoption and use in practically every working place in gaseous mines.

It is natural also that we should look forward to improvements in the design of mine rescue apparatus. Though most of our mine rescue work is carried on today with the use of gas masks, self-contained breathing apparatus would be more widely used if the apparatus were lighter in weight, simpler and more rugged in construction and did not require so much training to use with comfort and security.

It is not too much to expect that "rule of thumb" will give way to practices based on geophysical methods in the control of the roof. Instruments will be developed that will give continuous records of rock stresses and roof movements which will permit long-range forecasting of break
line falls. Portable equipment will be perfected to test for loose coal and roof slate. There will be more general application of mine roof sealing to prevent slate falls. The "if" will go out of safety and only the human equation will remain. The human equation in turn will be licked by education, and processes are outlined under Chapter 4, Personnel.

**Personnel**

The coal industry today calls for a broader general education, a greater familiarity with mechanical and technical operations, and a higher level of personal qualifications in its mine officials. These needs will be definitely enlarged in the post-war period.

The handling of mine labor is a science in itself. Some men are naturally endowed with this trait, while others must acquire it by observation and study. It is an unwise policy to put a green and untried man, especially one not familiar with the handling of labor, in charge of a coal mine or a section of a mine simply because he possesses a certificate of competency as mine foreman or fire boss. Such a course is unfair to the man himself, to the mine employees, to the company, and to the public. These men should be compelled to serve an apprenticeship or attend classes embodying short courses concerned with labor and management relationships, organization, cost control, accident prevention, mechanical mining methods, and others.

I am certain that the results of a well-conceived training program will speak for themselves. As an example, one need look no further than our armed forces. Tremendous sums are spent on the reserve officers' training corps to insure a sufficient number of officers of lower rank who are qualified to lead soldiers in time of war. It would be wise for coal companies to follow a similar plan. Generally speaking, the success of a company's personnel work may be gauged as much by its liberality in appropriations for training as by any other single item.

These needs can best be fulfilled through a more widespread use of the educational facilities of our college extension programs. However, such work must have the cooperation of both mine labor and management. It would be a boon to the industry to arouse the interest of promising high school boys in the possibilities of bituminous coal mining. This is being done by a few companies granting scholarships for study in mining engineering. The post-war era will definitely show the need for much more of this progressive work. The inclusion of mining vocational courses in high schools located in mining communities would do much to direct promising boys towards careers in the bituminous coal industry.

It is imperative that top executive positions in the coal industry be filled by well-trained technical men who have the best interests of both labor and management at heart. Very few individuals recognize the need for training or will do much about it if left to their own free choice. Such has been the lot of the coal industry, but this tendency must disappear in the post-war era. Young men with the proper technical and practical background should be spotted and placed as understudies for the various executive positions. Only in this way will whole-hearted support of policies for the training of mine officials and mine labor, and a general betterment of the industry result.

Any well-conceived training program for the industry will include the entire personnel, President's office to the working place. The training of
men below the rank of mine officials will be a tremendous task. No thorough training job can be accomplished in a year or even in several years, but if we are faithful to these concepts and ideals I am sure that we will slowly, but progressively, attain the much desired happy relationship between labor and management in the bituminous coal industry.

Research

The development of the long distance natural gas pipe line and the expansion of the petroleum industry have made many Americans convenience-conscious in so far as heating is concerned. The accelerated depletion of fluid fuel resources conditioned by the war does not necessarily imply that these citizens will be willing to return to old inconveniences of hand operation of heating plants after the war is over. There are three services in modern living that logically ought to be provided by a single unit. These are the provisions of heat during the heating season, hot service water the year around, and air conditioning as represented by humidification in the winter and dehumidification and cooling during the summer. As a matter of fact, these could be phrased as two since heating is, after all, a matter of air conditioning. The coal industry must recognize that its logical function, in so far as domestic utilization is concerned, is to provide those things in our environment that can be provided by heat energy. It is not too difficult to visualize, therefore, that the future will bring an appliance that will heat the service water during the entire year and will provide warm, humidified air in the winter, and cool, dehumidified air in the summer, all with a minimum of attention. In order to do this, however, it will be necessary for us to rid ourselves of some of our present notions of how to serve the domestic market. A major step in this direction has been made already in the fuel technology laboratories at State College.

Coal is a complex chemical material, the chief constituent of which is carbon. Its main use in the past has been as a source of energy. However, as a carbonaceous material there is no reason why it should not also serve as a raw material for the vast organic chemical industry. The reason why it has played only a minor role in this field during the past is that it has never been studied thoroughly enough to know what its fundamental chemical nature is and what its chemical properties are.

Chemical Industry Built on Coal Tars

During the past decade more and more interest has developed in this phase of coal technology, and developments have already taken place that make it a raw material for such widely different materials as synthetic wood alcohol, nylon stockings, and automobile tires.

The attitude of the coal industry in general has been one of disinterest in this phase of coal development largely because such markets are not tonnage markets. The industry has always been volume-conscious. This attitude must, and under stimulus of war, will change. World War I brought the by-product industry to a high stage of development. However, the by-product industry uses only the light oils, tars, gas, and ammonia for chemical purposes. World War II should stimulate the development of a chemical industry built on the whole coal molecule.

Already some progress has been made along these lines. Paints have been made using finely ground coal as a pigment. Dyestuffs and wood-
stains have been made by chemical treatment of the ash-free coal; or-
ganic acids, coal solutions, carbon blacks, and plastics have been made
by mild oxidation processes. Such processes need only further research
in order to bring them into useful application.

The hydrogenation process, of course, is well known and already firmly
established in those countries that have inadequate petroleum resources.
Cheaper processes may be discovered ultimately and these will hasten
the time when coal will serve as raw material for liquid fuels. Such a de-
velopment will open a market, the volume of which will make the coal
operators turn handsprings.

Research on extraction, preparation and safety must go forward as
indicated in preceding chapters.

Economics

Events during the past month have demonstrated as never before the
overwhelming importance of coal in the economy of the country and in
the defense of its actual existence. One benefit of this condition may be
the awakening of public consciousness, which too long has slumbered in
complacency, as to the seriousness of the social and economic problems
which pervade the structure of our Number One mineral resource.

The immediate problem of supply of fuel to wartime industries will
eventually be completed. In a post-war world the management of the
bituminous coal industry in an orderly, profitable and socially beneficial
manner will tax to the utmost the best array of technical and managerial
talent which we can muster. Perhaps the first reaction after examining
the record of the years following 1918 is one of profound discouragement.
Certainly we cannot point with pride to any outstanding accomplishments
in the years following the first World War from which we can learn les-
sions whose import can be applied to the conditions which we must face
again. However, labor and management are both entitled to pride in the
fact that during this period, and industry struggling with an over-
capacity to produce, low prices, and shrinking markets, due to greater
economy in combustion and the rise of competitive materials, did fulfill
its fundamental function of supplying fuel to the industries and homes
of the country.

In the post-war years we know that the industry again will be obliged
to deal with conditions which inevitably will follow much of the pattern
of the past. Markets will be on the decline. No great expansion in the
population of the country after the impetus of war conditions has passed
is likely. Greater economy in use may be expected. Competitive fuels
will still be with us. Productive capacity will be greater than the market.
Prices will tend to be low, taxes high. All signs indicate that the industry
must shape its course to operation on a reduced capacity.

Great Problems to Be Solved

In the past, the only solution has been one of survival of the fittest.
High cost mines have been forced out of existence. In the more complex
field of human relationships no solution has been found, and compromises
based on immediate expediency do little more than to ease temporary
troubles. Everything about the coal industry is large, including the prob-
lems which beset it. How these may be solved so that a profitable in-
dustry with steady and well-paid employment can be assured to all will
require the application of the best engineering practice and research in new uses, markets, and mining methods which will lower costs and increase safety. Operating groups in the various geographic units must learn to cooperate. Fundamental problems are similar; confusion results only from factional controversies, good, bad, and indifferent.

The most conspicuous trend of our times has been the centralization of power in Washington with a corresponding increase in the number of duties and responsibilities delegated to Federal agencies. It seems likely that Federal agencies will continue to play an important role in the future of the bituminous coal industry. What may come about in the way of restrictions to some operations and possibly in the way of subsidies will be interesting to watch. Meanwhile, Federal agencies must get down to earth.

My conclusions can be stated in simple terms. There must be greater service, greater safety, greater efficiency in bituminous coal mining in the post-war period. The objectives will be a proper supply of coal to the nation, a fair income to the miner, a fair return to management, a program of sound conservation. There must be a central Office of Public Relations to educate the people in regard to all the facts, especially the great economic importance of bituminous coal mining. Certainly our greatest single resource and one of our greatest industries must be placed on a basis where the rewards to those engaged in it will be greater and more secure. Stability will be accomplished only by organizing, planning, and taking action in a resolute manner.