MINERAL FUEL PRODUCTION IN ILLINOIS*

BY

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Illinois' mineral fuels, coal, oil, and gas, are dependent both in occurrence and present availability upon geologic conditions, past and present. Thus the coal seams represent several long-period accumulations of vegetal material beneath widespread swamps, accumulations later compressed and consolidated and slowly changed, first to peat, and finally to a soft bituminous coal. The coal beds were largely preserved from erosion by overlying sediments and by the down-warping of the bedrock strata into a great spoon-shaped basin, the "Illinois Coal Basin," the deepest part of which occurs in the south-central part of the state. The earth warping which formed the "Coal Basin" also formed anticlinal structures which in favorable places became the sites of accumulation of oil and gas, especially at the southern end of the LaSalle anticline in Lawrence and Wabash counties.

COAL

The Coal Measures extend over approximately two-thirds of the state, or 37,486[1] square miles, underlying eighty counties either wholly or in part (Fig. 1). This area comprises about three-fourths of the Eastern Interior Coal Field. The Illinois field is smaller and the coal is inferior in quality to that of the Appalachian Field but superior to most of that of the western fields. The seams have been numbered, presumably in the order in which they were deposited, and five of these seams, Nos. 1, 2, 5, 6, and 7, have been worked, a relatively small number when compared with the fields of West Virginia where coal is taken from 22 seams.

Estimates of the original reserves vary, but average approximately 200,000,000,000 tons. Of these reserves, 2,009,391,189 tons[2] had been mined up to and including 1928. Using this figure and a fifty per cent recovery basis, the fields have been depleted of more than four bil-

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[1] Bement, A., Illinois Coal: Illinois State Geol. Survey, Bull. 56, p. 190, 1929.

[2] Coal Report of Illinois, 1926, State Dept. of Mines, p. 51; and Coal Report of Illinois, 1928, State Dept. of Mines, p. 14.

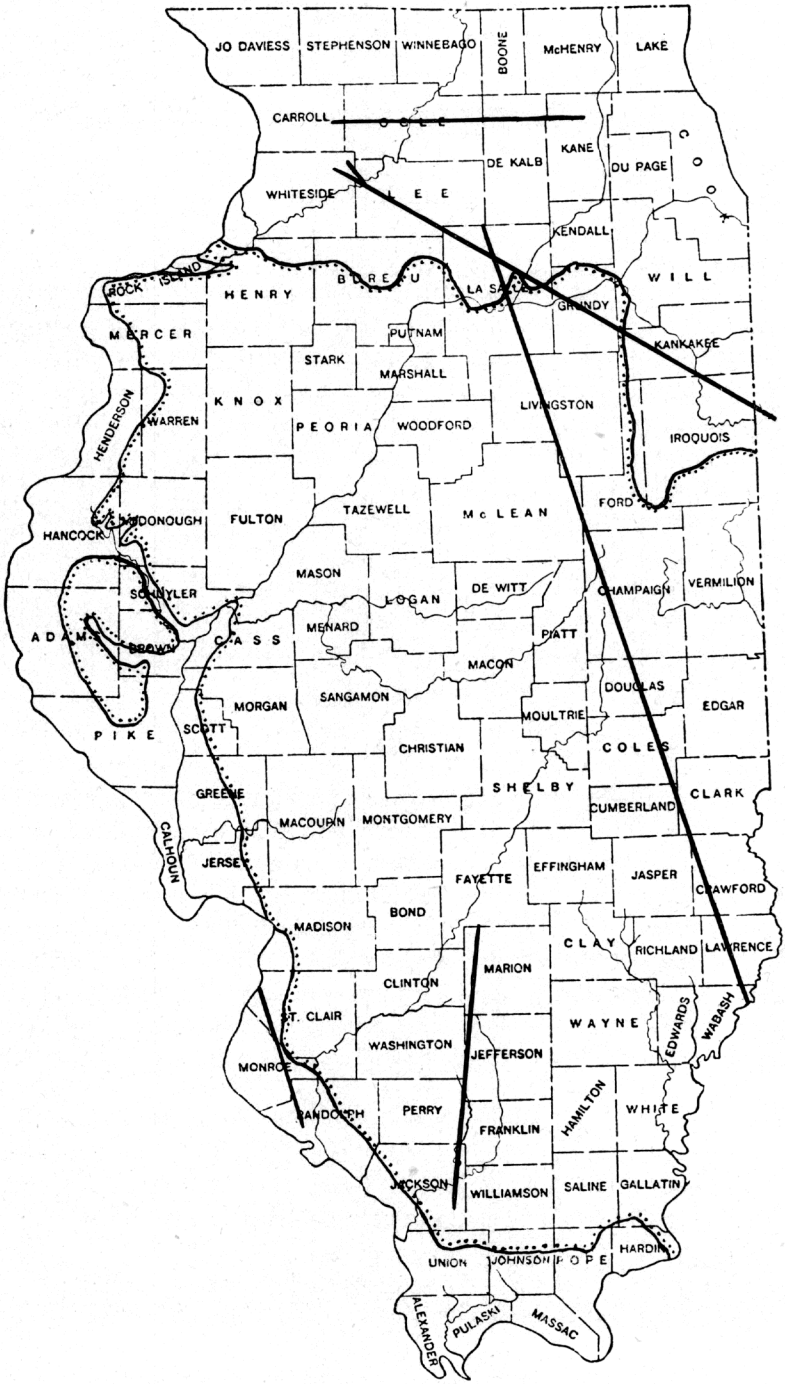

FIG. 1. Map showing the boundaries of the coal areas and the anticlinal axes of Illinois. *(Courtesy of the State Geological Survey.)*

lion tons, or about two per cent of their original resources, leaving Illinois with a reserve greater than that of any other state east of the Mississippi River.

Methods of mining include the room-and-pillar method in southern and central Illinois, where the thickness of coal No. 6 ranges from six to fourteen feet, and the Longwall method in northern Illinois, where the thickness of coal No. 2 averages three and one-half feet. The former method allows less than 50 per cent extraction because of the coal pillars that must be left to support the roof; the latter allows about 95 per cent extraction because much of the coal removed is replaced by pack walls. Recently strip-mining has been developed near the margins of the basin where the overburden does not exceed ten times the thickness of the coal. This method gives from 90 to 95 per cent extraction, more healthful working conditions, easier supervision of the mining crew, and an average daily output of 8.9 tons per man, as compared to 5 tons by the underground methods. The following figures indicate the increase of coal removed by stripping: 1.4 per cent of the total production in 1918; 2.4 per cent in 1922; 4.3 per cent in 1925;[3] and 10 per cent in 1929.[4]

The first discovery of coal in Illinois, as well as in the United States, was made by Father Marquette and Joliet in 1673 some place between the present cities of Utica and Ottawa,[5] but the first coal mined for commercial purposes was taken from along the bluffs of the Big Muddy River in Jackson County in 1810.[6] Coal production in Illinois continued to grow, making the greatest strides from 1898 to 1918 (Fig. 2) owing to the discovery of the Bessemer process of steel-making and to general growth in the manufacturing industries. Since 1918, production has fluctuated, mainly because of labor troubles. A seven-month strike in 1927 made Illinois' production less than any year since 1910. Another five-month strike occurred in 1928. As a result, for these two years, Illinois' rank among coal-producing states dropped from third to fourth. Nevertheless, in 1928 coal constituted about 60 per cent of the value of all minerals produced in Illinois.

Comparing Illinois' coal production in 1928 with that of other states, we find the relationship shown in Figure 3; or, comparing it with some of the large foreign producers, in 1926, the last normal year, Illinois produced about one-half as much as the United Kingdom or Germany, and two and one-half times as much as Belgium.[7] Produc-

[3] Mineral Resources of the U. S., part II, 1922, p. 525.
[4] Computed from monthly reports, State Department of Mines and Minerals, Springfield, Illinois.
[5] Bement, A., Illinois Coal: Illinois State Geol. Survey, Bull. 56, p. 13, 1929.
[6] Ridgley, Douglas C., Geography of Illinois, p. 200-207.
[7] U. S. D. C. Year Book, 1928, part II, p. 708.

tion per capita in Illinois is equal to nearly nine tons annually, as compared to fourteen tons per capita in Pennsylvania or five and one-half tons in Indiana.

It is especially interesting to note the growth in size of the mines as production increased. In 1892 there were no mines in the state in the 300,000 tons-per-year class. In 1900 there were three mines producing between 300,000 and 500,000 tons annually; in 1908 five mines produced more than a half million tons each; in 1925, nine mines produced more than a million tons each. The maximum possible production of the Orient Mine No. 2 at West Frankfort, which is the largest coal mine in the world, is about four and a half million tons.

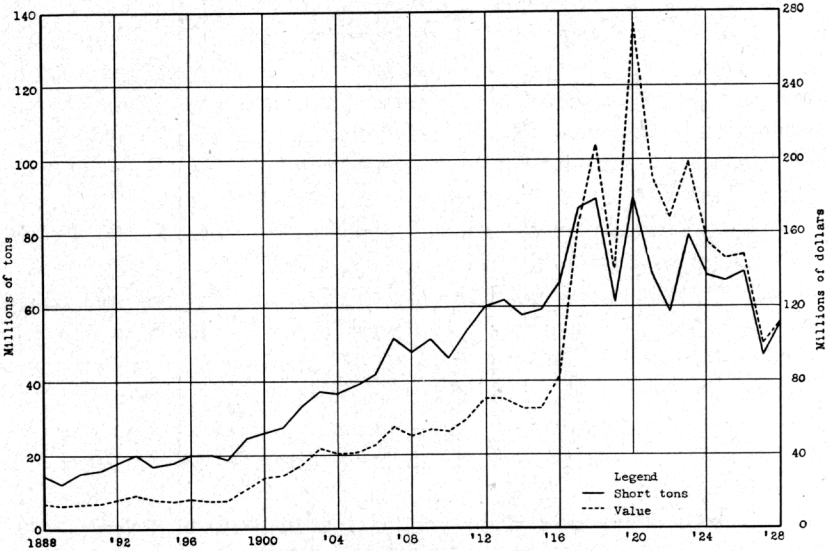

FIG. 2. Coal production in Illinois, 1888-1929.

(*Source:* Barrett, N. O., Mineral Resources of Illinois in 1917 and 1918: Ill. Geol. Surv. Bull, 38E, pp. 30-31, 1922. Mineral Resources of the United States, Part II, published annually by the U. S. Bureau of Mines.)

Another noteworthy feature is the shifting of the center of production from northern Illinois to southern Illinois; for the thicker seams, less expensive mining, and higher quality of the southern coal offset the northern district's nearness to market. In the early eighties, LaSalle County led in production, but in 1907 Williamson County took the lead, and since 1915 Franklin County has held first place.[8] In 1928, Franklin County had 2.2 per cent of the total number of mines in the state and produced 25 per cent of the state's output.[9]

[8] Bement, A., Illinois Coal: State Geol. Survey, Bull. 56, p. 44-45.
[9] Illinois Coal Report, 1928, p. 53.

Illinois coal finds a market among both domestic and industrial users. The extensive preparation by which Illinois coal is graded into ten different sizes has given Illinois producers an unusually large domestic market, which consumes about 33 per cent of all the coal mined in the state.[10] Railroads are the greatest single consumer, taking an average of about 35 per cent[11] annually. Artificial gas and electric plants are also large users. Nearness to Chicago and St. Louis, both great manufacturing centers, increases the industrial consumption. A

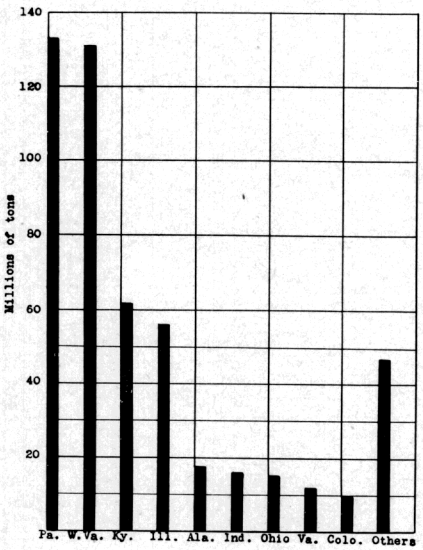

FIG. 3. Coal production of the leading coal producing states, 1928.

(*Source:* Mineral Resources of the United States, 1929, p. A32, published by the U. S. Bureau of Mines.)

small part of the state's output, only from Franklin County, however, is used in the manufacture of metallurgical coke, so that coal for this purpose is brought into the state from the east. About 57 per cent of the total output is consumed within the state and the remainder finds a market in Missouri, Iowa, Minnesota, Indiana, Nebraska, Michigan, South Dakota, Kansas, Louisiana, Tennessee, Arkansas, Mississippi, and North Dakota.[12] The western limits to which Illinois coal may

[10] Hale, Sydney A., Where Illinois coal goes, March 1928, Coal Age, vol. 33, No. 3, p. 160-163.
[11] Idem. Computed.
[12] Hale, Sydney A., *op. cit.*

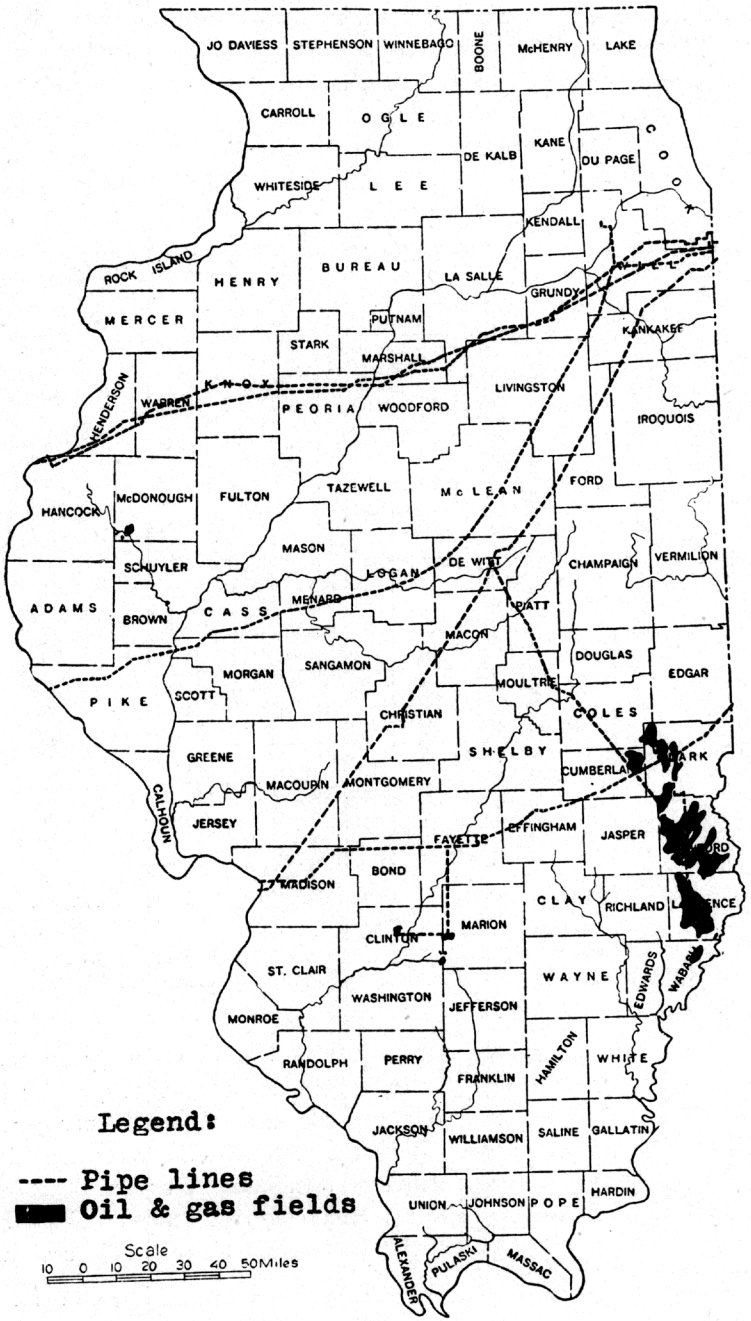

FIG. 4. Oil and gas fields of Illinois, showing oil pipe lines, 1930. *(Courtesy of the State Geological Survey.)*

profitably be sent are determined by the cost of transportation and the point at which it becomes cheaper to use the more expensive coals of Kansas, Oklahoma, and Colorado. Eastern and southern limits are determined by competition of the better grade coals of the east.

An adequate, reliable, and cheap fuel supply is one of the prime essentials of a manufacturing industry. If we compare the centers of manufacture in Illinois with the centers of early coal production, we can perceive the influence of the vast supplies of fuel on the location and growth of cities, manufacturing, and population. Early coal production centered in the areas near Chicago and St. Louis and, no doubt, aided greatly in the growth of these cities. Future manufacturing may also be directly influenced by the supplies of coal in the state.

Petroleum and Natural Gas

Supplying a much smaller portion of the fuel of the state, are the petroleum and natural gas industries. Figure 4 shows the position of the oil and gas fields and of the pipe lines of the state. The most important oil fields of the state, in Crawford and Lawrence counties, are located along the crest of the southern part of the LaSalle anticline. In general, oil accumulation has taken place on the high parts of the several anticlines and domes, but locally irregular reservoir beds have modified this relation so that the limits of the producing areas do not exactly conform to the structural features.

A limited petroleum production was secured from 1889 to 1903 in Montgomery County, but not until 1904 was sufficient interest aroused in the industry to stimulate prospecting in the eastern Illinois fields. Production began in Clark County in 1904 and in Lawrence County in 1906. Thousands of wells were drilled within a few years, and production reached a maximum in 1908 with an output of 33,686,238 barrels valued at $22,649,561—which gave Illinois third place among the oil-producing states, being surpassed by only Oklahoma and California.[13] After two years the production began to decline steadily. In 1928 Illinois held eleventh place with an output of approximately 6,000,000 barrels valued at $10,000,000[14] (Fig. 5). Within recent years the decline has been less rapid because of the finding of new fields, the most recent of which is the Dupo field in St. Clair County, about five miles southeast of East St. Louis. A continued decline is most probable, but the rate will depend on the improvement of methods of production and whether or not new fields are discovered.

[13] Mineral Resources of the U. S.,part II, published annually.
[14] Mineral Resources of the U. S., 1928, preliminary summary.

Natural gas is produced in limited quantities in connection with the prospecting and production of petroleum. The natural gas produced in 1928 was valued at approximately $760,000. Comparatively recent inventions have enabled manufacturers to produce gasoline from natural gas by methods of compression and condensation. This industry grew steadily and rapidly until 1926, when nearly 10,000,000 gallons were produced, but since that date it has been declining, probably an indication of the future trends.

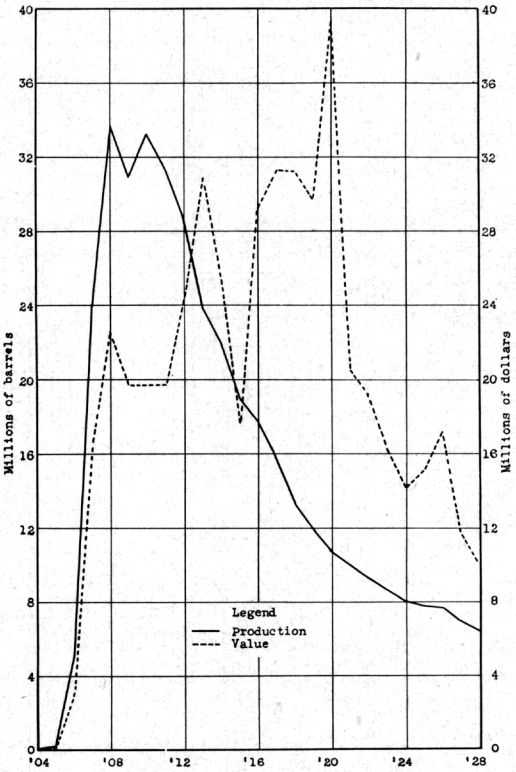

FIG. 5. Petroleum production in Illinois, 1904-1928.

(*Source:* Mineral Resources of the United States, Part II, published annually by the U. S. Bureau of Mines.)

The magnitude of our mineral industries may be appreciated if we reduce them all to terms of power by multiplying the units by specific conversion factors. Thus, the coal produced in Illinois in 1928 was equivalent to approximately one-third the potential power of Niagara Falls, or 2,000,000 horsepower; and the petroleum, reduced to the same terms, was equivalent to one fiftieth of Niagara's potential power.