Technological Change and Productivity
in the
BITUMINOUS COAL INDUSTRY
1920-60

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UNITED STATES DEPARTMENT OF LABOR
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Introduction

The object of this report is to increase public understanding of some of the benefits and problems arising from technological change. The technology of bituminous coal mining has changed dramatically in the United States, particularly in the years since World War II. Large-scale mechanization, the industry's principal response to increased competition from other fuels and rising production costs, was accompanied by a substantial increase in productivity. The increase in coal output per man-hour provided the basis for higher wages and greater benefits for workers in the industry, a succession of profitable years for many mine operators, and relatively stable prices for consumers. At the same time, the rapid reduction of labor requirements led to the displacement of thousands of mine workers, with resulting economic hardship for their families and communities. This bulletin reviews recent developments in the Bituminous Coal Mining Industry, presenting the salient points in text and charts, and basic statistical data with technical notes in appendix tables.

The term, "productivity," used in this bulletin includes several measures commonly used in the bituminous coal mining industry (e.g. output per man-hour, tons per man-day, tons per man-month). Although these measures relate output to labor input, they do not measure the specific contribution of labor, capital, or any other factor to production. Rather, they reflect the joint effect of a number of interrelated influences, such as changes in technology, capital investment per worker, utilization of capacity, managerial ability, skill of the work force, and labor-management relations.

The study is based primarily on data published by the Bureau of Labor Statistics, the Bureau of Mines, and other Government sources. The study relates, for the most part, to changes through 1959, the latest year for which final figures were available at the time the bulletin was being prepared. Preliminary data for 1960, where available, are shown in the tables and charts. The generous assistance given by officials of various coal associations, the United Mine Workers, government agencies, and experts in the industry is appreciated.

This bulletin was prepared in the Bureau's Division of Productivity and Technological Developments by Edgar Weinberg, Chief, Branch of Analysis and Technological Studies, Robert E. Malakoff, and Robert T. Adams.

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Increased Mechanization

Greater mechanization and mine modernization, undertaken by coal operators with union support to meet competition from other fuels, underlay an impressive increase in productivity after World War II. The expansion of mechanization in underground mining (the widespread adoption of the mechanical loader, the introduction of the continuous mining machine, and conveyorization, in particular) was the most important postwar development. The growth of mechanical coal processing, and the continued shift to surface mining also contributed to the industry's advance.

Increasing Output per Man-Hour

Output per man-hour in bituminous coal mining increased faster in the 1949-59 period than in the preceding 30 years. The gain in output per man-hour exceeded output gains in many other major industries as well as in the total private economy. Output per man-day in U.S. mining, which was already substantially greater than in most other coal-producing nations, also increased faster in the period after World War II.

Falling Production and Idle Capacity

The output of coal declined, continuing a long-term trend that began after World War I. Sales fell off as markets underwent substantial changes. Petroleum and natural gas moved ahead as sources of energy in the United States. Unused production capacity, long a problem in coal mining, increased as the industry adjusted to declining demand slowly.

Changing Markets

Three major developments--dieselization of railroads, construction of cross-country pipelines, and reduced use of small steam power generators at factories--were instrumental in displacing coal from its principal markets: railroads, residential and commercial heating, and industry. Advances in techniques of fuel combustion and energy application also served to reduce unit coal requirements in the economy. The expanded use of electric power, on the other hand, increased consumption of coal "by wire" and made electric power utilities the largest and fastest growing consumers of coal.

Falling Employment, Climbing Unemployment

Employment declined drastically, as production and unit-labor requirements were reduced. Many coal areas had substantial and persisting unemployment even during periods of high economic activity in the Nation. Entire communities, dependent on mine employment, were adversely affected.

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Changes in Minework

Increased mechanization affected the job structure and the work involved in coal mining. An increasing proportion of mineworkers were employed in nonproduction rather than production occupations, in jobs above ground rather than under ground, and in maintenance work rather than in direct production. Accident frequency continued to decline.

Improved Earnings and Welfare Benefits

Hourly earnings of employed mineworkers rose steadily despite widespread unemployment of miners. The hourly pay of miners was substantially higher than the average in United States manufacturing industry. Short workweeks, however, offset high hourly pay. The average annual earnings of miners are estimated to have been only slightly higher than the average in manufacturing. Supplements to wages and salaries (covering payments to the Miners Welfare and Pension Fund based on tonnage produced, as well as social security and other related contributions) increased sharply between 1947 and 1951 and remained relatively stable thereafter. Supplementary payments constituted a larger percentage of total employee compensation in mining than in other major industries.

Declining Importance of Labor Costs

Labor costs per ton of mined coal fell after 1953, despite the steady rise of total employee compensation per man-hour. Increased output per man-hour offset rising hourly wage costs. Over the entire postwar period, the increase in unit labor cost was less than the increase in material and other nonlabor costs. The relative importance of labor payments in the cost structure of bituminous coal mining has declined since 1939.

Stable Prices, Low Profits

The price of coal was relatively stable in the postwar period when compared to prices of other fuels at production sites. Transport costs, a large share of coal's delivered price, however, continued to rise steadily. In its most important market, electric power generation, coal's competitive position improved. The industry as a whole continued to report net profits, although half of all corporation returns over the postwar period showed net losses. Compared to other industries, profit rates continued to be low.

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Outlook

Increased research is being sponsored by both industry and Government to develop new ways to mine and use coal more economically, and so expand sales. Remote control continuous mining, hydraulic mining, low-temperature carbonization, and hydrogenation are among the potential developments. The coal pipeline may reduce transport costs.

Cooperative efforts to expand coal sales and production and to continue productivity growth are being increased by the mineworkers and operators, the National Coal Association, and other groups interested in the coal industry. The National Coal Policy Conference, Inc., composed of coal companies, the United Mine Workers, coal carrying railroads, electric utility companies, and coal equipment manufacturers, was organized to advance the interests of the industry.

Output per man-hour is expected to continue upward although at a slower rate than in the 1947-59 period. Substantial increases in coal production are widely predicted as a result of greater demands for electric power. Employment in coal mining, however, is not expected to return to past levels.

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The Importance of Bituminous Coal Mining

Bituminous coal plays a major role in the U.S. industrial economy. One-half of the electricity and one-fourth of all energy produced in the Nation are generated from bituminous coal. It provides coke required in steelmaking, carbon for the production of chemicals, and heat for the manufacture of cement and numerous other commodities. Almost 200,000 workers are employed in extracting and processing some $2 billion worth of coal each year. More coal is mined, and more coal energy is produced per person in the United States than in any other nation.

More than 95 percent of all coals mined in the United States are classed as bituminous and lignite. (Only small amounts of Pennsylvania anthracite and Texas lignite, the other major types, are currently produced.) These coals vary greatly in characteristics. In heating value, the characteristic most important for coal consumers, soft coals range from 7,000 to 14,000 B.t.u.'s per pound, with 1 ton of high quality bituminous the equivalent of 2 tons of lignite.

Bituminous coal remains the most abundant and the most accessible conventional fuel resource in the United States, despite the rapid development and utilization of other energy sources in the past two decades. Proved bituminous reserves of approximately 5,400 quadrillion B.t.u.'s constitute almost 90 percent of the known energy resources of the United States. At present rates of consumption, authorities estimate that total reserves, which are more than six times as large as the combined known reserves of petroleum and natural gas, could last more than 2,000 years.

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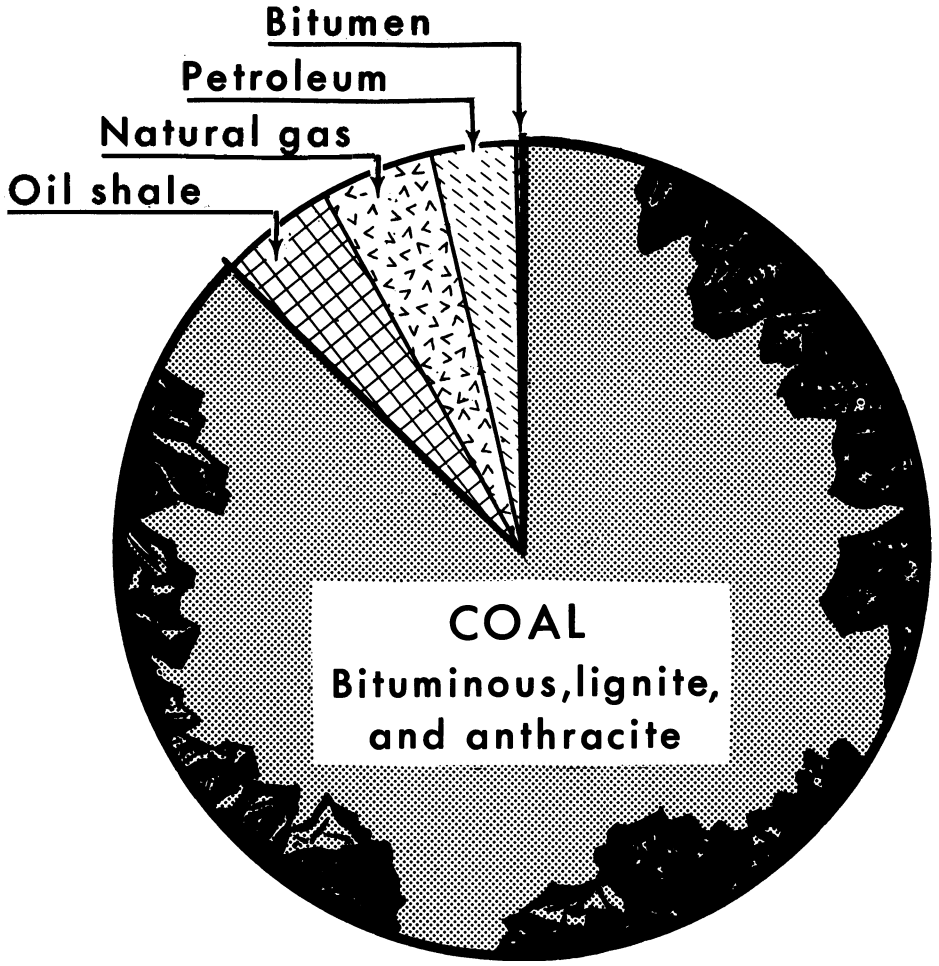
Proved Mineral-Fuel Reserves of the United States, January 1, 1960



RESERVES		
	Quadrillion B.T.U.S.	Percent
COAL	5,400	87.1
Oil shale	290	4.7
Natural gas	285	4.6
Petroleum	215	3.5
Bitumen	10	0.1
TOTAL	6,200	100.0

Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix table 1.

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Location of the Industry

Although bituminous coal mines are found in more than half of the States, virtually all of the industry's employment and production is concentrated in six States east of the Mississippi River. In 1959, the leading coal-producing States (West Virginia, Pennsylvania, Kentucky, Illinois, Ohio, and Virginia) accounted for 87 percent of total output and 85 percent of all employment. In recent decades, the geographical center of coal production has shifted west and south of West Virginia and Pennsylvania (where half of all United States coal to date has been produced) to Ohio and Kentucky.

Coal consumption also is concentrated in the states east of the Mississippi. Fifty-nine percent of all bituminous coal mined was shipped to six industrial States (Ohio, Pennsylvania, Illinois, Indiana, Michigan, and New York, in rank order) and an additional 24 percent to the rapidly expanding industrial southeast in 1959.

Two-thirds of the Nation's coal reserves are in the West. Over 50 percent of these western coals are subbituminous, concentrated chiefly in Montana and Wyoming, and lignite, located almost entirely in North Dakota. Reserves of high-rank bituminous, which constitute less than one-third of the total U.S. reserve, are located primarily in the major coal-producing States of Illinois, Kentucky, and West Virginia.

The concentration of coal mining in a few areas is an important aspect of the industry. A decline in the demand for coal can affect all business in the few States where mining employment is concentrated. In mining towns, which are generally isolated and without alternative employment opportunities, a decline in coal production or the exhaustion of a local seam can result in communitywide unemployment.

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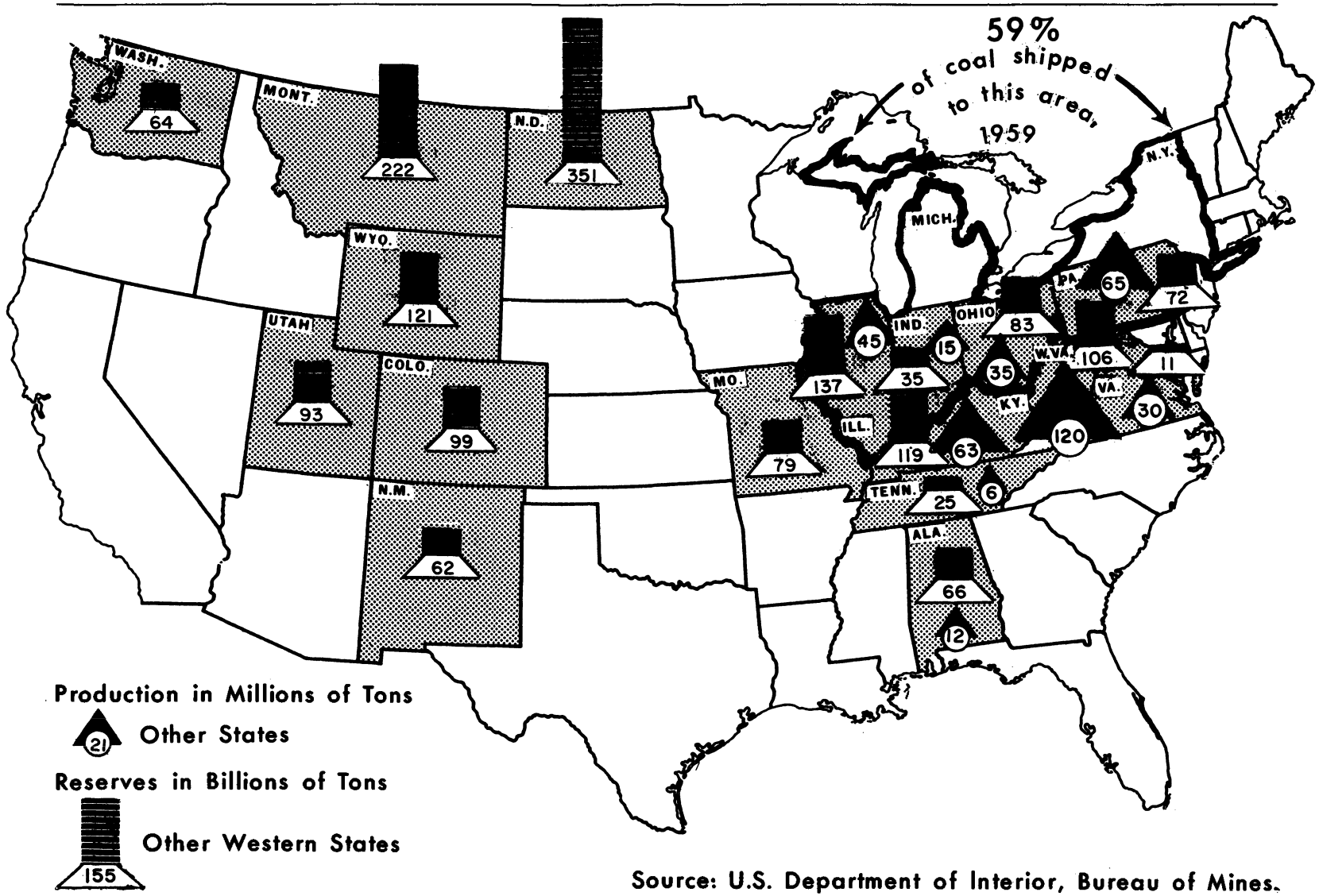
Bituminous Coal Production, Distribution, and Reserves, 1959



Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix table 2A.

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Structure of the Industry

The bituminous coal industry is composed of about 5,000 companies and almost 8,000 mines. In 1959, 5,800 were underground mines, and these produced 69 percent of total coal output; 1,600 were strip mining operations producing 29 percent of the total; some 300 were auger mines which accounted for 2 percent of total tonnage. There were, in addition, an undetermined number of small "wagon mines" not accounted for in the official statistics.

Production of coal is concentrated in a small proportion of mines. In 1959, the 50 largest, each of which produced more than 1 million tons annually, accounted for 22 percent of the industry's total output. The 212 largest (3 percent of all mines) produced 50 percent of the total. In contrast, the almost 4,700 small mines (60 percent of the total number) together produced only 5 percent of annual output.

Employment in the industry was more widely distributed. Fewer than 400 of the almost 8,000 mines employed as many as 100 workers, and fewer than 50 had more than 500 workers. More than 6,000 mines, on the other hand, employed fewer than a hundred workers. Those mines that employed more than 500 workers each accounted for 16 percent of total employment. On the other hand, the 7,000 mines that employed fewer than 100 workers each, accounted for more than one-third of total industry employment.

In 1957, 90 percent of the assets of the industry were owned by 206 corporations. The seven largest corporations owned 41 percent of the total. In contrast, the seven largest corporations of the competitive petroleum industry held almost two-thirds. Only one coal mining corporation held gross assets of $250 million or more, as compared with 20 in the petroleum industry. In the coal industry, small corporations, which constituted 87 percent of all corporations, together accounted for less than 10 percent of all assets.

Approximately 20 percent of the industry's annual output is produced in "captive" mines, i.e., those in which 40 percent or more of the output is billed to an owning, controlling, or affiliated corporation. The percentage of coal produced by captive operations has changed little over the past 25 years. Coking (and steel) companies, which own the bulk of captive operations, and electric utilities have increased their coal mining activities, while railroads and other consuming groups have reduced such activities.

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Structure of the Bituminous Coal Mining Industry

Employment *in* 1958

By employee size class

Percent of mines	Percent of total employment
500 employees or more	16
	1
100 to 499 employees	46
	5
10 to 99 employees	26
	27
Under 10 employees	12
	67

Production *in* 1959

By mine tonnage class

Percent of mines	Percent of total tonnage
500,000 tons or more	50
	3
100,000 to 490,000 tons	28
	7
10,000 to 99,000 tons	17
	30
Under 10,000 tons	5
	60

Assets *in* 1957

By corporation size class

Percent of companies	Percent ot industry assets
$50,000,000 or more	42
	1
$1,000,000 to $49,000,000	49
	13
$100,000 to $999,000	8
	36
Under $100,000	1
	50

Sources: U.S. Department of Interior, Bureau of Mines;
U.S. Department of the Treasury, Internal Revenue Service
Based on appendix table 3A.

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Increased Mechanization

One of the most important post-World War II developments in the bituminous coal industry has been the increased mechanization of production. Faced with greater competition from other fuels and increased production costs, many coal operators, with the support of the United Mine Workers, introduced labor-saving machinery and modernized their mines to increase output per man-hour.

A useful indicator of the overall rate of mechanization is the rise in the physical volume of fixed capital per production worker. According to estimates derived from National Bureau of Economic Research data, the net value of plant and equipment per worker (expressed in 1929 dollars) increased by 10 percent a year between 1948 and 1958. This rate was unprecedented in the industry's history. The total stock of fixed capital increased by less than 1 percent per year, and actually declined between 1953 and 1958. The number of production workers, on the other hand, fell sharply throughout the period. Technological changes in the postwar period apparently involved innovations with a substantial laborsaving potential. The estimated gross book value of plant, equipment, and resources (before depreciation) per production worker amounted to more than $13,000 in 1958.

The rapid expansion of plant and equipment per worker after World War II differed markedly from the industry's experience after World War I. Between 1919 and 1939, the total volume of plant and equipment was reduced sharply, particularly during the depression, while employment fell slowly. Fixed capital per worker declined by 2 percent a year. Between 1939 and 1948, fixed capital per worker rose slowly as both the stock of capital and employment expanded.

The growth of plant and equipment per worker between 1948 and 1959 also differed from the industry's experience in its early period of expansion. Between 1880 and 1919, fixed capital per worker rose by almost 4 percent a year. Unlike the period 1948-58, employment in this early growth phase expanded together with increased stock of capital.

The relatively rapid pace of mechanization in recent years is also shown by the more than threefold increase in the amount of horsepower installed per production worker between the census years, 1939 and 1954. The increase in horsepower per worker in these 15 years was greater than the increase recorded in the previous 30 years. Similarly, electric energy consumption per production worker rose substantially--almost 175 percent--between 1939 and 1954, after a period of slow growth between 1929 and 1939.

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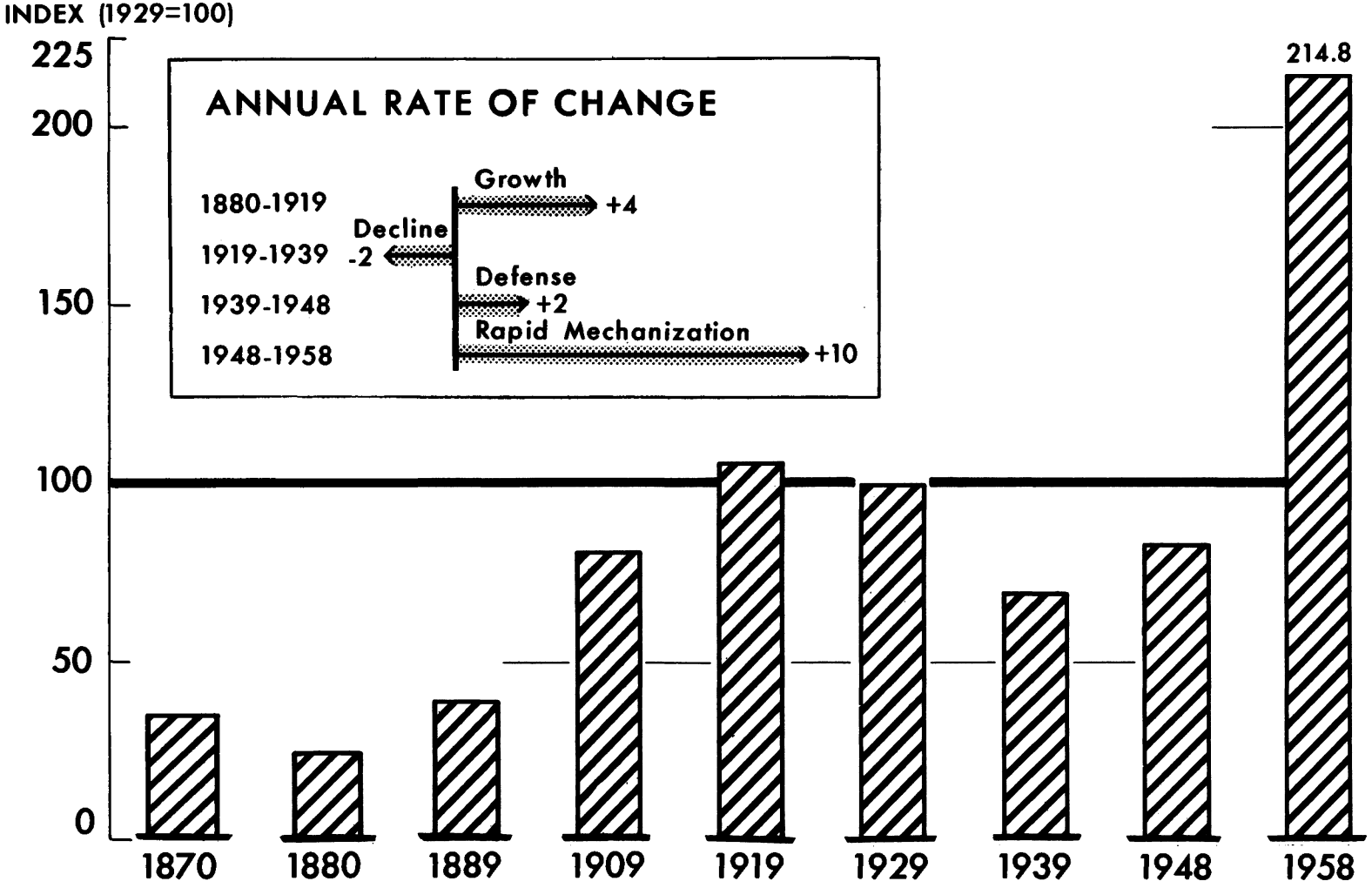
Capital Invested in Plant and Equipment Per Worker, Bituminous Coal Mining, Selected Years, 1870-1958



Sources: National Bureau of Economic Research;
U.S. Department of Labor, Bureau of Labor Statistics.
Based on appendix table 4A.

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Mechanization of Underground Mining

In underground mining where the bulk of coal is still mined, mechanization of loading and hauling operations, introduced earlier, advanced rapidly. The mechanical loading machine almost completely eliminated the hand shovel in the years following World War II. Since almost 60 percent of the labor employed under ground was engaged in loading and hauling coal, the adoption of mechanical loading had an enormous impact on productivity. First introduced in the early 1920's, mechanical loading equipment (which includes mobile loading machines, duckbills, and scrapers) accounted for about 60 percent of all underground coal mined in 1947. Although the extension of mechanical loading was slowed between 1954 and 1959, over 90 percent of all underground coal was mechanically loaded by 1960.

The growth of mechanical loading carried forward the process of mechanizing coal mining which began in the 1870's when the coal-cutting machine first replaced the miner's pickaxe. By 1913, half of all underground coal was machine cut; and by 1953, virtually 100 percent. Introduction of mechanical loading devices followed the mechanization of drilling and blasting operations.

Underground transportation also became more mechanized in the postwar period. Mechanical conveyors and shuttle cars were used in greater numbers to remove the coal from the working face fast enough to enable the loading machines to operate at near capacity. In less than 15 years, 1945-59, the number and the total miles of gathering and haulage conveyors in use quadrupled. Use of larger coal hauling cars and faster, more powerful locomotives running on heavier, more durable tracks grew rapidly.

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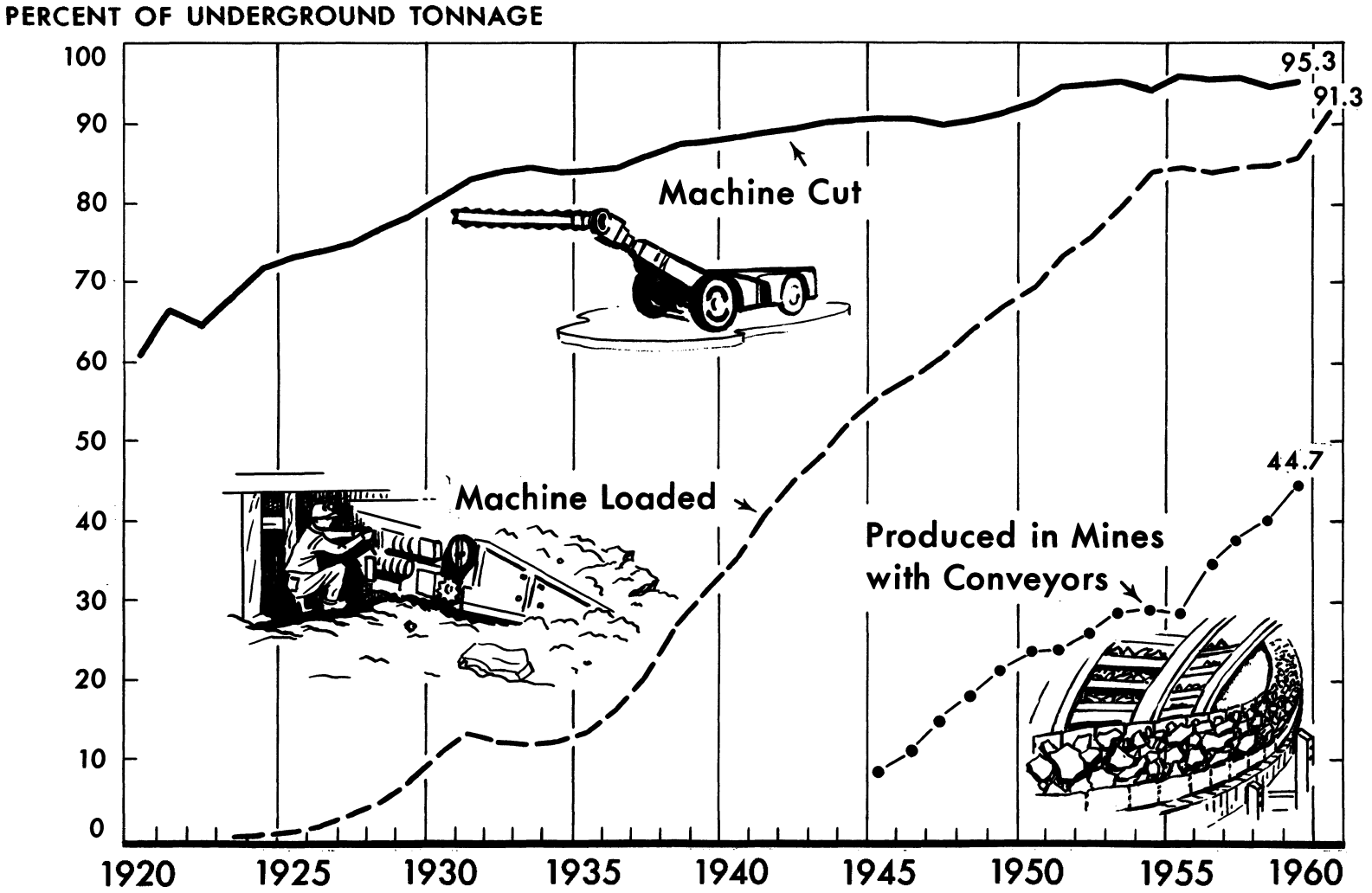
Mechanization of Underground Mining, 1920-60



Source: U. S. Department of Interior, Bureau of Mines.
Based on appendix tables 5A and 5B.

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Greater Use of Continuous Mining Machines

The most far-reaching postwar development in underground mining technology is the continuous mining machine. This machine integrates cutting and loading into continuous sequence, with a minimum of human intervention. It eliminates drilling and blasting. The steel claws of the continuous miner tear the coal from the seam, scoop it up, and load it, eliminating the time lost in performing these steps separately.

The use of continuous mining machines has grown rapidly. In 1959, the 776 machines in use accounted for 23 percent of all coal produced from underground mines; in 1952, the first year of record, only 152 were in operation, and these mined only 2 percent of the total. Fifty-nine mines in 1959 employed continuous mining machines exclusively--more than eight times as many as in 1952.

Because of their substantially lower labor requirements and their ability to increase the quantity of coal recovered, it is expected that use of continuous mining machines will continue to expand rapidly and will be an important factor in further raising productivity in the bituminous coal industry during the next decade. Output per man-day in mines using continuous mining machines exclusively was, in 1959, 24 percent greater than that in highly mechanized mines employing mobile loading machines and shuttle cars; and 144 percent greater than that in the outdated hand-loaded pit.

More widespread use of the continuous mining machine awaits its successful adaptation to thin and pitching seams and to other unfavorable natural resource conditions which have delayed its use. Another factor which has limited the adoption of continuous mining machines is their relatively high cost, approximately $70,000 a machine. Several types of thin-seam mining machines are currently being tested in the United States.

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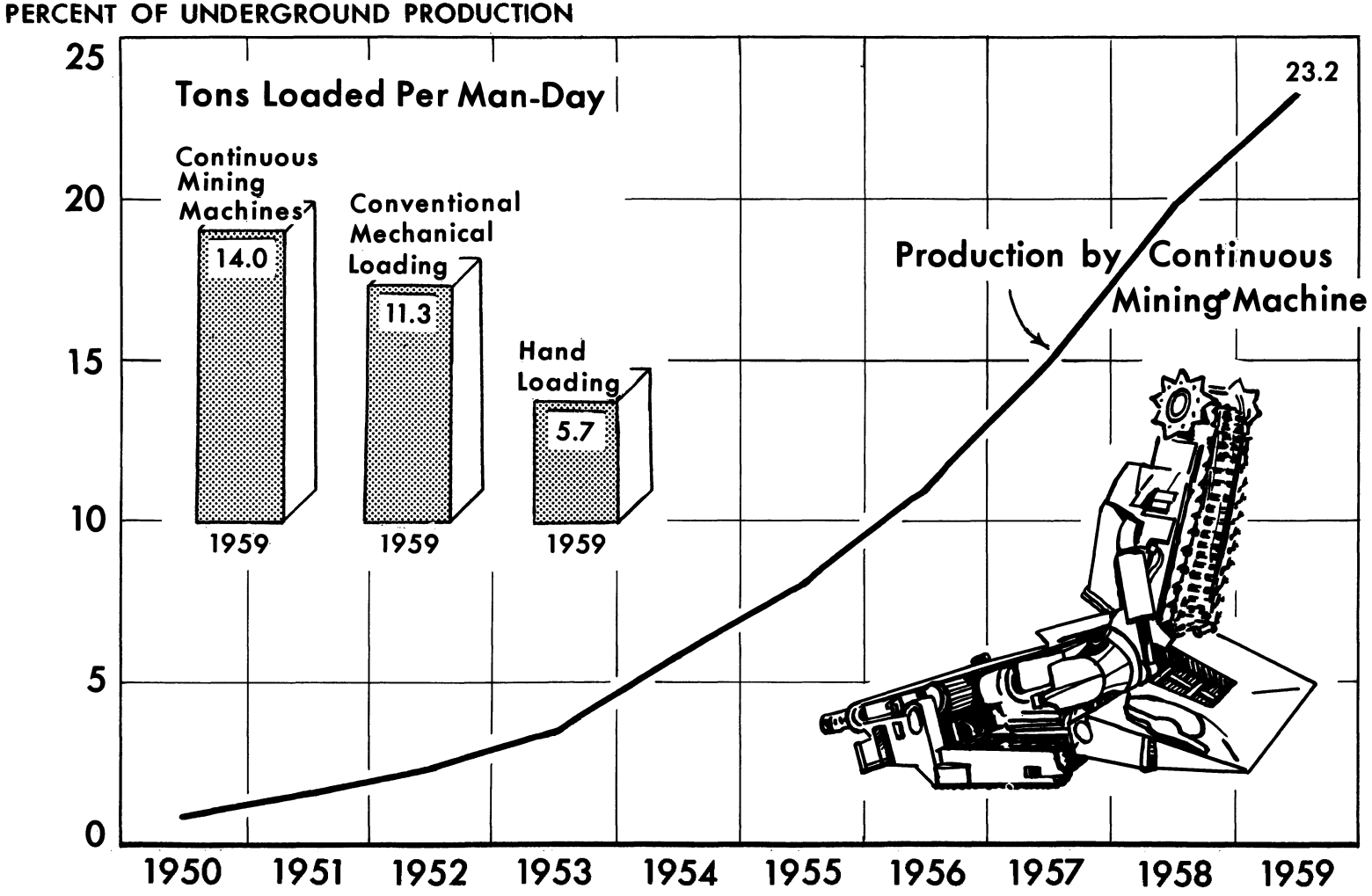
Percent of Underground Coal Mined by Continuous Mining Machines, 1950-59



Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix tables 6A and 6B.

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Growth of Strip Mining

In strip or open cut surface mining, some of the world's largest land-based machines rip away the crust of the earth to expose coal seams. Smaller machines then load the coal into special-purpose vehicles for transportation to processing plants. Only a small crew of men is required to operate such earth-moving equipment.

Surface mining has expanded rapidly in the United States in recent years. In 1959, almost 121 million tons, or 29 percent of all coal produced, originated in strip mines. In 1920, less than 2 percent was mined in this way. Most of the expansion occurred during World War II, when emergency needs for coal hastened the opening of surface deposits. Since 1947, the total output of strip mines has declined along with the rest of the industry. The proportion of total output mined by stripping, however, has continued to rise. Output per man-day in strip mines increased by 42 percent between 1947 and 1959, but this was only about one-half as great as the increase in underground mines.

The growth of surface mining has been the result of its high output per man-day, its low development and investment costs, the high percentage of coal recovered from deposits, and the rising demand for utility as distinct from high-grade lump coals. Since output per man-day in strip mining has been two to three times greater than in underground mining, its relative growth has had a measurable effect on the industry's overall change in output per man-hour. If strip mining had remained at its 1920 proportion, output in the industry in 1959 would have risen only to 10.2 tons per man-day, or almost 20 percent less than the level actually achieved.

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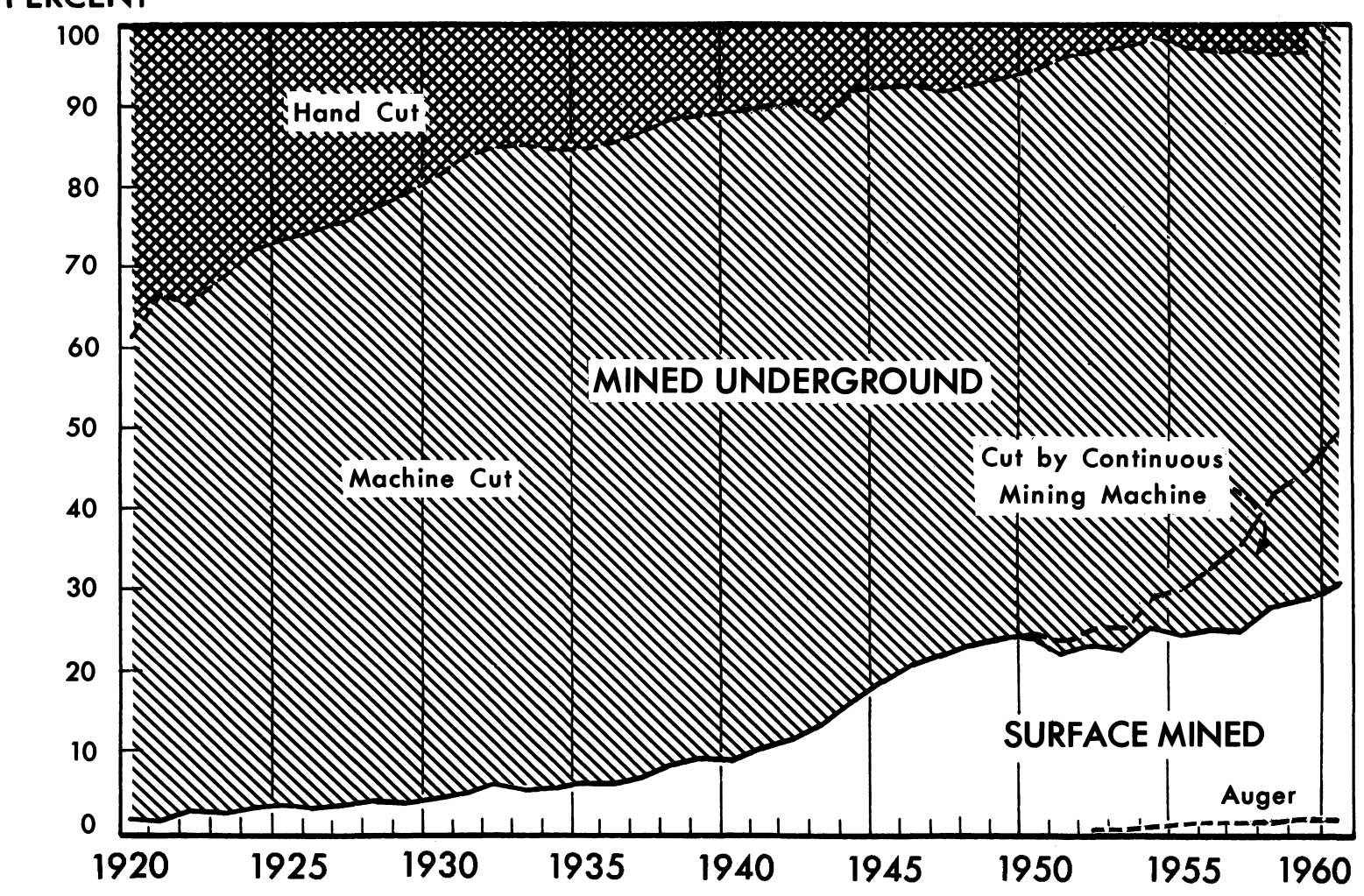
Trends in Bituminous Coal Mining in Underground and Surface Mines, 1920-60



Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix tables 5A, 6A, 7A and 7B.

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Technological Trends in Surface Mining

Recent technological developments in surface mining have consisted primarily of increases in the capacity and changes in the motive power of the earth-moving equipment used (such as draglines, shovels, and trucks). The size of working crews required to operate the larger, more powerful equipment has not changed significantly.

The postwar period saw the introduction of shovels with earth-moving capacities up to 180 yards each; by comparison, the largest earth mover in the 1930's had a capacity of only 30 yards. In addition to shovels with enlarged capacity, machinery was specially designed to move large quantities of coal-bearing earth over longer distances. The wheel excavator, a series of whirling buckets capable of moving 3,000 cubic yards an hour over a distance of more than 300 feet, is one impressive example.

Another specially designed mining machine is the coal auger which is used to drill coal in hill country where the thickness of overburden makes conventional strip mining unecomonical. In 1959, the average output per man-day of all auger mines was 28.8 tons, or about one-fourth more than the average for strip mines. A recently introduced auger, costing $1.5 million, is able to bore up to 1,000 feet into embankment. This unusual machine, run by a single man seated at an electric panel outside the mine, has a potential capacity to mine 3,000 tons of coal daily under favorable mining conditions.

The coal industry itself has been caught up in the technological shift from coal to diesel fuels as a source of power. Prior to World War II, most earth-moving equipment was steam or gasoline driven. In the decade after World War II, these were replaced by diesel and electric powered shovels. The steam shovel has virtually disappeared from open pits--only 7 steam shovels were reported among the 3,417 pits operating in 1959.

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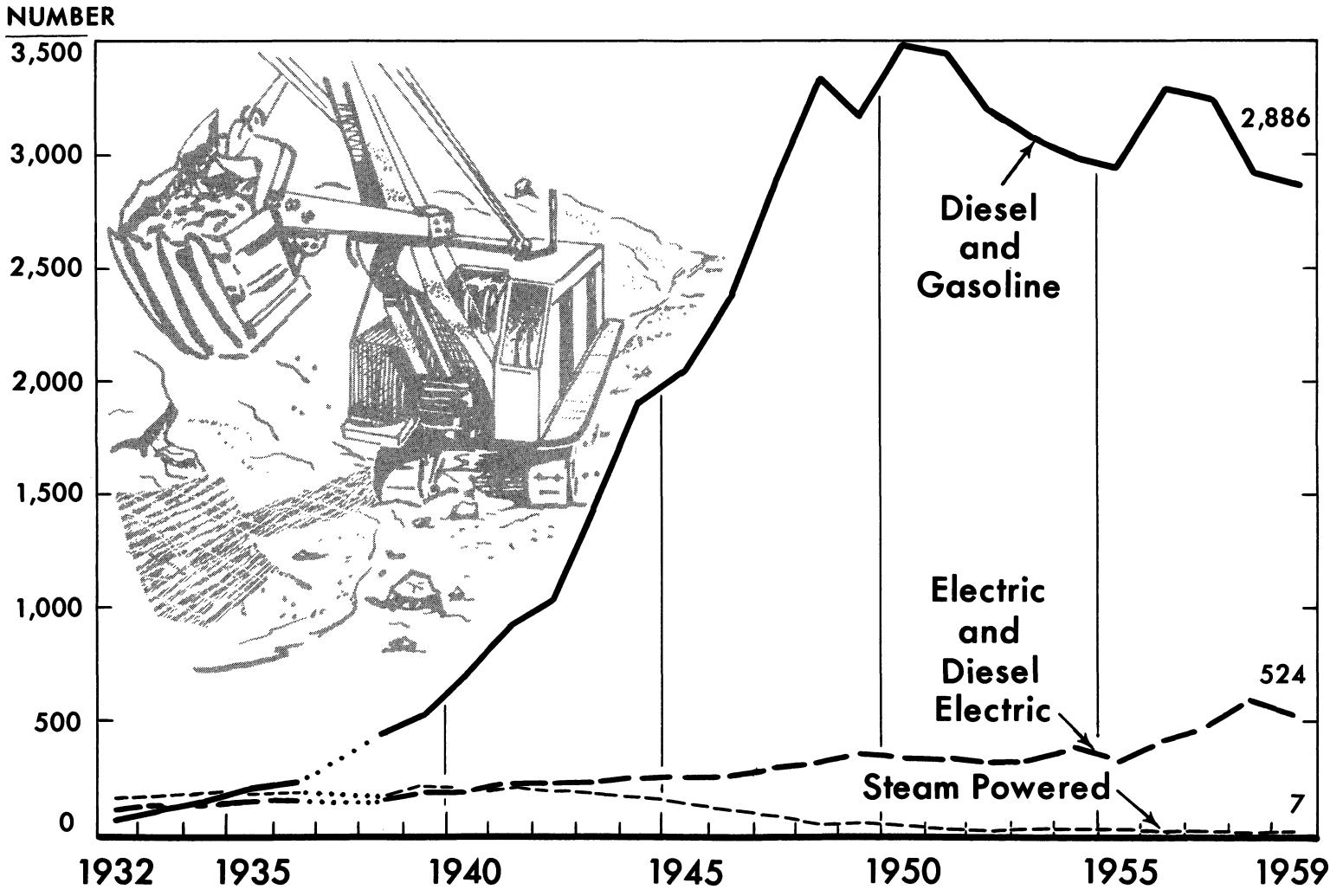
Number of Draglines and Shovels in Use, by Type, in Bituminous Coal Mining, 1932-59



Source: U. S. Department of Interior, Bureau of Mines.
Based on appendix table 8B.

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Mechanization of Coal Processing

Mechanical mining increased the amount of refuse mined with coal, and correspondingly increased the need for processing--cleaning, crushing, dust treating, and drying--the product. A ton of coal mined in 1959 contained 28 percent more refuse than it did a decade earlier. At the same time, coal consumers demanded higher quality and greater purity of product. As a result of these pressures, the processing of coal formerly performed manually underground was expanded and mechanized rapidly in the years following World War II.

The rapid increase in mechanical processing is indicated both by the sharp rise in the number of coal processing plants and by the increase in the percentage of coal processed. In 1959, 555 plants processed coal mechanically. This was 100 more than were operating 12 years earlier, and over twice the number in use in 1928. These plants cleaned almost two-thirds and crushed more than one-third of all coal produced in the United States in 1959. They also steadily increased the percentage of coal dust treated and thermally dried. Over the post-war period, 1947-59, the proportion cleaned and crushed more than doubled, while the percentage dust treated increased by almost two-thirds.

Although coal preparation was once a hand operation involving little capital investment, it has become a highly mechanized, continuous flow operation involving large capital outlays. The modern processing plant employs such devices as closed circuit television to monitor the flow of coal, nuclear density controls to insure uniform quality, and electropneumatic carstoppers and automatic car loaders and haulers to speed loading of the processed coal. One of the newest plants is designed to process up to 5,000 tons per shift--or about as much coal as 500 miners produced per shift, on the average in U.S. mines in 1959--with only 3 panel-control operators and 12 maintenance men.

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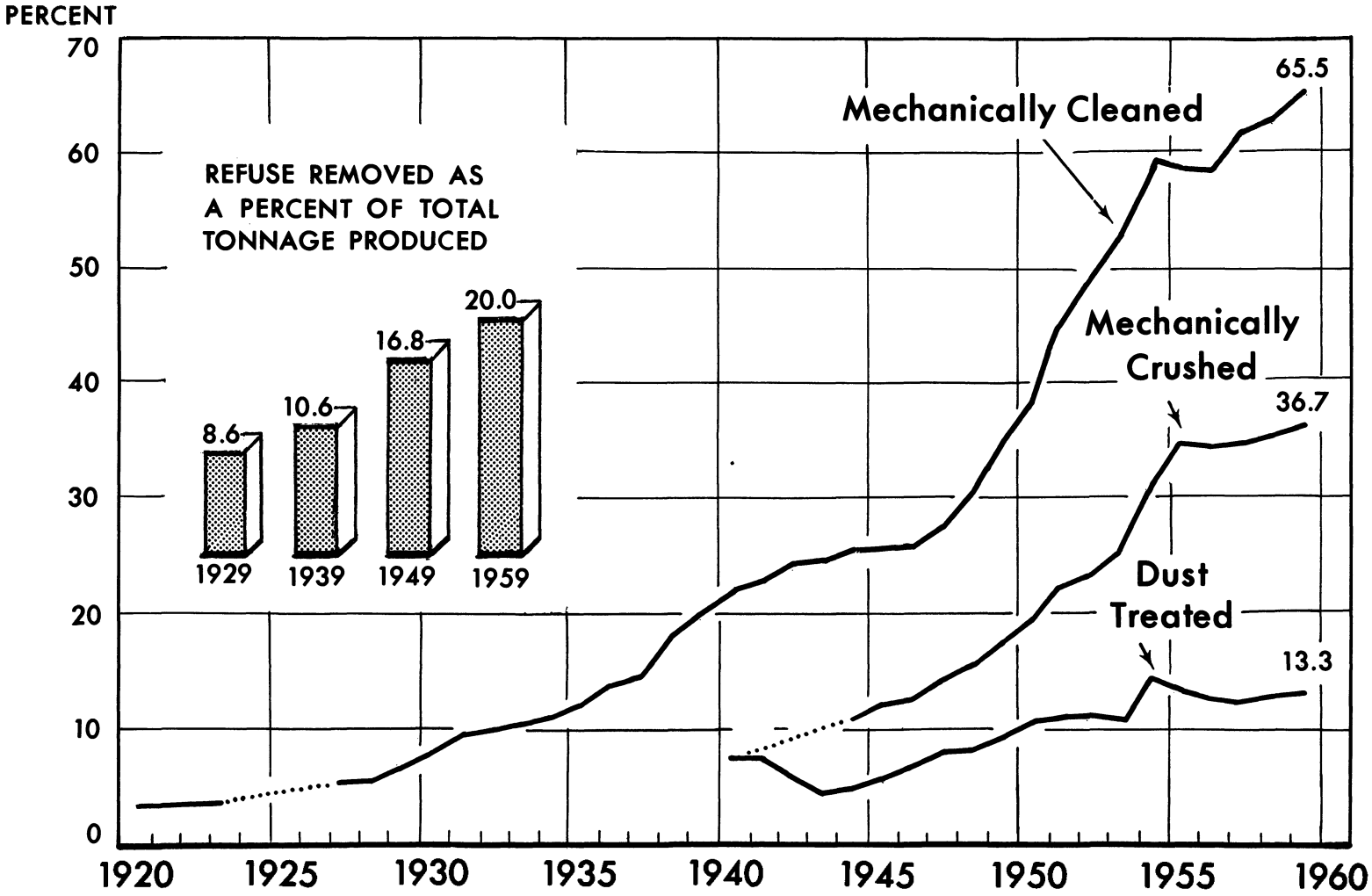
Percent of Bituminous Coal Tonnage Mechanically Processed, 1920-59



Source: U.S. Department of Interior, Bureau of Mines. Based on appendix table 9.

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Rising Output per Man-Hour

Greater mechanization and related technological improvements were the main factors underlying the impressive rise in coal mining productivity after World War II. Changes in output per man-hour or tons per man-day, however, reflect not only the increased use of machinery in cutting, loading, hauling, and other operations, but also interrelated changes in the proportion of coal output coming from surface rather than from underground mines and from mines at different levels of mechanization, with seams of varying depths, thickness, slopes, and faults. The precise effect of each factor cannot be readily measured. The net result of these changes was an increase of 85.2 percent in output per production worker man-hour between 1949 and 1959 and of 77.3 percent in output per all employee man-hour. In tons per man-day, a measure that does not take account of changes in the length of the workday, the industry's advance was equally impressive: production jumped from 6.4 tons to 12.2 tons per man-day.

Output per man-hour in U.S. coal mining increased at a more rapid rate in the 10 years 1949-59 than in the three previous decades combined. The average annual increase of 6.4 percent in output per production worker man-hour was more than double the annual gain in any previous 10-year period. In the decade after World War I, when coal production began to decline, productivity advanced 2.0 percent yearly. In the depression decade, output per production worker man-hour rose at a slow pace. During the wartime emergency, productivity growth slowed to 1.4 percent yearly. The average annual rate of increase between 1947 and 1959 (6.1 percent) was more than three times greater than the industry's long-term rate of 1.9 percent, recorded between 1919 and 1947.

Increases in output per man-hour may have reached their highest yearly rate during the early 1950's. Output per production worker man-hour rose by an average of 6.5 percent yearly between 1949 and 1954; in the following 5 years (1954-59), increases were reduced to an average of 4.8 percent yearly. The sharpest gains were recorded between 1952 and 1954, when output per production worker man-hour climbed by about 11.5 percent per year. A second rapid increase was recorded late in the decade (1957-59) but at a reduced rate. In both underground and strip mining, tonnage per man-day rose faster in the first half of the decade (1949-54) than in the last half (1954-59). Among the factors slowing the rate of increase late in the decade were the virtual completion of mechanical loading installations and the slowing down of the rate of productivity gains in strip mines.

Figures on changes in output per man-hour for the industry as a whole represent averages covering mines of varying sizes and levels of mechanization. Small mines did not improve their output per man-hour as much as the larger, more mechanized mines.

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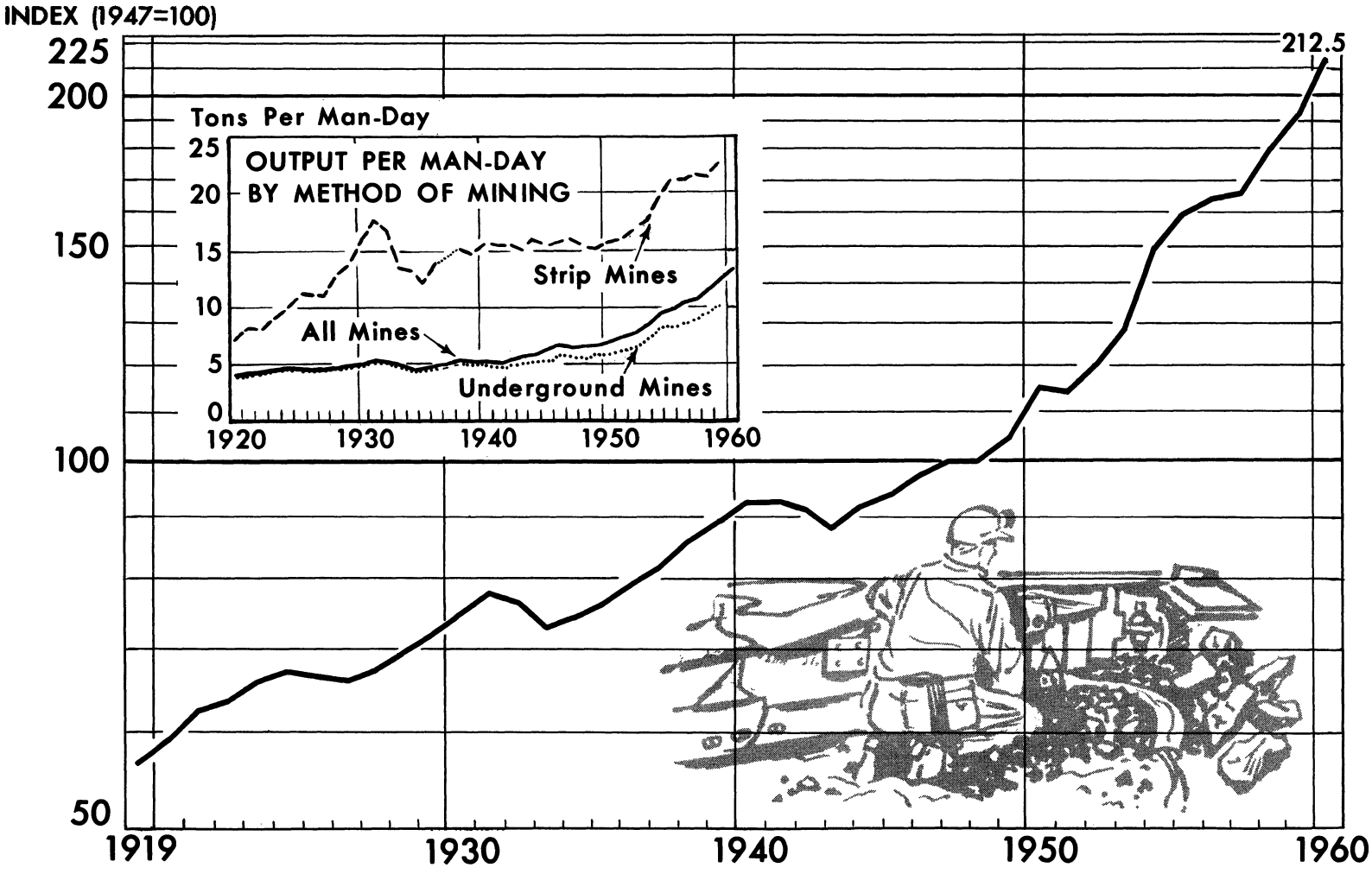
Indexes of Output Per Production-Worker Man-Hour in Bituminous Coal-Mining, 1919-60



Sources: U. S. Department of Labor, Bureau of Labor Statistics;
U. S. Department of Interior, Bureau of Mines
Based on appendix tables 8A and 10A.

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Increase Relative to Other Industries

The dramatic increase in the rate of change in output per man-hour in bituminous coal mining is seen clearly when compared with the changes which occurred in the rest of the economy.

Between 1949 and 1959, output per man-hour (of all employees) in bituminous coal mining advanced about twice as fast as in the total private economy, and almost three times as fast as in the nonfarm sector. The industry took an even greater stride forward in productivity than did agriculture, when compared to the gains recorded between 1939 and 1949. The growth in output per man-hour between 1949 and 1959 in bituminous coal was about 6 times greater than the increase between 1939 and 1949; in the agricultural sector, the 1949-59 increase was only 3 times greater. The 1949-59 farm increase in output per man-hour was only slightly higher than in coal.

Increases in output per man-hour (of production workers) in the basic steel industry, were less than half as great as in coal mining during the period 1949-59. In railroads, productivity gains, though substantial, were only three-fourths as great. The 1949-59 record contrasts sharply with that of the previous decade when productivity gains in both steel and railroads were more than 70 percent greater than in bituminous coal mining.

Percent Changes in Output per Man-Hour

Period	Output per all employee man-hour				Output per production worker man-hour		
	Bituminous coal	Total private economy 1/	Agriculture 1/	Nonagriculture 1/	Bituminous coal	Basic steel	Railroads
1949-59..	77	38	82	29	85	38	70
1939-49..	13	33	26	25	17	30	30

1/ Man-hours relate to man-hours of all persons engaged.

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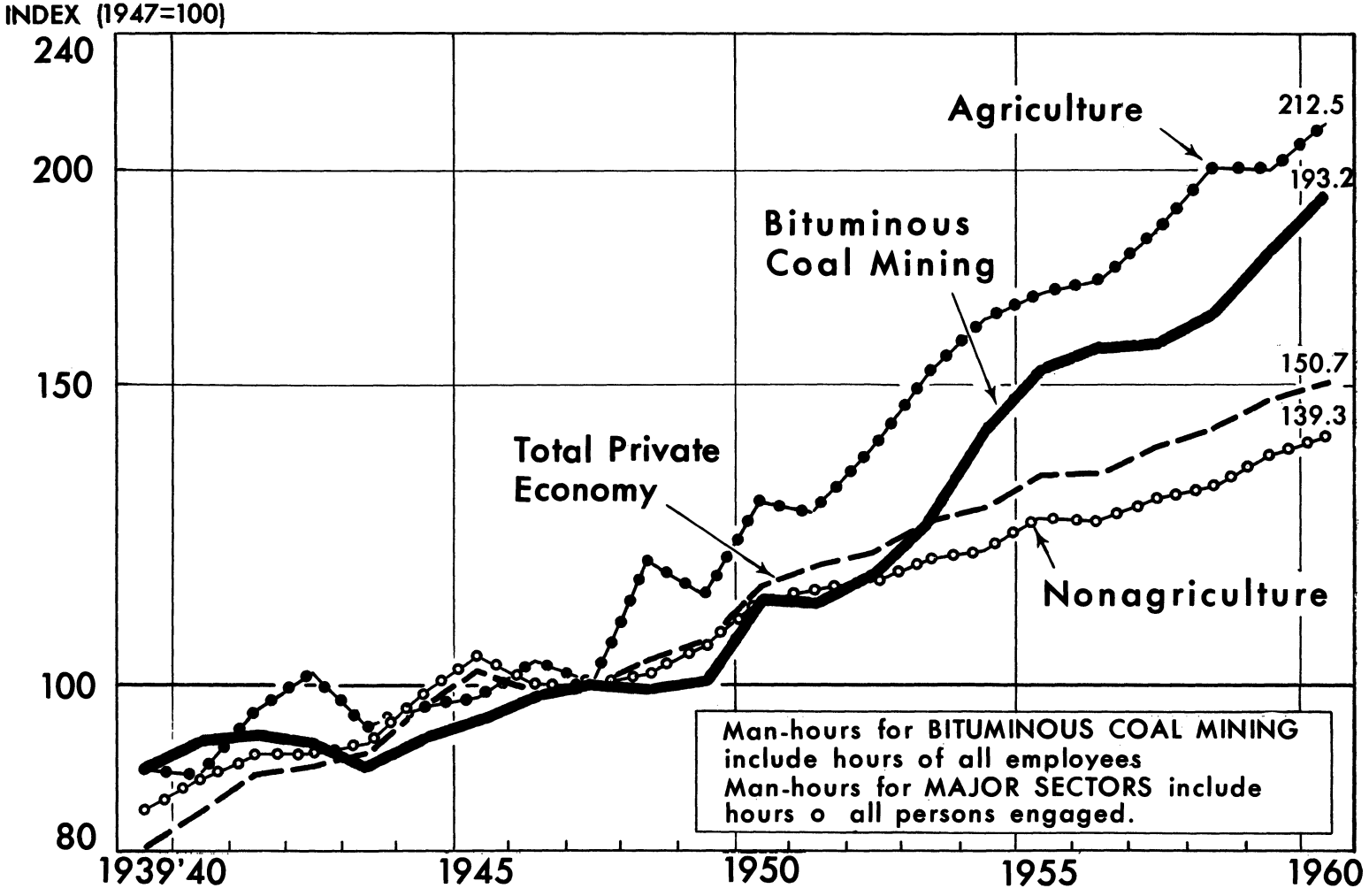
Indexes of Output Per Man-Hour in Bituminous Coal Mining and Selected Major Sectors of the Economy, 1939-60



Based on appendix table 11.

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Increase Relative to Other Countries

Output per man-day in U.S. coal mining, already substantially greater than in other parts of the world, also increased faster during the post-World War II period. U.S. underground mines produced, on the average, over 10 tons of coal per man-day in 1959, or about five times as much as the highest average shown by any European nation. Output per man-day in underground U.S. mines between 1947 and 1959 increased by 84 percent as compared with 80 percent in France, about 50 percent in Belgium and West Germany, the traditional centers of European coal mining, and 18 percent in the United Kingdom. (These differences may not result in correspondingly lower unit labor costs since differences in wage rates must be taken into account.)

Output per man-day rose slowly in European countries (excepting France) through most of the postwar period as coal mines were being reconstructed. Only after 1957 did increased mechanization, the closing of inefficient mines, and greater efforts result in sizeable improvements in output per man-day, particularly in the mines of West Germany.

Higher levels of output per man-day in the United States are, to a considerable degree, the result of geological advantages, as well as technological advances and social and economic factors. U.S. coal deposits lie closer to the earth's surface, are generally thicker and less sloped than those in Europe. The average depth of about 200 feet in U.S. underground workings compares with an average of 1,100 feet in British mines; the deepest shaft in the United States (under 900 feet) is less than 1/3 the deepest British shaft. Average thickness of U.S. seams worked is over 5 feet, considerably wider than in most European diggings. Faults and dislocations are fewer, and water drainage is less of a problem in the United States. These geological advantages have combined to make U.S. coal mining both less difficult in terms of physical effort required and more adaptable to mechanization.

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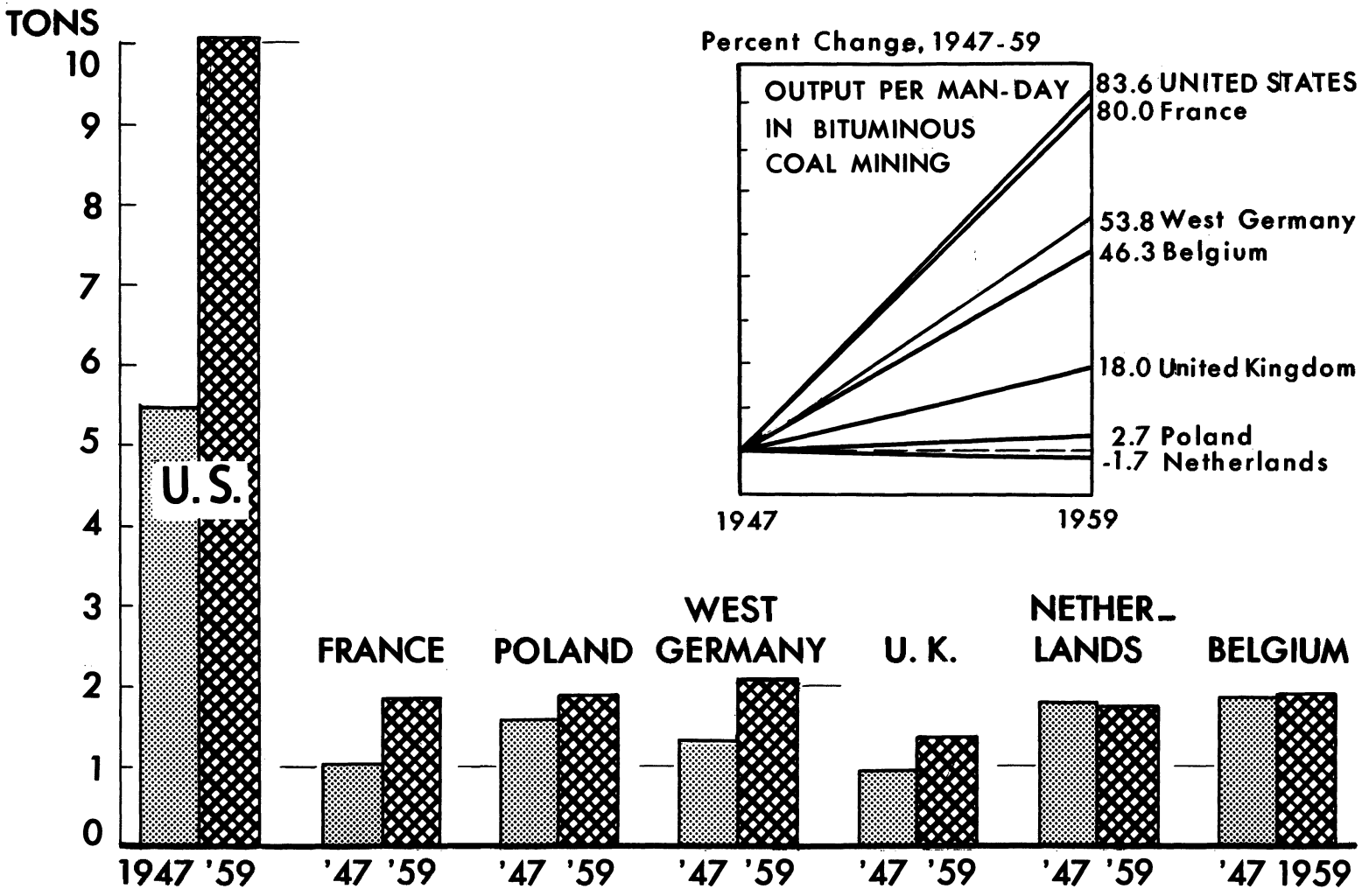
Output Per Man-Day in Bituminous Coal Mining, United States and Selected Foreign Countries, 1947 and 1959



Source: U. S. Department of Interior, Bureau of Mines.
U.N. Economic Commission for Europe.
Based on appendix table 12.

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Trends in Bituminous Coal Mining: United States and the U.S.S.R.

Soviet coal miners produced 1.95 tons per man-day in 1958, less than one-fifth the U.S. miners' daily output of 11.3 tons. Despite impressive postwar advances, the level of productivity in Soviet coal mining was only one-half as high as that achieved in the United States in 1920. Data available are not exactly comparable but are believed to present valid approximate differences.

Since World War II, the U.S. coal mining industry raised output per man-day at a higher rate than the U.S.S.R. Soviet progress, in part, reflects the lower level from which their advance is measured. U.S. tonnage per man-day rose by 96 percent between 1945 and 1958, higher than the U.S.S.R. increase of 82 percent. Soviet gains were greater in the reconstruction period 1945-50, whereas U.S. gains were greater in the years 1950-58. The rapid development of strip mining in eastern Russia resulted in greater Soviet productivity advances in surface mines throughout the postwar period. In underground mining, the Soviet advance, 1945-50, was greater than in the United States; after 1950, however, underground productivity in the United States grew more than twice as fast as in the Soviet Union.

The coal mining industry of the U.S.S.R. was expanded and mechanized rapidly after World War II. The U.S.S.R. supplanted the United States as the world's leading coal producer in 1958; by 1959, it was producing 29 percent more coal per year than the United States. In terms of heat value, however, industry output was about equal in the two countries, primarily because lignite constituted 29 percent of Soviet output, but less than 1 percent of the U.S. total. Per capita production in the United States, consequently, exceeded that in the U.S.S.R. both in gross tons and in heat value.

Rapid development of the estimated 8.7 trillion tons of U.S.S.R. coal reserves was undertaken after World War II to supply the growing demands for energy in the Soviet Union. Almost 1 million workers (five times the number in the United States) were employed in the industry in 1957, and intensive research was being conducted on coal uses and methods of mining. Coal is providing the basis for Soviet industrial development as it did for U.S. development nearly a century ago.

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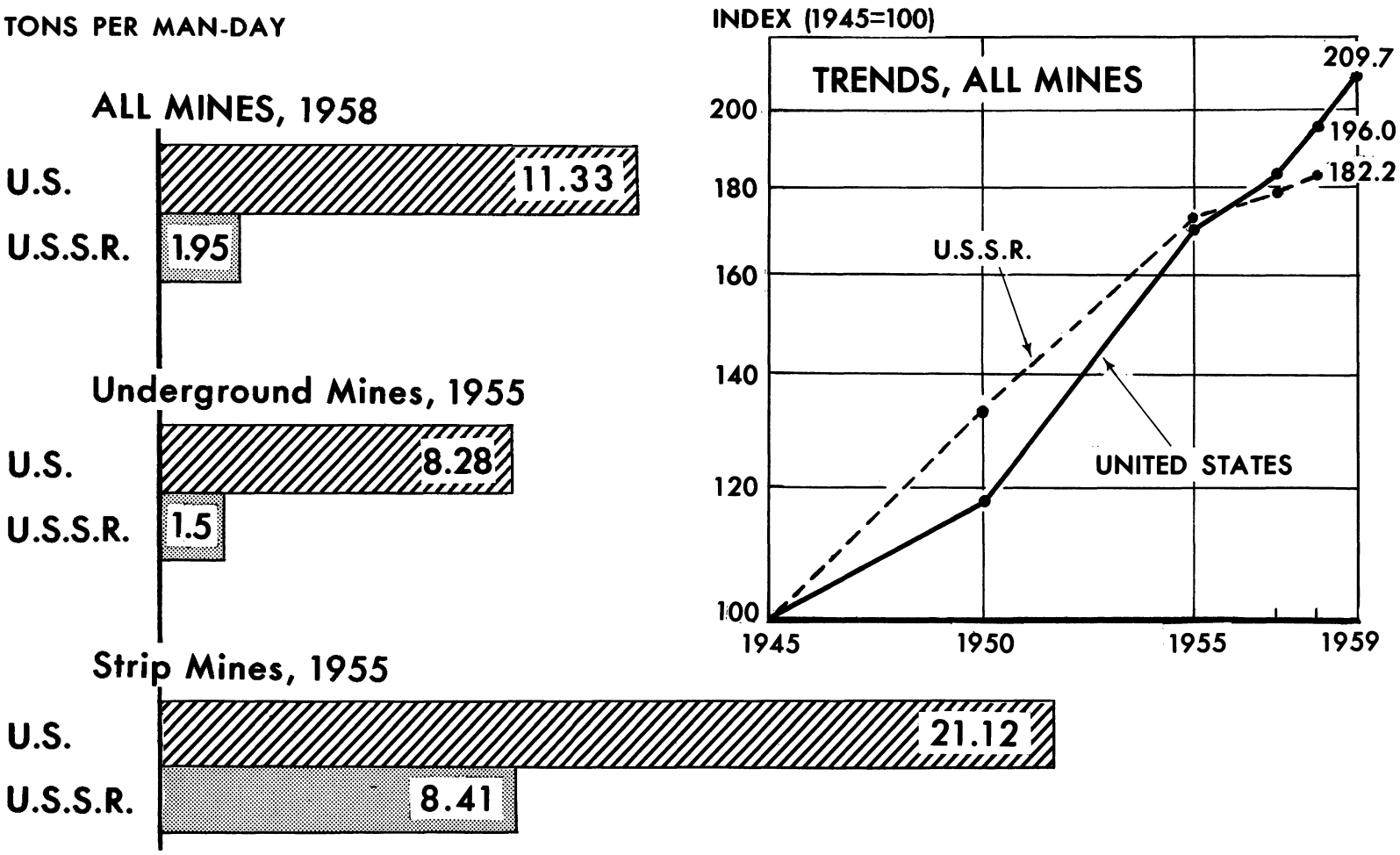
Output Per Man-Day in Bituminous Coal Mining, United States and U.S.S.R.; Selected Years



Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix table 13.

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Declining Production

The drive to introduce labor-saving machinery and improve output per man-day after World War II constituted a major step in the industry's efforts to arrest a long-term decline in coal production and sales arising from increased competition of other fuels. Despite these efforts, output continued to decline in the postwar period. In 1947 (the historic peak), the industry produced more than 600 million tons. During the subsequent period, output topped 500 million tons in only 4 years--1948, 1950, 1951, and 1956. In 1954, production actually fell below 400 million tons, and in 1958-59, it hovered just above 410 million tons. Short-term fluctuations in activity were relatively sharp, as they have been for many years in coal mining. Output fell by 30 percent between 1947 and 1949, by 27 percent between 1951 and 1954, and by 18 percent between 1956 and 1959.

The downtrend of the 1950's resumed the long-term decline of coal output that began in the 1920's, and was interrupted only during the 1940's. Commercial coal mining in the United States was begun about 1750 in Virginia. Production expanded gradually up to 1860; with the growth of steam railroads and heavy industry after the Civil War, coal mining entered a 60-year period of vigorous growth. The close of World War I brought to an end the industry's period of rapid, steady growth. Thereafter, except for temporary gains during World War II, the industry declined.

The decline in bituminous coal production contrasted sharply with the rise in United States industrial production and gross national product. Between 1947 and 1959, industrial production rose 61 percent and the index of private output (GNP) 52 percent; the index of bituminous coal production, on the other hand, declined by 35 percent. While the rest of the economy climbed to higher levels after World War II, with only temporary setbacks during recessions, coal output fell sharply during recessions and failed to recover during periods of economic upturn.

Coal's failure to share in the Nation's growth after World War II was similar to its experience during the prosperous years after World War I. Total output in the United States rose by almost 50 percent between 1920 and 1929 at the same time that the bituminous industry was struggling, unsuccessfully, to maintain levels of production reached at the close of World War I. Fluctuations in coal production in the 1920's tended to occur at the same time as those in the national economy. After World War II, declines in coal tended to precede declines in the national economy, reflecting a shift in coal demand which has tended to make production in the industry more sensitive to changes in business activity in the national economy.

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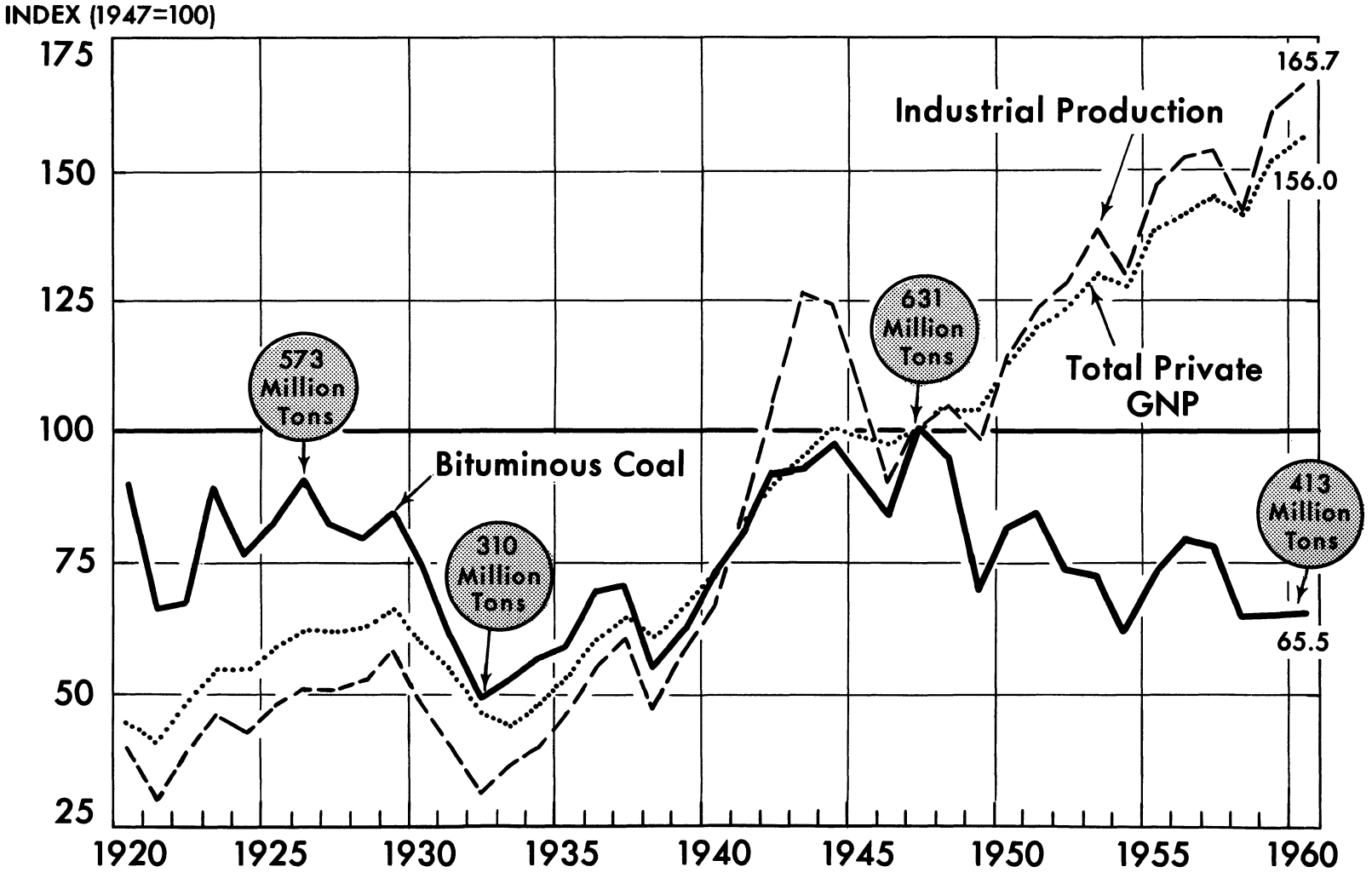
Indexes of Change in Bituminous Coal Production, Industrial Production, and Total Private GNP, 1920-60



Sources: U. S. Department of Interior, Bureau of Mines; Board of Governors of the Federal Reserve System; U. S. Department of Labor, Bureau of Labor Statistics.
Based on appendix table 14.

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Growth in Idle Capacity

Idle productive capacity, a problem of the coal industry since early in the century, continued to trouble the industry in the period following World War II. According to the Bureau of Mines, in 1959 the bituminous coal industry was capable of producing 614 million tons (assuming that mines operated a full 280-day year at existing levels of productivity) or 49 percent more coal than was actually mined. Although coal production began to fall after 1947, the industry's capacity continued to expand until 1950. Reduction of capacity after 1950 little more than kept pace with falling demand. There was, as a result, about two-thirds more unused capacity in 1959 than in 1947. Total capacity in 1959 was almost equal to the Nation's coal requirements in 1947, the greatest in the industry's history.

Except for a brief period during World War II, the bituminous coal industry has operated over the past 40 years with excess capacity. In 1920, after the wartime expansion of capacity and the beginnings of the decline in coal consumption, a U.S. Bituminous Coal Commission reported: "At the present time, America requires less than 500 million tons of bituminous coal a year, while the capacity of the mines in operation is over 700 million tons." Thirty-nine years later, the industry, with almost as many mines in operation as in 1920, still had the capacity to produce 200 million tons more per year than could be consumed. In only one year between 1920 and 1959--1944--did the industry produce at near capacity.

The slow process by which the industry adjusts capacity to declines in demand is a consequence of conditions which have made entry into the industry easy, and exit difficult. Increases in the demand for coal have been rapidly followed by increases in capacity because coal-bearing lands and transportation facilities are widespread, and because State laws generally permit bankrupt mines to reopen at greatly reduced valuation. But declines in coal demand have not resulted in corresponding reductions in capacity because development and specialized equipment costs can only be recovered by mining coal. In addition, there is a strong incentive to keep mines in operation because of the relatively heavy maintenance and other overhead costs that exist even during periods of shutdown. Since coal has been important in defense emergencies, some capacity in excess of normal requirements is often considered to be essential for national security.

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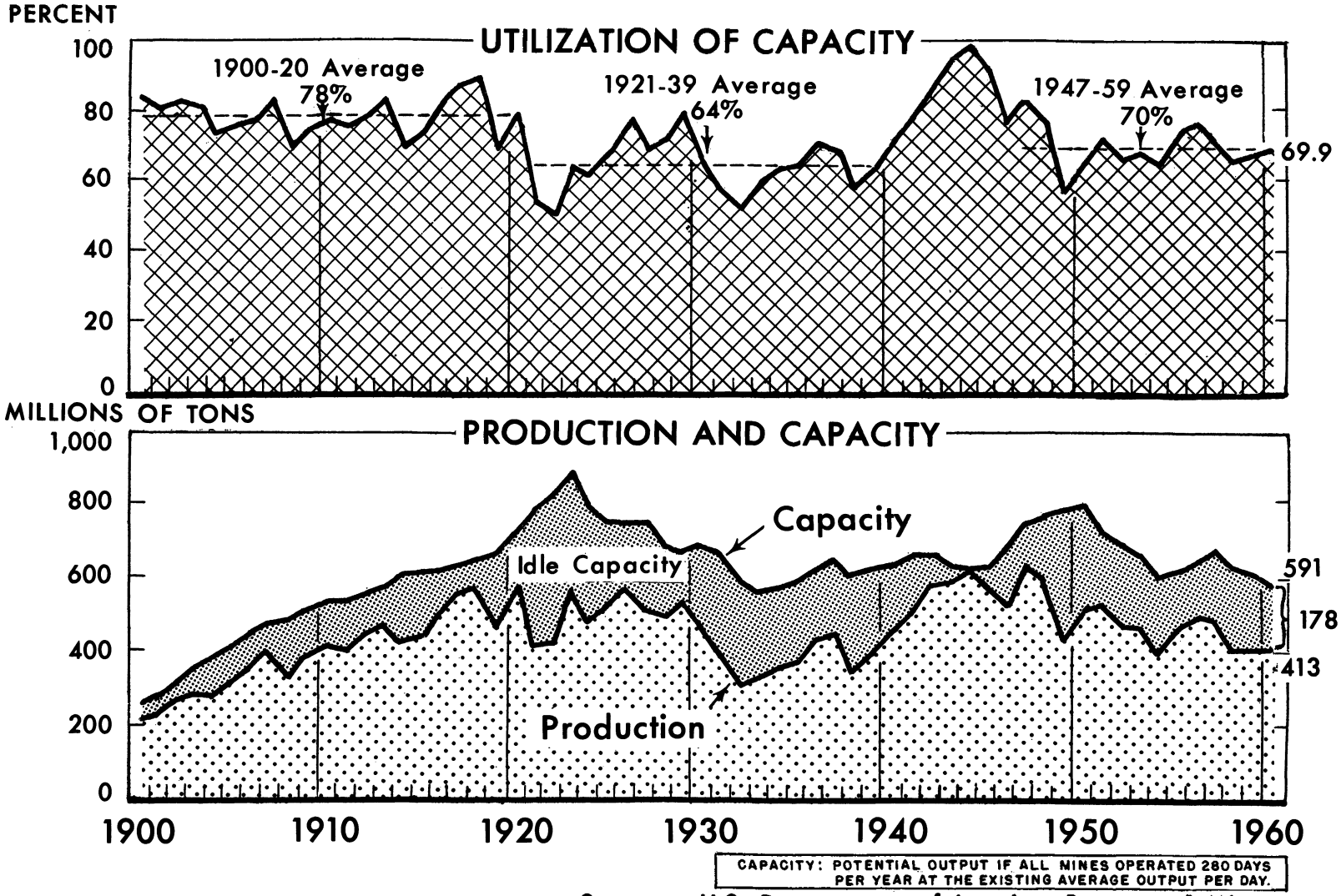
Production and Capacity of Bituminous Coal Mines and Percent of Capacity Utilized, 1900-60



Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix tables 14 and 15.

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Changing Industry Structure

With greater mechanization and investment, the largest mining corporations increased their share of the industry's assets. In 1947, corporations with assets of more than $50 million controlled 16 percent of the industry's assets; by 1957 they held over 42 percent. The smallest corporations lost ground: corporations with assets of less than $1 million held less than 10 percent of the industry's assets in 1957 compared with more than 16 percent in 1947. But the greatest decline took place among middle-size corporations whose share of total assets fell from 68 to 49 percent.

The largest bituminous coal mines (as shown by production data for establishments) increased their portion of the industry's output after World War II. In 1945, the 50 largest mines produced only 5 percent of total tonnage; in 1958, their output climbed to 22 percent of the total. The largest size class of mines, those producing more than 500,000 tons per year, raised their share of the industry's production from 42 percent in 1947 to 50 percent in 1959, the greatest increase made by any size class.

The small marginal mines, operating with a minimum of capital investment, expanded as a group during the postwar period as moderate-size mines were abandoned. The growth of the small mine, however, is related to its ability to produce for the local market, generally without effective union contract or Federal safety regulation. Mines producing fewer than 10,000 tons annually increased their share of total production from 2.5 percent in 1947 to 4.9 percent in 1959, as they raised their annual output by almost 5 million tons. The number of such mines increased by 755, although the number in all other classes fell. In 1947, they comprised fewer than half of all mines in operation; in 1959, they constituted 61 percent.

Employment in mines with fewer than 10 workers increased, although it fell sharply throughout the rest of the industry. The proportion of employees working in the smallest size mine more than doubled, rising from 5 percent in 1948 to 12 percent in 1958. Fewer than half of all mines employed less than 10 workers in 1948; by 1958, slightly more than two-thirds did.

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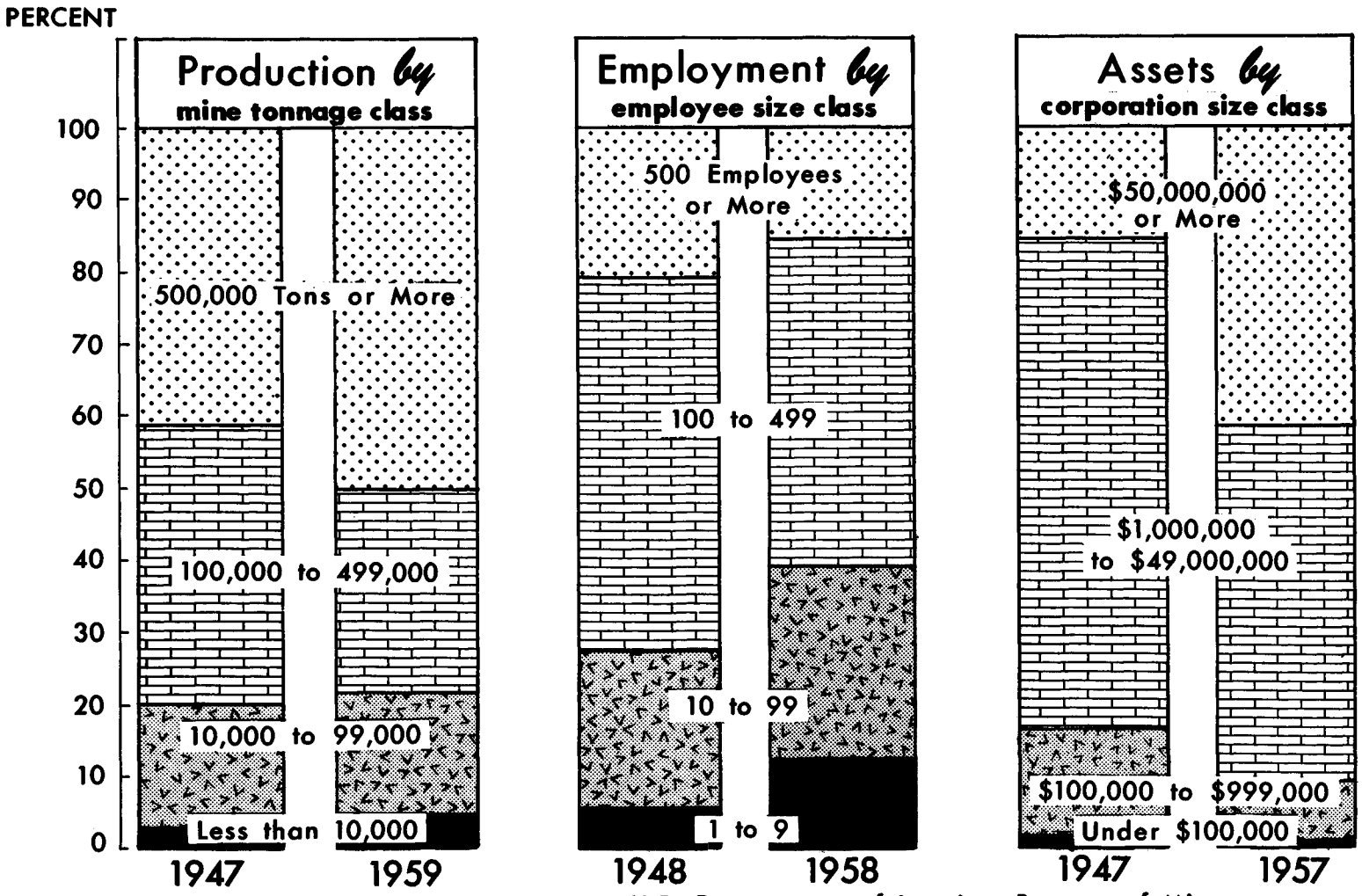
Structure of Bituminous Coal Mining Industry, Three Postwar-Periods



Sources: U.S. Department of Interior, Bureau of Mines;
U.S. Department of Treasury, Internal Revenue Service.
Based on appendix table 16.

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Rise of Competitive Fuels

The postwar decline of bituminous coal production reflected a continuing long-term shift from coal to alternative sources of energy. At the close of the 19th century, coal supplanted wood as the Nation's principal fuel, and by 1920, supplied almost two-thirds of all energy consumed in the United States (in terms of B.t.u's). After 1920, however, coal consumption declined relative to other fuels largely as a result of the expanding use of the internal combustion engine. In 1950, only 35 percent of the Nation's energy supply came from bituminous coal, while 37 percent was derived from petroleum, which succeeded coal as the Nation's leading energy source. By 1959, bituminous coal supplied 22 percent of the Nation's energy; natural gas, which expanded phenomenally during World War II, accounted for 31 percent; and petroleum, continuing to rank first among the Nation's fuels, provided 42 percent of the total consumed.

In energy markets in which it directly competes with petroleum and natural gas--excluding such uses as gasoline, lubricating oils, and the manufacture of carbon black--bituminous coal supplied almost one-third of the total B.t.u.'s used in the United States in 1959, but this was a decline from more than 50 percent in 1945-49 and more than 70 percent in the early 1920's.

The shift from bituminous coal to other fuels resulted in part from its competitors' natural advantages, as well as from cost considerations. Both petroleum and natural gas are regarded as cleaner and more conveniently consumed fuels than coal. Uncertainties about a constant supply of coal arising from the frequent labor-management disputes of the 1940's, also contributed to the continuing shift away from bituminous coal. Petroleum and natural gas, moreover, were aided by well-financed research programs which helped develop more efficient and more automatic equipment for utilizing these fuels.

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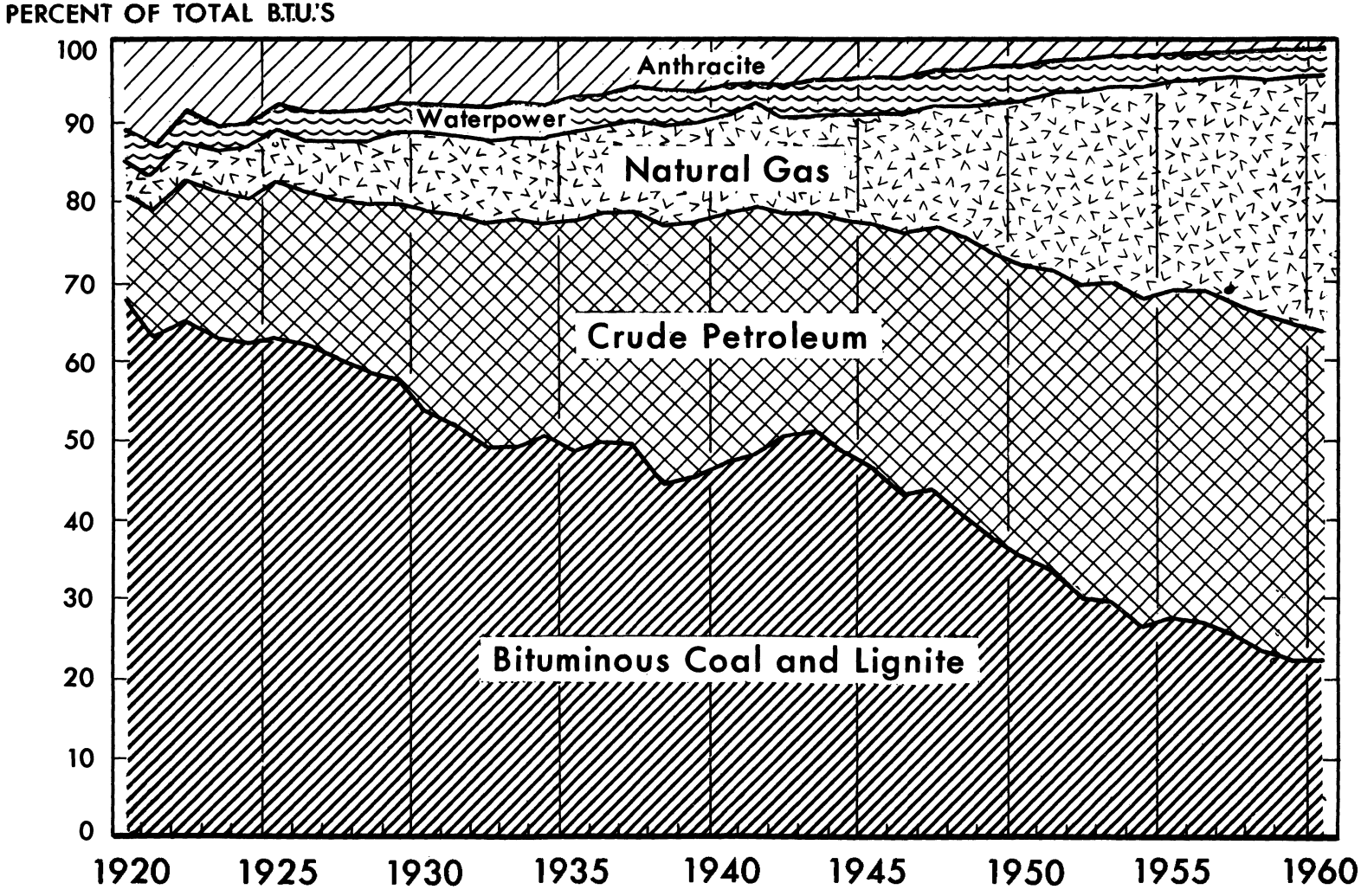
Proportions of the Nation's Energy Supply Furnished by Mineral Fuels and Waterpower, 1920-60



Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix table 17 B.

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Technology and the Changing Pattern of Coal Consumption

Technological changes were instrumental in displacing coal from three of its principal markets--railroads, industry, and homes and businesses (retail deliveries). At the same time, they were creating a new market for coal--electric power--which has rapidly become the industry's largest market.

The adoption of the diesel locomotive led to the virtual elimination of coal from the railroad market. For many years, railroads ranked with industry and retail deliveries as a major market for coal. Between 1933 and 1947, steam locomotives used 20 percent of the coal consumed in the United States. With conversion from steam to diesel power in the decade after World War II, railroad consumption shrank from more than 109 million tons in 1947 to fewer than 3 million tons, or less than 1 percent of all coal consumed in 1959.

The introduction of the welded steel pipeline was a primary factor in the substitution of natural gas and petroleum products for coal in residential and commercial spaceheating. Although home and commercial use of coal declined less drastically than did railroad consumption, retail deliveries fell by 70 percent (68 million tons) between 1947 and 1959.

The development of transcontinental oil and gas pipelines also partially explains the 33-percent decline in coal buying by U.S. mining and manufacturing industries between 1947 and 1959. Increased imports of low-cost residual fuel oil are said to have further reduced industrial demand for bituminous coal. All industry groups, except cement manufacture, reduced consumption of coal during the period.

The decline in industrial coal consumption also reflected the rise of the electrical power industry. Improvements in the generation of electricity and in the manufacture of electrical machinery enabled industry to substitute purchased electrical power for factory generated steam-power. This substitution in large part amounted to a shift from direct coal use to the use of coal "by wire," since approximately half of all the electric power used in the past 40 years was generated from coal. Consumption of coal "by wire" has increased spectacularly in recent years. The amount of coal purchased by electric power utilities doubled between 1937 and 1947 and again between 1947 and 1959. In 1948, electric utilities surpassed railroads as a consumer of coal; and by 1954, they used more than any other consumer group. In 1959, 166 million tons, more than 45 percent of all coal consumed in the United States, were delivered to electric power plants.

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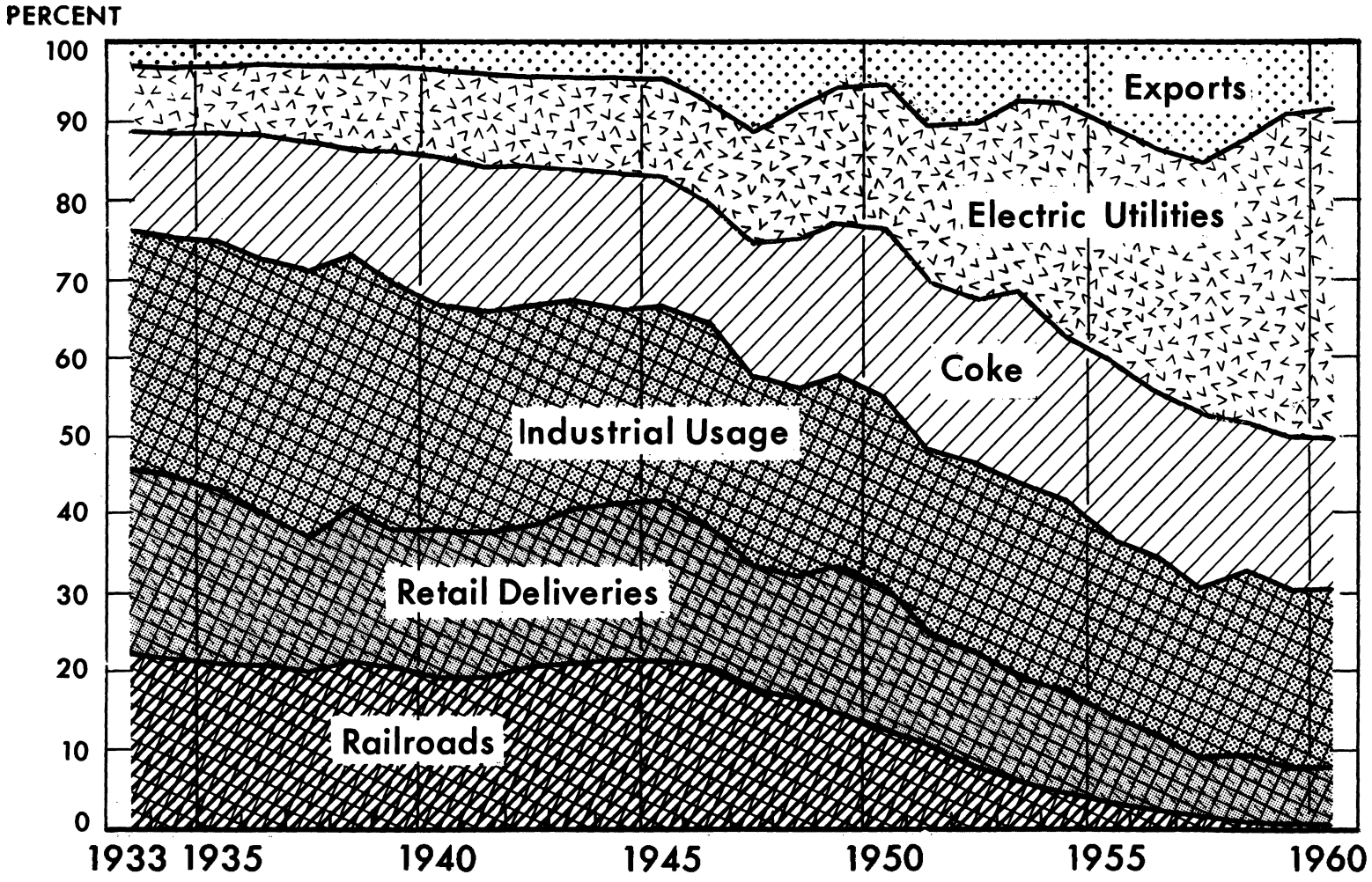
Relative Consumption of Bituminous Coal, by Major Consumption Classes, 1933-60



Source: U.S. Department of Interior, Bureau of Mines.
Based on appendix table 18 B.

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Expanded Foreign Trade

Export markets for coal, although unstable, became more important to the industry in the period following World War II. In contrast, imports of coal continued to be very small, amounting to less than 1 percent of the total consumed in the United States annually. Between 1947 and 1959, U.S. producers supplied over 620 million tons of coal, or almost 10 percent of their total production to foreign consumers. Exports exceeded 25 million tons every year, and reached peaks of 69 million tons in 1947, and 76 millions in 1957. This was a substantial increase over the export trade during the 1920-47 period when less than 5 percent of total coal production was exported, and foreign sales exceeded 25 million tons in only 2 years.

Canada and Western Europe consumed almost 90 percent of postwar U.S. coal exports. For many years, Canada was a stable, growing market for U.S. coal: in the period 1935-40, its imports of U.S. coal amounted to about 10 million tons annually, and during World War II purchases averaged about 20 million tons a year. In the postwar period, however, Canadian demand declined from almost 26 million tons annually in 1947-48 to just over 12 millions in 1958-59. Exports of U.S. coal to European countries--chiefly West Germany, Italy, and the Netherlands--began in quantity only after World War II, and fluctuated greatly from year to year, ranging from a low of 800,000 tons in 1950 to a high of almost 50 million tons in 1957. In 1959, exports to Europe fell to 19 million tons. Only small amounts of U.S. coal were shipped to other parts of the world, most of it to Japan where a small but expanding market developed after 1950.

Wide fluctuations in U.S. coal exports in recent years reflect wartime destruction of Europe's coal mines and postwar political crises on the one hand and increased production from reconstructed mines and growing competition abroad from petroleum and natural gas, on the other. The growth of iron and steel production in Canada, Europe, and Japan appears to have permanently raised the level of international demand for U.S. metallurgical (coking) coal, since this type of coal is generally in short supply throughout the world. On the other hand, the increased protectionist policies of the coal producing nations of Europe and the reestablishment of coal trade with Eastern Europe cut into U.S. coal exports in the late 1950's. Future expansion of U.S. coal exports will depend in large measure upon the import quotas, government subsidies, and common market arrangements--adopted by coal-using nations.

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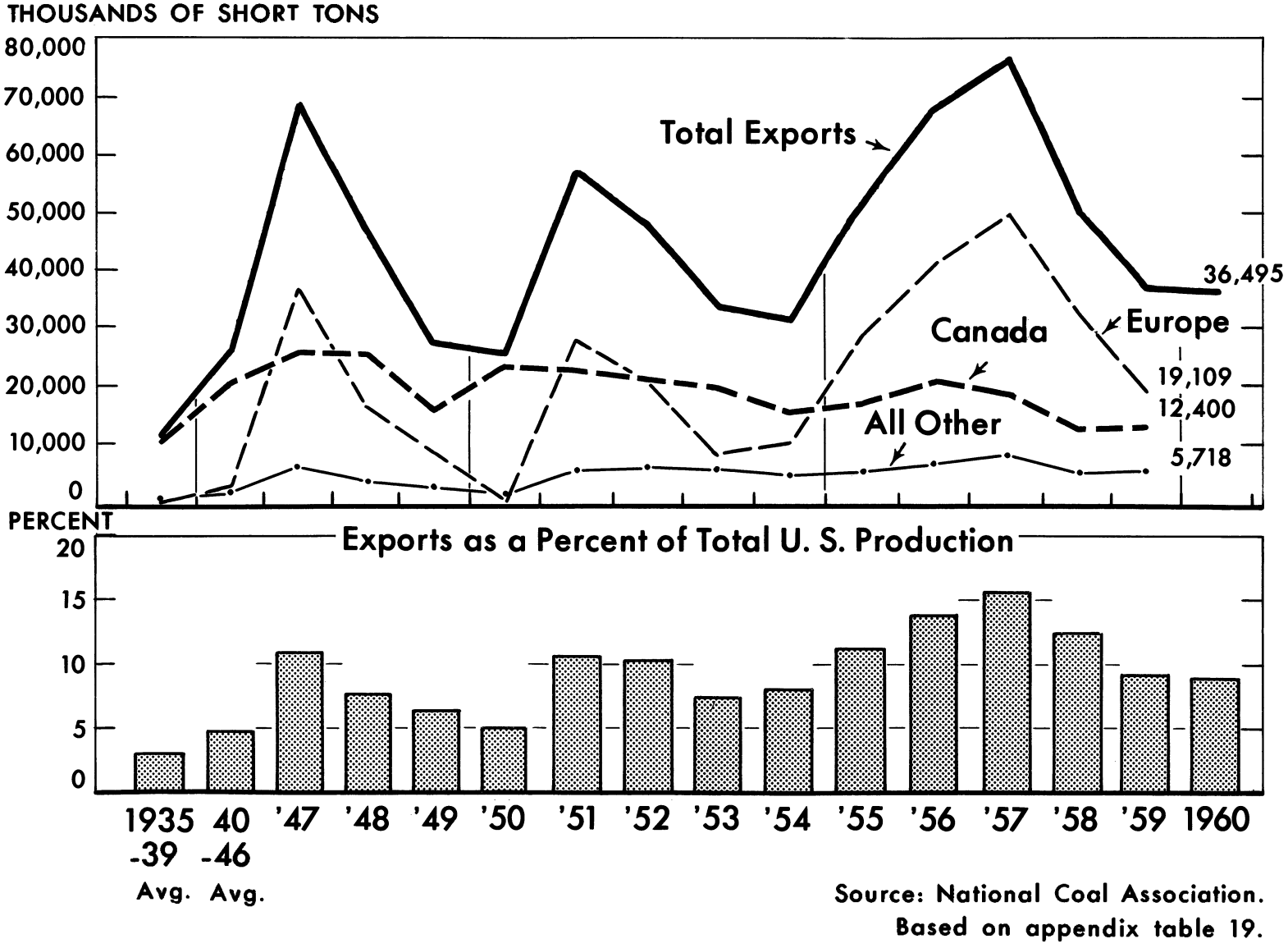
U.S. Bituminous Coal Exports to Major Markets, 1935-60



Source: National Coal Association.
Based on appendix table 19.

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Increased Efficiency in Coal Utilization

Increased efficiency in coal utilization affected the level of coal consumption in the post-World War II period. Improvements in combustion techniques, obtained through increasing the energy captured from a given amount of the fuel, reduced the demand for coal per unit of final product. At the time, greater economies realized in the use of coal helped to keep it competitive in important energy markets.

In the electric power industry, the amount of coal required to generate 1 kilowatt-hour was reduced by nearly 31 percent, from 1.3 pounds to 0.9 pounds per kilowatt-hour, between 1947 and 1959. Despite declining unit fuel requirements, the industry's total consumption of coal continued to rise as the demand for electric power climbed.

Similar savings were recorded in manufacturing industries using coal for process heat. The steel industry reduced coal consumption per ton of pig iron by 17 percent between 1947 and 1959. In the cement industry, coal requirements were reduced by 15 percent per barrel between 1947 and 1959.

The increases in the efficiency of coal utilization are part of a long-term trend in the U.S. economy toward lower fuel and energy requirements per unit of output. Between 1920 and 1959, total energy consumed per dollar of gross national product (in constant prices)--one indicator of this long-term movement--fell by approximately 30 percent. In part, this reduction resulted from the electrification of industry and related advances in electrical technology. Where steam engines were used to generate power for industrial machinery, energy was lost in transmission by shafts and belts. The introduction of the electric motor, which brought power directly to the point of application, made possible greater efficiencies in the use of energy. In addition, the substitution of large electrical power generators by public utilities for small steam power generators operated by individual plants made possible greater efficiencies in the utilization of energy fuels.

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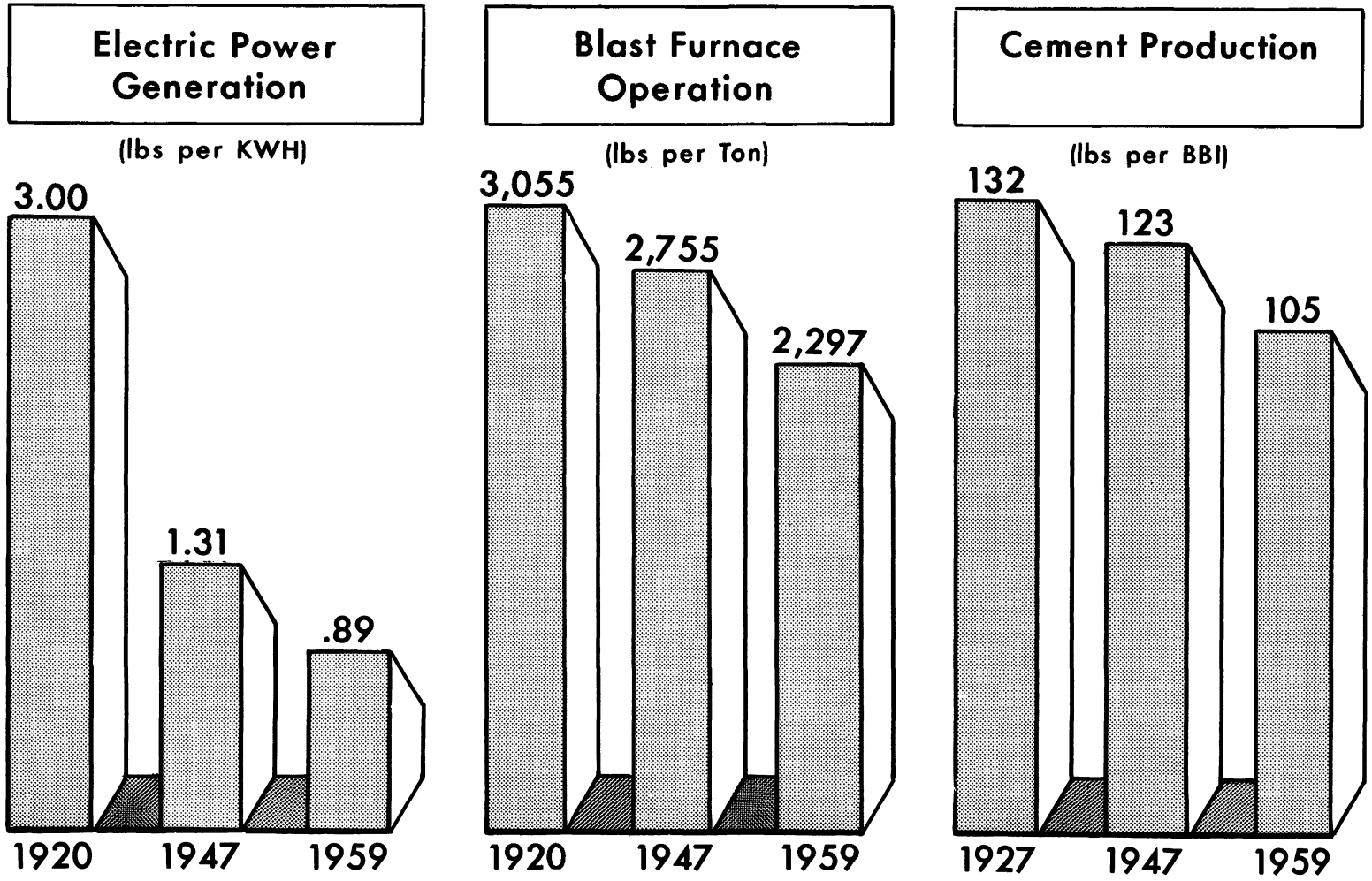
Bituminous Coal Requirements Per Unit of Production, Three Selected Industries and Periods



Sources: National Coal Association; American Iron and Steel Institute; U.S. Department of Interior, Bureau of Mines.

Based on appendix table 20.

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Declining Employment Opportunities

As production declined and unit labor requirements were reduced after World War II, employment fell sharply. The average number of production workers employed in the industry fell from about 411,000 in 1948 to less than 150,000 in 1959. This decline of 64 percent, or about 24,000 jobs each year, was almost twice the rate of decline which occurred in the years 1923-34 following World War I. With drastic cutbacks in employment following both world wars, and little recovery in the years between, the trend of production worker employment in bituminous mining has been downward for almost 40 years. In 1923, the alltime high of bituminous coal employment, more than 643,000 miners were employed in the industry; by 1959, only one-fourth as many miners were at work.

The contraction of coal mining employment was greater than the decline in agriculture and contrasted markedly with the growth of employment elsewhere in the economy. While the total number of bituminous coal employees (nonproduction as well as production workers) fell by almost two-thirds between 1948 and 1959, the number in manufacturing climbed by 6 percent, and in private nonagricultural establishments, by 13 percent. The divergence of employment trends in bituminous coal and other industries is even more striking over a longer period. Between 1939 and 1959, the average work force in bituminous coal mines was reduced by more than one-half; over the same period there was a 60-percent increase in manufacturing employment, and a 67-percent expansion of employment in all private nonfarm establishments.

Older mine workers increased markedly in importance in the industry's contracting work force. In 1938, according to Social Security data, 30 percent of all coal miners were 45 years of age and over; by 1957, the proportion had risen to 41 percent. Compared with U.S. workers as a whole, the labor force of the coal industry was older and the average age was rising faster; between 1938 and 1957, the median age of coal miners increased by 5½ years to 42 years; in industry as a whole, the increase was only 3 years and the median age was 37 years.

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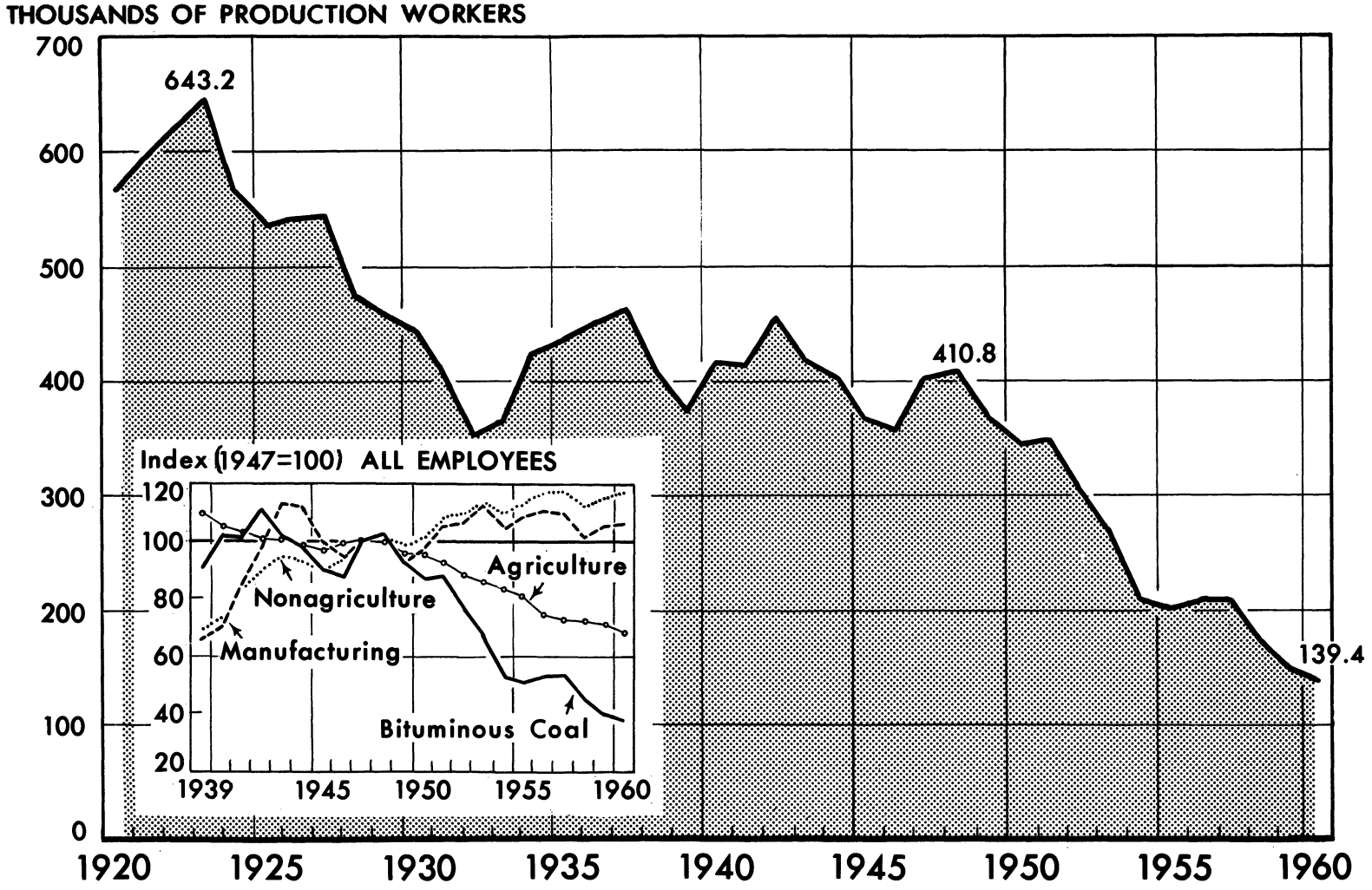
Trends in Bituminous Coal Mining Employment: Production Workers, 1920-60; and All Employees, 1939-60



Sourses: U.S. Department of Labor, Bureau of Labor Statistics;
U.S. Department of Agriculture, Agricultural Reasearch Service.
Based on appendix table 21A and 21B.

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Serious Unemployment

The decline of bituminous coal mining employment after World War II created severe hardship for displaced mineworkers and their families. Although 88,000 employees are estimated to have retired under pension provisions of the Miners' Welfare and Retirement Fund, and some, particularly younger workers, found jobs in other communities, moving their families or commuting long distances to work, many displaced mineworkers were unable to secure steady jobs. Serious and persisting unemployment plagued coal communities through much of the postwar period.

Scattered information on unemployment by industry attachment shows that unemployment has been heavier in recent years among coal miners than among other industrial workers. In March 1957, the Bureau of Employment Security estimated that 6.4 percent of all bituminous coal mineworkers were unemployed compared with 3.8 percent of the workers in all United States industry. Although the period was marked by relatively high coal mining activity, the bituminous coal mining unemployment rate was 50 percent greater than in manufacturing, and 30 percent greater than in all mining. In West Virginia, the Nation's leading coal-producing State, unemployment in bituminous coal mining is estimated to have exceeded 20 percent in both 1958 and 1959, with the average term of unemployment lasting more than 20 weeks. In both years, the unemployment rate in bituminous coal mining is calculated to have been more than twice as great as the average for all other industries in the State.

The chronic nature of unemployment in coal mining is clearly indicated in Bureau of Employment Security surveys of local labor market conditions. In March 1960, 1 out of every 5 areas of substantial unemployment in the Nation was a coal mining center. Of the 32 coal communities with heavy unemployment, 27 were specially designated as "areas of substantial and persistent unemployment." Bituminous coal mining centers were among the hardest hit chronic areas of substantial unemployment. In March 1959, the unemployment rate in major areas with bituminous coal mining averaged 12 percent as against 9 percent in nonmining areas. Among the samller chronically depressed areas surveyed, unemployment rates were greater than 10 percent in more than three-fourths of the bituminous coal mining areas, but in only one-third of the nonbituminous coal mining areas.

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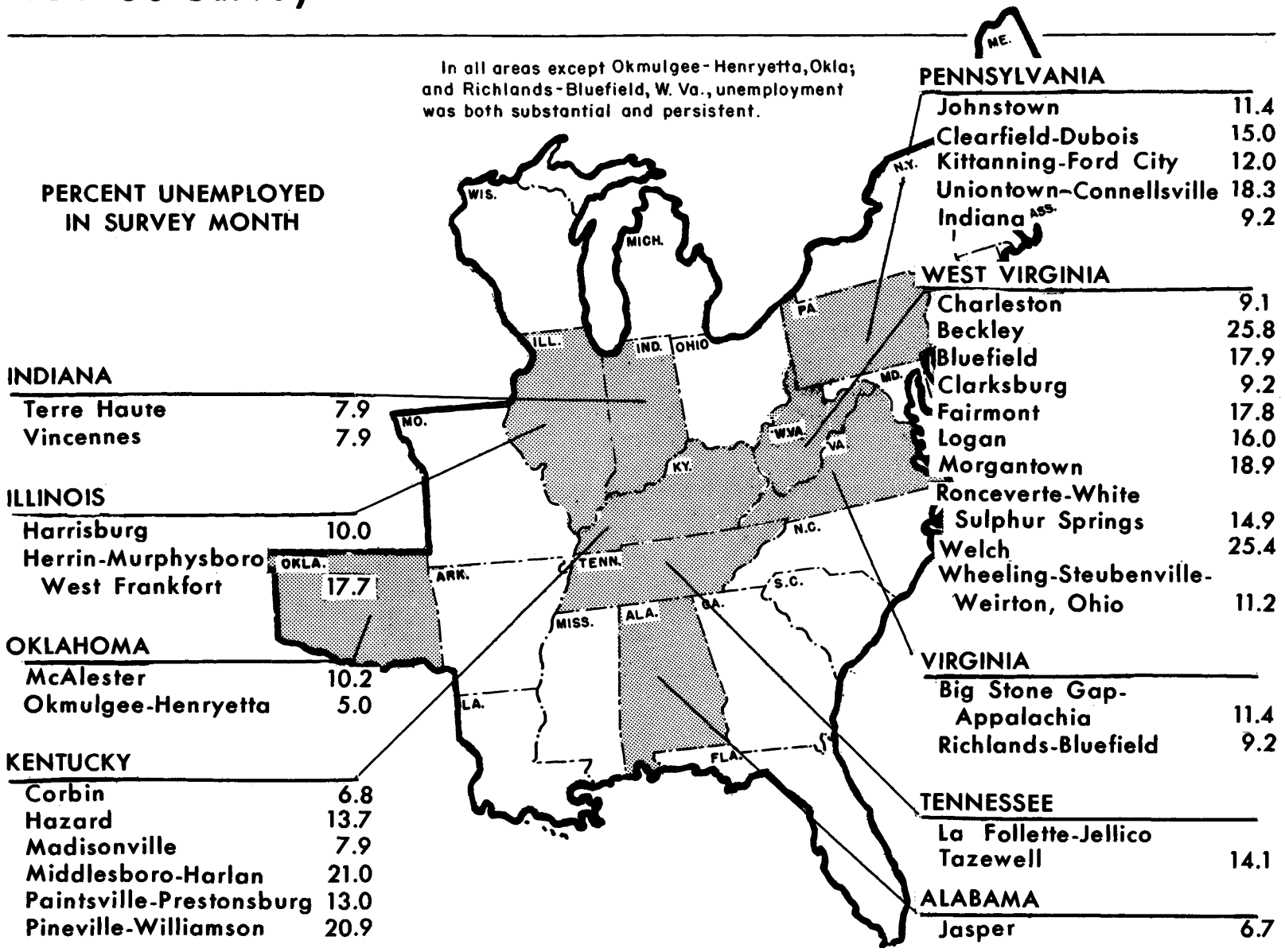
Bituminous Coal Mining Areas With Substantial Unemployment, 1959-60 Survey



Source: U.S. Department of Labor, Bureau of Employment Security

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Impact on Areas

The employment problems of coal miners have been complicated by the depletion of local coal deposits, as well as by the contraction of coal markets and the mechanization of production. Abandonment of exhausted mines in some areas, and the opening of new mines in others, with consequent local unemployment, has long been a feature of coal mining. In Illinois, for example, 162 mines were abandoned between 1955 and 1959, while at the same time 116 new mines were opened, many of them in new locations.

Unemployed mineworkers had special difficulties in finding new jobs. The general rise of unemployment in the United States in recent years limited their opportunities for employment in other industries. Because coal towns are frequently one-industry towns, located miles from industrial and trade centers, local opportunities for securing alternative employment were severely limited. The high average age of displaced mineworkers, their inability to secure retraining, and the widespread assumption that mining skills are not easily transferred also emerged as important barriers to their reemployment.

The type of demographic and economic decline that some coal areas have undergone is illustrated by the record for the five-county area of Southeastern Kentucky where coal mining had been the principal industry for decades. Production of coal fell by one-third and mine employment by two-thirds between 1950 and 1959. Population (rural and urban), the number of households, and the number of young people fell sharply, while increasing in the rest of the State. The proportion of older persons rose sharply as young people left the area. Personal income and the volume of retail trade declined, whereas they increased elsewhere in the State. These changes further complicated the problem of developing new jobs in distressed coal areas.

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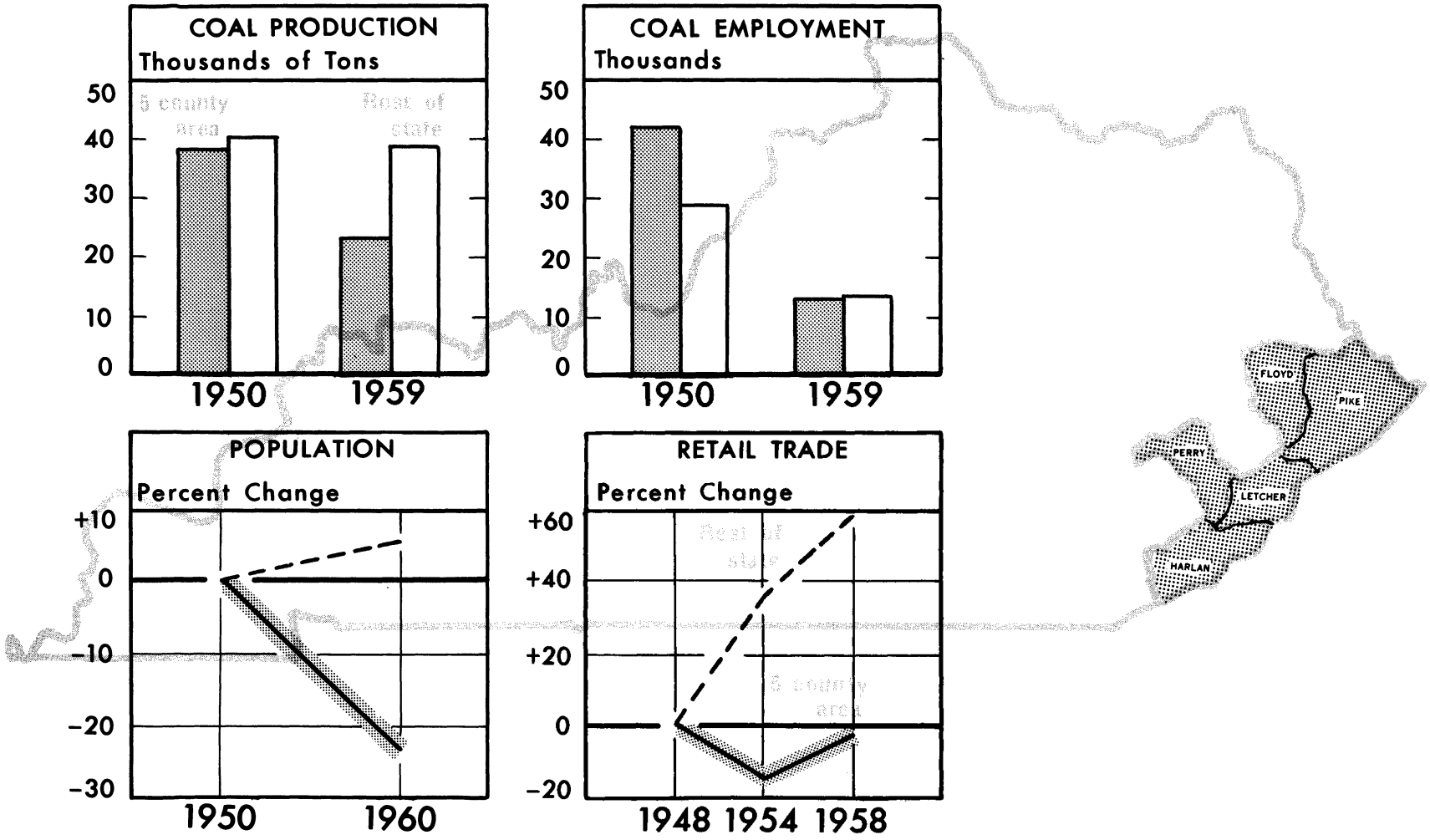
Demographic and Economic Changes in Five Counties in Kentucky and Rest of State, Selected Years



Sources: U.S. Department of Interior, Bureau of Mines;
U.S. Department of Commerce, Bureau of the Census;
University of Kentucky, Bureau of Business Research.
Based on Appendix Table 23.

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Shorter Worktime

Short workweeks, long characteristic of coal mining because of slack demand, continued to be a serious problem in the postwar period. In 1959, coal miners averaged 36.4 hours a week compared with the average of 40.3 hours for factory workers. Average weekly hours in coal mining declined after the 1947-48 boom and fluctuated between a low of 32.6 hours in 1949 to a high of 37.8 hours in 1956.

A relatively short workweek has prevailed in the industry since 1923. Although factory workers have averaged above or close to 40 hours for most of the past 36 years, other than the depression years of the 1930's, workers in the bituminous coal industry have averaged as many as 40 hours a week in only 4 years of this period. The workweek in the coal industry was longer than in manufacturing in only 2 years--1946 and 1947.

The reduced demand for labor in the postwar period is also measured by the postwar reductions in the number of days worked each year. In 1959, bituminous coal mines operated an average of 188 days or only about two-thirds of the industry's standard workyear. This was well below the average during the peak years of coal demand, 1940-48. Over the entire postwar period, 1947-59, mines operated only slightly more than the average during the decade of the 1930's.

Reductions in scheduled worktime also occurred over the period as a result of collective bargaining between the United Mine Workers of America (UMW) and the major coal operators (and the United States Government during World War II). In 1933, miners worked a scheduled 8 hours a day, 40 hours weekly in production. A year later, this was reduced to 7 hours daily and 35 hours a week. During World War II, the 35-hour week was abandoned, but both travel and lunchtime were included in the longer scheduled paid workday of 8 3/4 hours. On July 1, 1947, the scheduled workday was reduced to 8 hours, including portal-to-portal travel and lunchtime. In 1959, miners were working a scheduled 8 hours daily, but with the inclusion of travel and lunchtime, they were working significantly less time in actual production than they were 25 years earlier.

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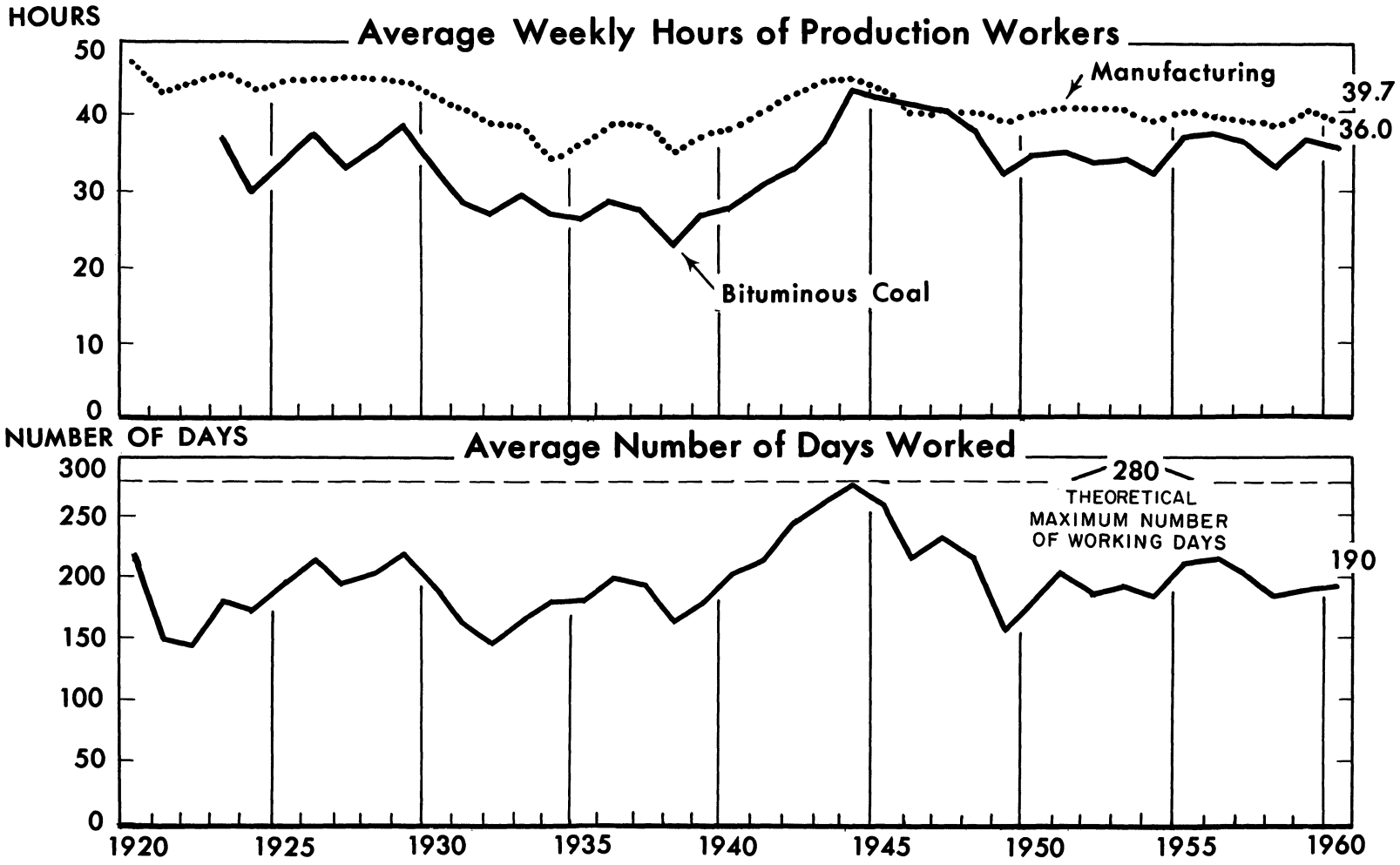
Average Weekly Hours and Days Worked Per Year in Bituminous Coal Mining, 1920-60



Sources: U.S. Department of Interior, Bureau of Mines;
U.S. Department of Labor, Bureau of Labor Statistics.
Based on appendix table 24A.

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Changing Occupational Structure

The mechanization of bituminous coal mining significantly changed the job structure and the work involved in mining, as well as reduced the number of jobs in the industry. Increasing proportions of bituminous coal workers were employed, particularly after World War II, in non-production rather than production occupations; in jobs above ground rather than under ground; in maintenance work rather than in direct production at the face of the coal seam.

Although total employment in bituminous coal mining declined drastically after 1947, almost all of the decline was in production worker jobs. The decline in the number of administrative, professional, supervisory, and clerical workers in the industry was considerably less drastic. As a result, the ratio of nonproduction to production workers was more than twice as high.

This shift toward nonproduction work was more marked in bituminous coal mining than in many other major industries. However, the proportion of nonproduction workers, which tends to reflect the degree of mechanization, continued to be lower than in many other major industries. Only one worker in nine in coal mining was in the administrative, professional, supervisory and clerical category in 1959, compared with one in five in steel, and one in three in petroleum refining.

A second important change in bituminous coal mining was the growth in the proportion of workers employed in surface operations. The expansion of strip mining, the growing importance of coal preparation, and the mechanization of underground mining, contributed to raise the proportion of U.S. mine employees working at surface jobs from 15 percent in 1923 to 25 percent in 1948; of these, approximately one-fourth were employed at strip mines while the remainder were employed at other surface work, primarily coal cleaning. Although comparable data are not available, it is estimated that almost 30 percent of all U.S. bituminous coal employees in 1959 worked above ground. The continued relative decline of underground operations and the growth of coal processing point to a further rise in the importance of surface jobs.

A third important change in the occupational structure was the shift from direct (largely manual) production to machine maintenance, transportation, and supervision jobs in underground mines. In Illinois, for example, the proportion of electricians, motormen, and managers increased steadily, whereas the proportion of men employed in direct production fell sharply. In 1923, two-thirds of all underground workers were miners, loaders, and other direct production workers. In 1947, the proportion fell to one-fourth and by 1956, only one underground employee in six worked at the face of the coal seam.

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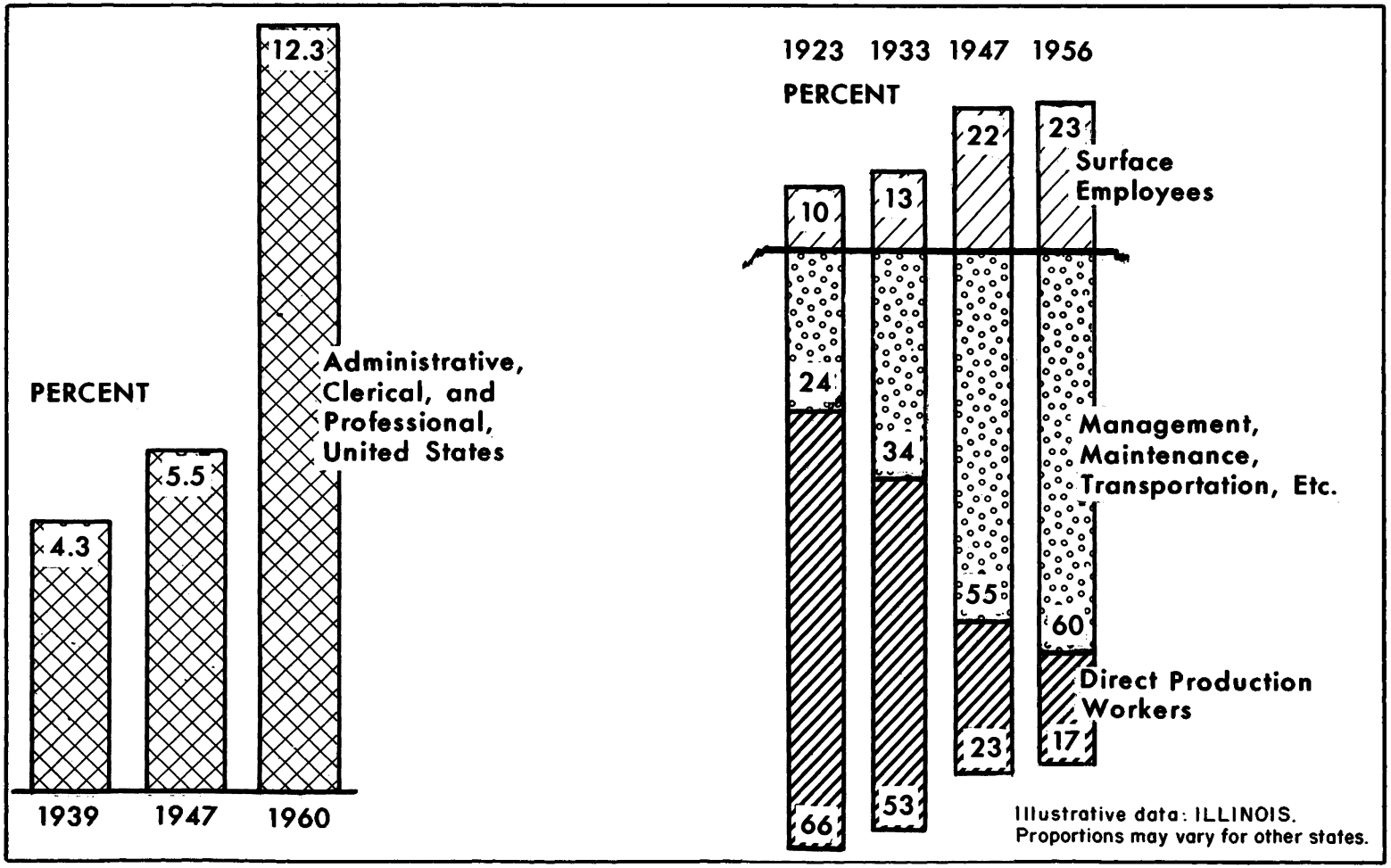
Occupational Structure in Bituminous Coal Mining, Selected Years



Sources: U.S. Department of Labor, Bureau of Labor Statistics; Illinois Department of Mines and Minerals.
Based in part on appendix table 25A and 25B.

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Progress in Safety

Technological developments, mine safety legislation,and intensified education contributed to the substantial reduction in the hazards of mining coal and to the improvement of miners working conditions. In 1947, there were 1.3 fatal and 57.3 nonfatal injuries per million man-hours worked in mining bituminous coal. By 1959, these rates had been lowered by approximately one-fourth--fatalities to 0.9 and nonfatal injuries to 41.4 per million man-hours worked. Over the longer period 1930-59, accident frequency rates were reduced by one-half. Injuries per ton of coal produced fell even more sharply. Marked reductions were recorded in fatalities attributable to ground falls and to explosions of gas and dust; and major disasters (those in which five or more lives were lost) were less frequent in the 1950's than in any previous decade.

Increased mechanization, one of the most important changes affecting accident frequency, reduced both the number of hazards and the amount of human exposure to them. Widespread use of technical developments such as the electric cap lamp, safer explosives, roof bolting, and improved ventilation and electrical systems eliminated some of the traditional hazards. The shift to surface mining, where accidents are less frequent and less severe, reduced mining risks. Establishment of a Federal Mine Safety Code in 1946, application of State laws, and U.S. Bureau of Mines safety activities also served to improve mining safety. The Federal Safety Code, although not enforceable by statute, has promoted good practices through safety training, better inspection, and through setting standards which have voluntarily been adopted--in national wage agreements--by a large segment of the industry.

Despite marked improvement in safety, coal mining continues to be a hazardous occupation. Disabling work injuries occurred more than three times as often in coal mining as in manufacturing in 1959. Although the frequency of accidents declined in recent years, severity rates (the average loss in days per injury) did not. Mechanization reduced some hazards, but intensified others. The continuous mining machine, for example, reduced exposure of personnel and eliminated drilling and blasting hazards, but at the same time made adequate ventilation to protect against the danger of dust and gas explosion a more serious problem.

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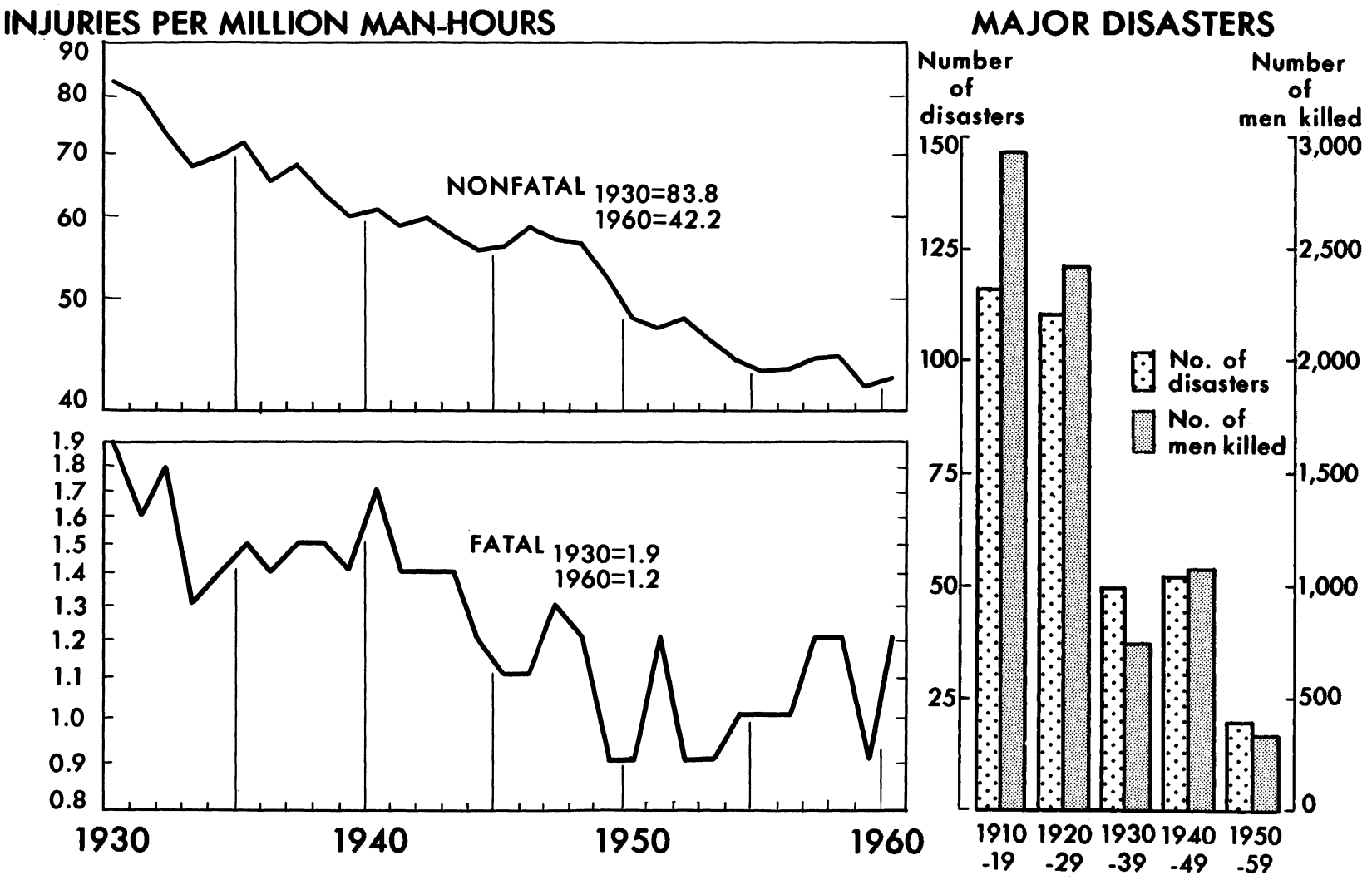
Injury Rates, 1930-60, and Major Disasters, 1910-59 in Bituminous Coal Mining



Source: U.S. Department of Interior, Bureau of Mines. Based on table 26A.

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Rising Earnings

The earnings of coal miners rose steadily after World War II. Average hourly earnings almost doubled between 1947 and 1959, rising from $1.64 to $3.25 an hour. The daily wage rate of a mechanical loading machine operator under union agreements advanced from $15.48 to $26.68, over the same period. These increases continued the upward trend of wages that began in 1933 with the signing of the Appalachian wage agreement between the UMW and the associations representing bituminous coal operators.

The steady rise in coal miners' earnings in the period after World War II (1947-59) contrasts sharply with the decline following World War I (1923-33). Mineworker earnings fell almost three times as fast as manufacturing earnings between 1923-33, whereas they increased by one-fifth more in the period 1947-59. After adjustment for changes in consumer prices, mineworkers earned 52 percent more an hour in 1959 than they did 12 years earlier.

The average hourly earnings of miners were among the highest paid to United States workers. However, they were offset by short workweeks. Although hourly earnings were almost 50 percent greater than the average for all manufacturing in 1959, weekly earnings were only one-third greater. The 1959 average annual earnings of mineworkers covered by State unemployment insurance laws were less than 10 percent greater than the earnings of all covered workers in manufacturing. Annual earnings in bituminous coal mining were, on the average, lower than the average in petroleum refining and primary metals, despite higher average hourly earnings in coal mining. Increases in yearly earnings between 1947 and 1959, moreover, were lower than in most other major industries.

The expanding mechanization of mining not only provided a basis for increased earnings, but also was a major reason for turning the industry from a predominantly incentive pay basis to a predominantly daily pay system. The widespread introduction of machine loading made payment for individual production difficult. As a result of this and continued union demands for uniform wage rates, a daily pay scale, and a job structure with few grades and narrow pay differentials were adopted by most of the industry by the mid-1950's.

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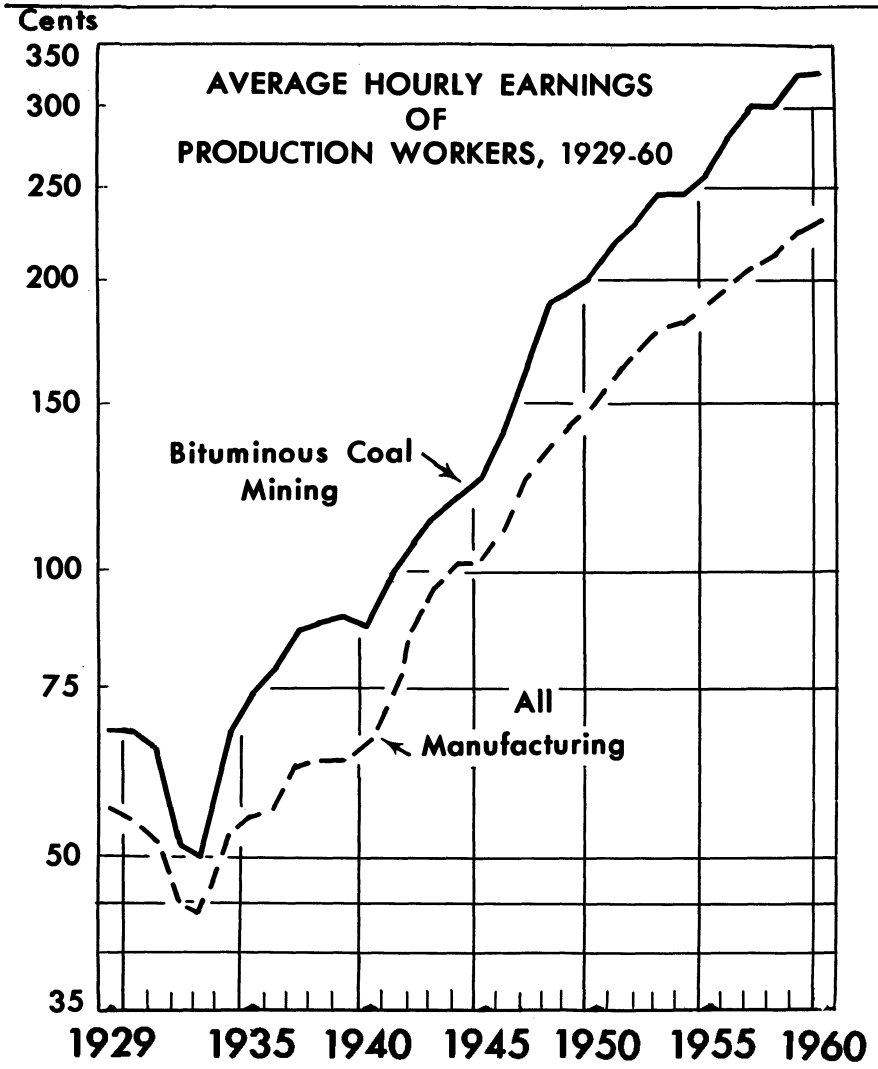
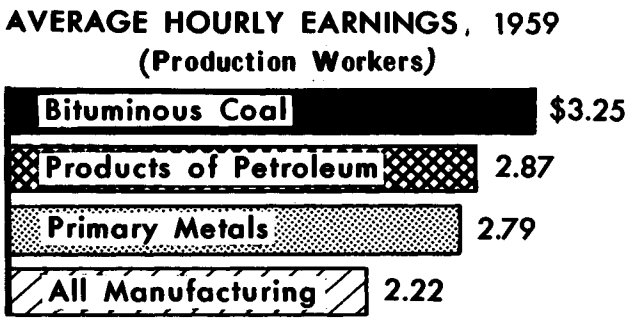
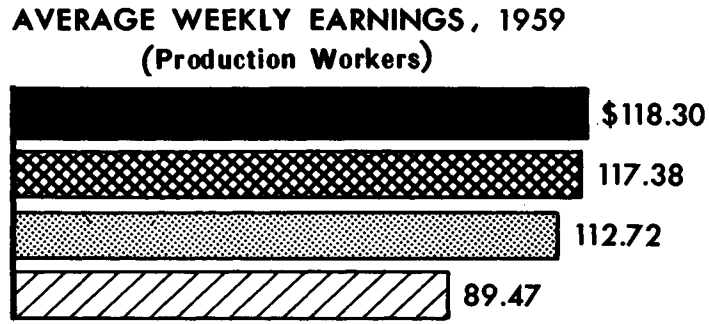
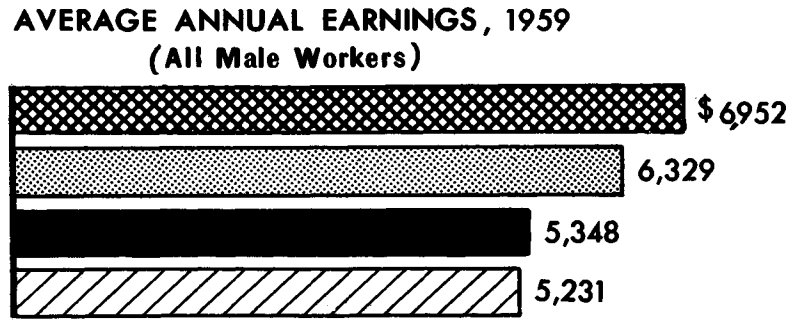
Earnings in Bituminous Coal Mining and Manufacturing Industries, Selected Years









Sources: U.S. Department of Labor, Bureau of Employment Security and Bureau of Labor Statistics,
Based in part on appendix table 27A and B.

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Greater Welfare Benefits

In addition to increased wages, bituminous coal miners have benefited from greatly increased expenditures for pensions and related welfare programs since the end of World War II. In 1959, expenditures for such payments (supplementary to wages and salaries) paid by mine operators, amounted to $187 million (which included Federal, State, social security and other legally required contributions as well as contractual payments for pensions and welfare) according to the U.S. Department of Commerce's national income statistics. Although total wage and salary payments fell by one-third between 1947 and 1959, supplementary payments doubled. Most of this increase occurred between 1947 and 1951, when the industry's pension program was getting under way; thereafter, the total of supplementary payments remained fairly constant. In 1947, such expenditures comprised about 6 percent of total wages and salaries; by 1959, they amounted to over 16 percent. In no other major industry group did supplementary payments constitute as high a proportion.

Industry contributions to the Miners' Welfare and Retirement Fund constituted the major factor in the growth of supplementary payments. Established in 1946, the fund provided, for the first time in the industry's history, retirement pensions for miners at age 60; full medical care and hospitalization for miners and their families; rehabilitation care for the disabled; death benefits and disaster assistance for widows and survivors. Construction of 10 Miners Memorial Hospitals in West Virginia, Virginia, and Kentucky enabled miners to receive care in coal mining areas which traditionally have been short of hospital facilities.

A unique feature in financing these benefits is the basing of employer contributions on tonnage produced rather than on wages paid. The 1946 agreement which established the welfare and retirement fund, set royalty payments at 5 cents a ton. Since then they have been increased 4 times--in 1947, 1948, 1950, and 1952--reaching a level of 40 cents for every ton produced. Thus, because production has declined more slowly than employment, the average supplementary payment per employed worker has steadily increased.

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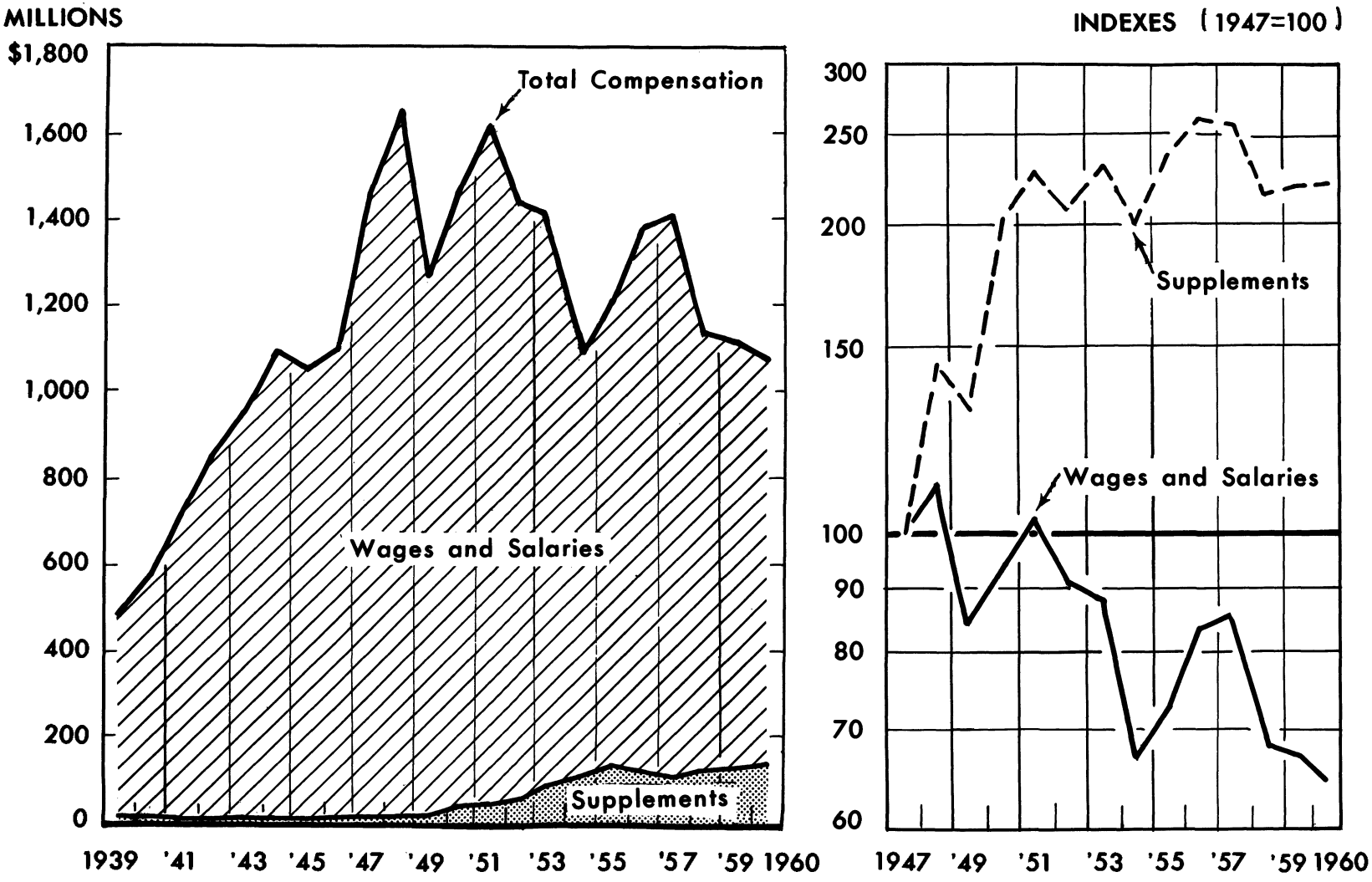
Compensation of Employees in Bituminous Coal Mining, 1939-60, and Indexes of Change, 1947-60



Source: U.S. Department of Commerce, Office of Business Economics
Based on appendix table 28

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Hourly Compensation and Unit Employment Cost

Although employee compensation per man-hour (including wages and salaries and supplementary payments for all employees) rose sharply throughout the post-World War II period, the increase in the employment cost per ton of coal was relatively small. Large postwar gains in productivity permitted hourly compensation to rise without a corresponding increase in unit employment cost. By 1959, employment cost per ton was only 17 percent higher than in 1947 despite the fact that total compensation per hour had more than doubled. These trends reflected the record of the industry as a whole; the experience of individual mines may have varied greatly.

Changes in unit employment cost in the postwar period were marked by three phases. Between 1947 and 1949, they increased as hourly compensation increased. This continued the upward trends in unit employment cost and hourly compensation which occurred between 1939 and 1947. Output per man-hour grew slowly throughout the decade.

Between 1949 and 1953, unit employment cost continued to climb, but more slowly than compensation per hour. The index of employment cost per ton advanced only 5 percent compared with an increase of 31 percent in total hourly compensation. Output per man-hour began to rise more sharply.

The employment cost per ton of coal mined reached its peak in 1953. Hourly employee compensation continued to climb, but employment costs per ton actually declined. Between 1953 and 1959, unit employment cost fell by 12 percent although compensation per hour rose by 26 percent.

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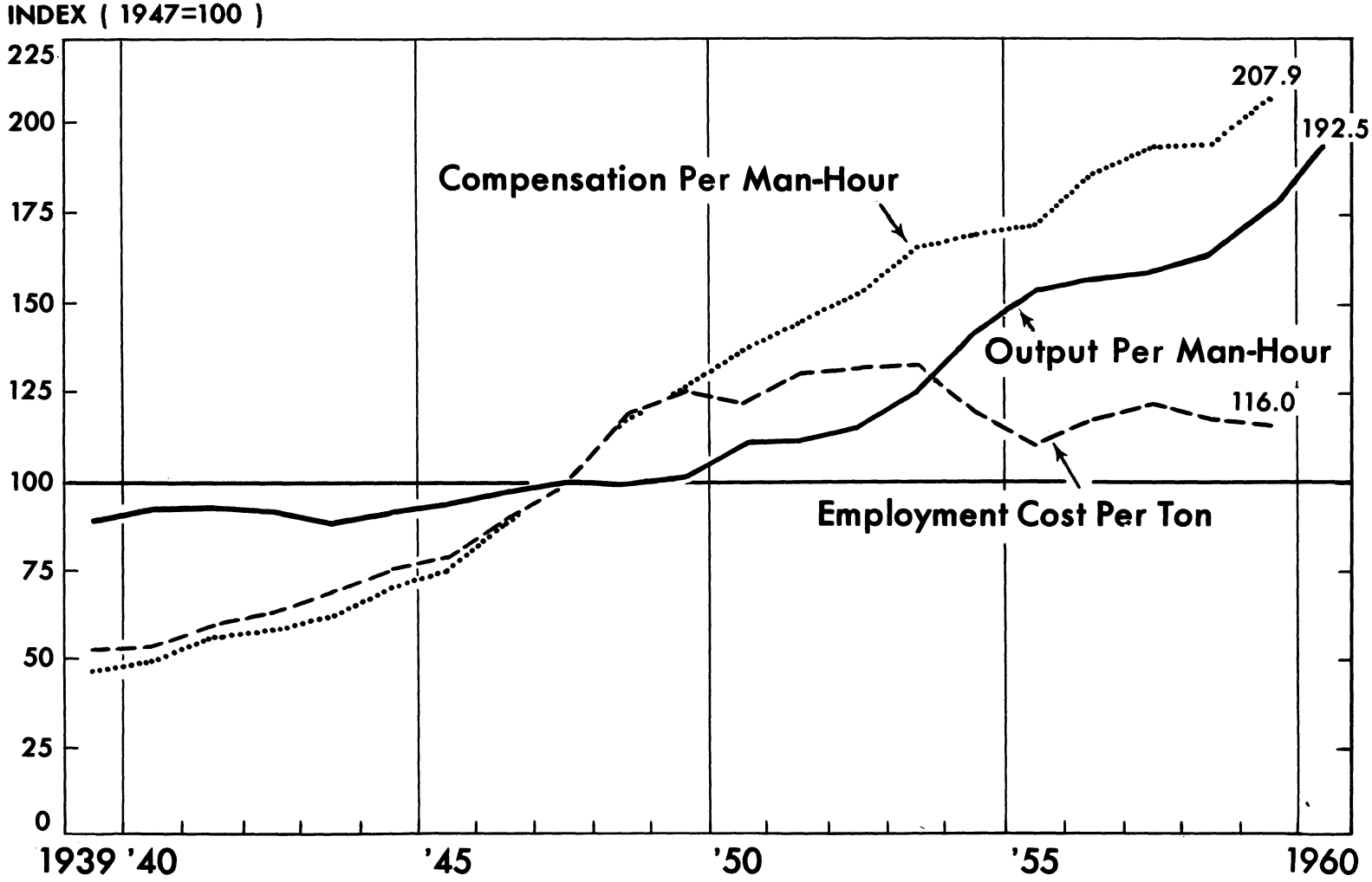
Indexes of Compensation Per Man-Hour, Employment Cost Per Ton, and Output Per Man-Hour, 1939-60



Sources: U. S. Department of Commerce, Office of Business Economics; U. S. Department of Interior, Bureau of Mines; U. S. Department of Labor, Bureau of Labor Statistics.
Based on appendix tables 29 and 11.

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Reduced Importance of Employment Costs

The trend of unit employment cost between Census years 1954 and 1958 differed sharply from the trend of material and other costs per unit. Figures derived from the Census of Minerals (the only detailed industry data available) show that employment cost per ton fell by 2 percent between these years, while unit material cost increased by 11 percent and other costs (including depreciation, interest, advertising, insurance, and other overhead and profits) rose by 47 percent per ton. The average value of a ton of coal shipped rose by 10 percent.

Unit employment cost also lagged behind other costs and prices between 1939 and 1954, a period of war and postwar price and wage increases. Employment cost per ton doubled over this period, but both unit material and other costs increased substantially more.

The pattern of change after 1939 differed markedly from that of the depression decade. Unit employment cost was 5 percent higher in 1939 than in 1929, and the average value per ton was 2 percent higher. Material and other costs per unit, however, declined sharply between these years.

One consequence of the changes after 1939 was a significant decline in the importance of employment costs in the cost structure of the industry. In 1939, payments to employees amounted to two-thirds the total value of coal shipped; by 1958 they had fallen to one-half the total value.

Only fragmentary data are available for the items comprising costs other than material. Information on two overhead items--interest and depreciation--show that these fixed costs per unit of output increased by more than 200 percent between 1947 and 1957, reflecting not only increased outlays for plant and equipment, but also the decline in sales. A third item, corporate profits per unit of output, on the other hand, fell sharply from the 1947 peak and fluctuated downward as production declined.

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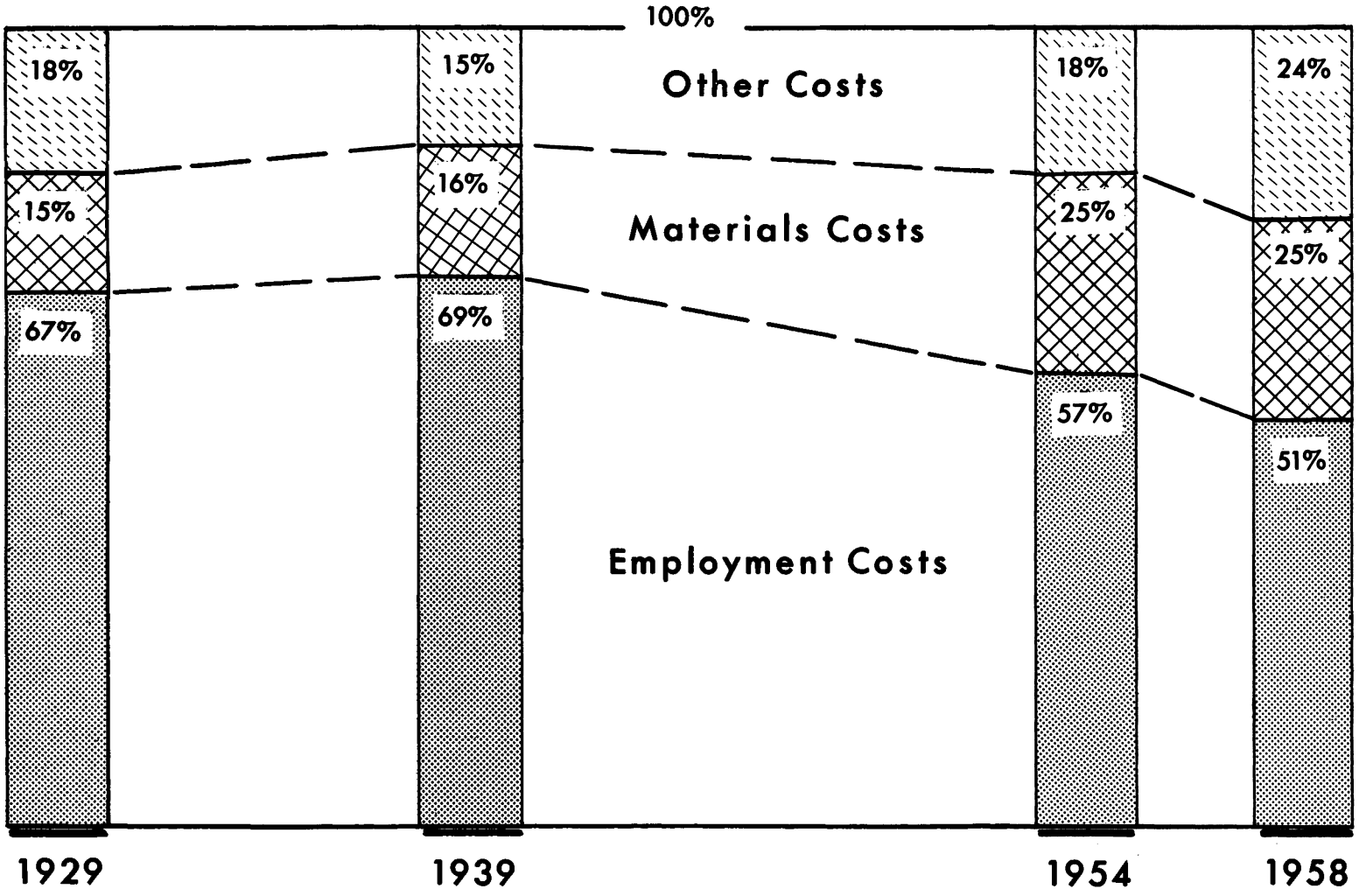
Employment, Materials, and Other Costs as a Percent of Total Cost Per Ton of Bituminous Coal, Census Years



Source: U.S. Department of Commerce, Bureau of the Census.
Based on appendix table 30.

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Price Trends

The price of coal at the mine (average value per ton, f.o.b.) was relatively stable through most of the postwar period. Following a 20-percent increase between 1947 and 1948, with the general relaxation of wartime controls, average price fluctuated within a narrow range: from a low of $4.50 per ton in 1955 to a high of $5.08 in 1957. In 1959, the average price was $4.77 per ton, or only 15 percent higher than in 1947, and 4 percent below that in 1948.

Postwar price stability was in marked contrast with the instability of the previous 30 years. The average price of coal tripled during World War I, fell by two-thirds in the following years of decline and depression, and doubled again in recovery and World War II. Although the postwar average price of coal at the mine was stable, competitive fuel prices rose sharply at sites of production. Between 1948 and 1959, the average price of petroleum (average value per barrel at well) rose by 12 percent, and natural gas by 98 percent, compared with coal's 4 percent decline. In contrast, between 1935 and 1945, the price of coal rose relative to both oil and gas.

No single comparison accurately measures relative fuel prices at points of consumption. Market fuel prices, as distinct from prices at sites of production, vary according to the significance of transportation costs, the type of fuel, the kind of market, and the efficiency of combustion. For example, three-fourths of all coal is shipped by rail, and rail charges in 1959 added almost 75 percent to the price of coal at the mine. Although mine prices fell by 3 percent between 1948 and 1959, delivered prices rose by almost 10 percent because of the steady increase in transportation charges.

In its most important market, electric power generation, coal's competitive position improved during the period. Between 1948 and 1959, the average price of coal at power generating plants declined by 6 percent, while the price of its chief competitor, natural gas, more than doubled. Fuel oil for power generation (almost entirely residual oil) fell more than coal in price as the result of a precipitous price decline in 1948-49. The steady rise in the price of gas raised its average price per B.t.u. in electric power generation closer to the level of coal. Despite its relative price fall, oil continued to be the high cost fuel in all markets.

The price of coking coal used in the manufacture of steel, coal's second largest industrial market, in contrast, increased by 20 percent between 1948 and 1959. The price of high grade steam coal used by railroads (and other industries) rose by more than 30 percent. In the retail or space heating market, the price of bituminous coal increased by an average of 28 percent, natural gas rose by 35 percent, and fuel oil by only 20 percent. Price variations, however, were substantial from city to city and the cost of coal was only one of the elements leading to a reduction in use.

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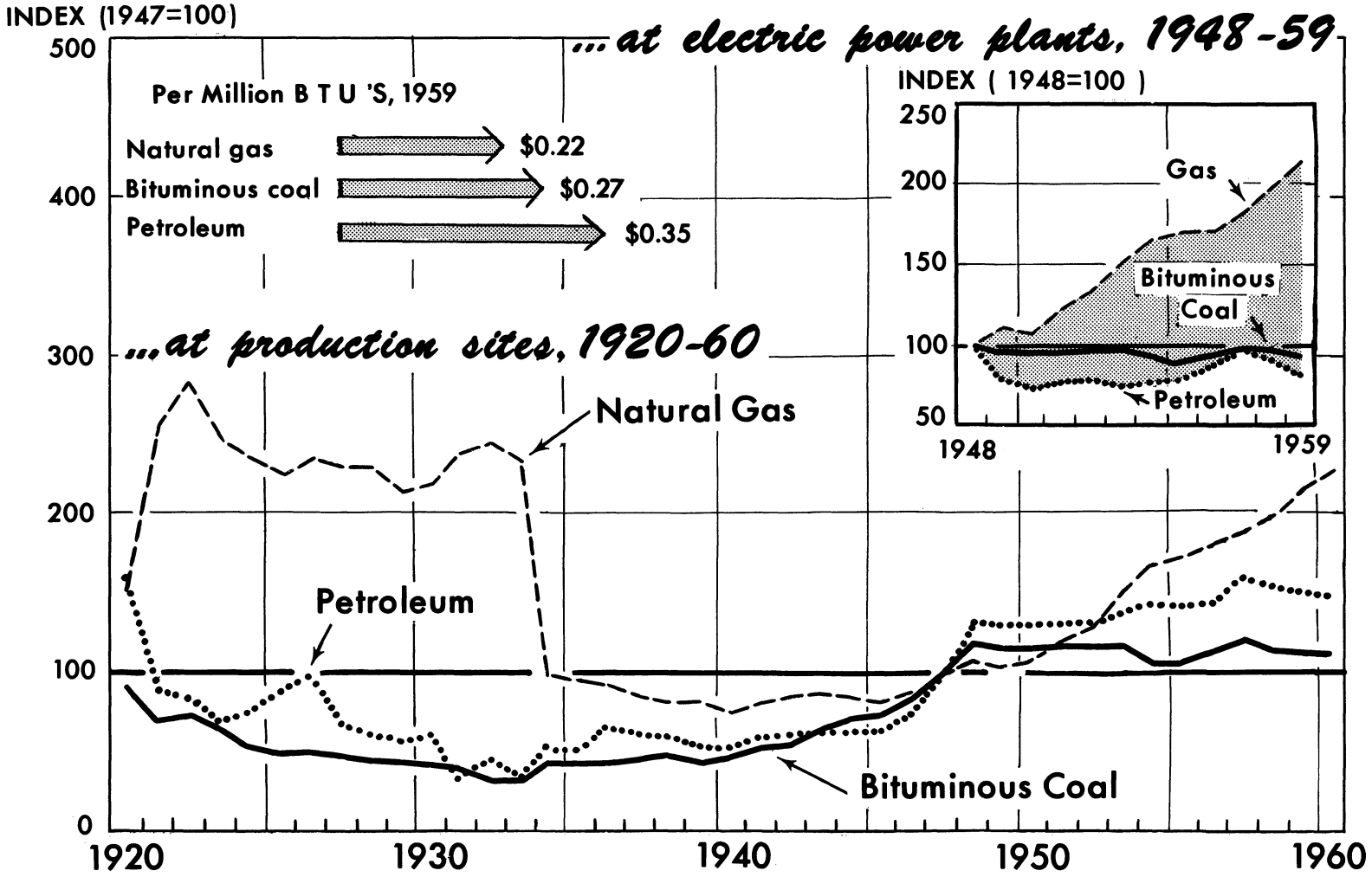
Indexes of Prices for Bituminous Coal, Petroleum, and Natural Gas, 1920-60



Sources: U. S. Department of Interior, Bureau of Mines, National Coal Association; Edison Electric Institute. Based on appendix tables 31A, 31D, and 31E.

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Profit Trends

The bituminous coal industry reported net income after taxes in each of the 18 years, 1940-58 (except 1954) after an almost equally long period of losses. According to Internal Revenue Service data, the industry showed a net loss in every recorded year between 1921 and 1939. With World War II, coal mining entered a period of relative prosperity which reached its peak in the postwar years 1947-48. Net profit for these 2 years amounted to more than the total for the preceeding 7 years. It also equaled the total for the following 7 years when industry earnings declined. Profits fell from 7.5 percent of sales in 1948 to only 1.1 percent in 1958. The average rate for the period 1949-58 was 2.1 percent.

While the industry as a whole recorded net earnings after World War II, there were about as many firms reporting losses annually as recording profits. In only 5 years after 1947 (when a record 75 percent reported net earnings) did a majority of bituminous coal corporations earn profits. Over the entire period, 1948-57, 50 percent of all corporation returns actually showed net losses.

Most of the profits have been earned by the relatively small percentage of large (and highly mechanized) corporations. In 1957, 3 percent of all coal mining corporations (those with assets of more than $10 million) accounted for 92 percent of the industry's total net profits after taxes. In contrast, firms with assets of less than $500,000, 78 percent of all bituminous mining corporations, recorded net losses after taxes of more than $6 million.

Compared with other industries, the profit rate in bituminous coal mining has been low. The ratio of net profit to net worth was less than in manufacturing in all of the past 20 years. From the 1948 peak of 13.1 percent, the ratio of coal earnings to net worth fell sharply, reaching 1.4 percent after taxes in 1958. Between 1949 and 1958, the profit rate in bituminous coal mining averaged only 3.0 percent of net worth, compared with 8.7 percent in manufacturing. Among bituminous coal companies, profit rates varied, with some exceeding the average for the coal industry and other industries.

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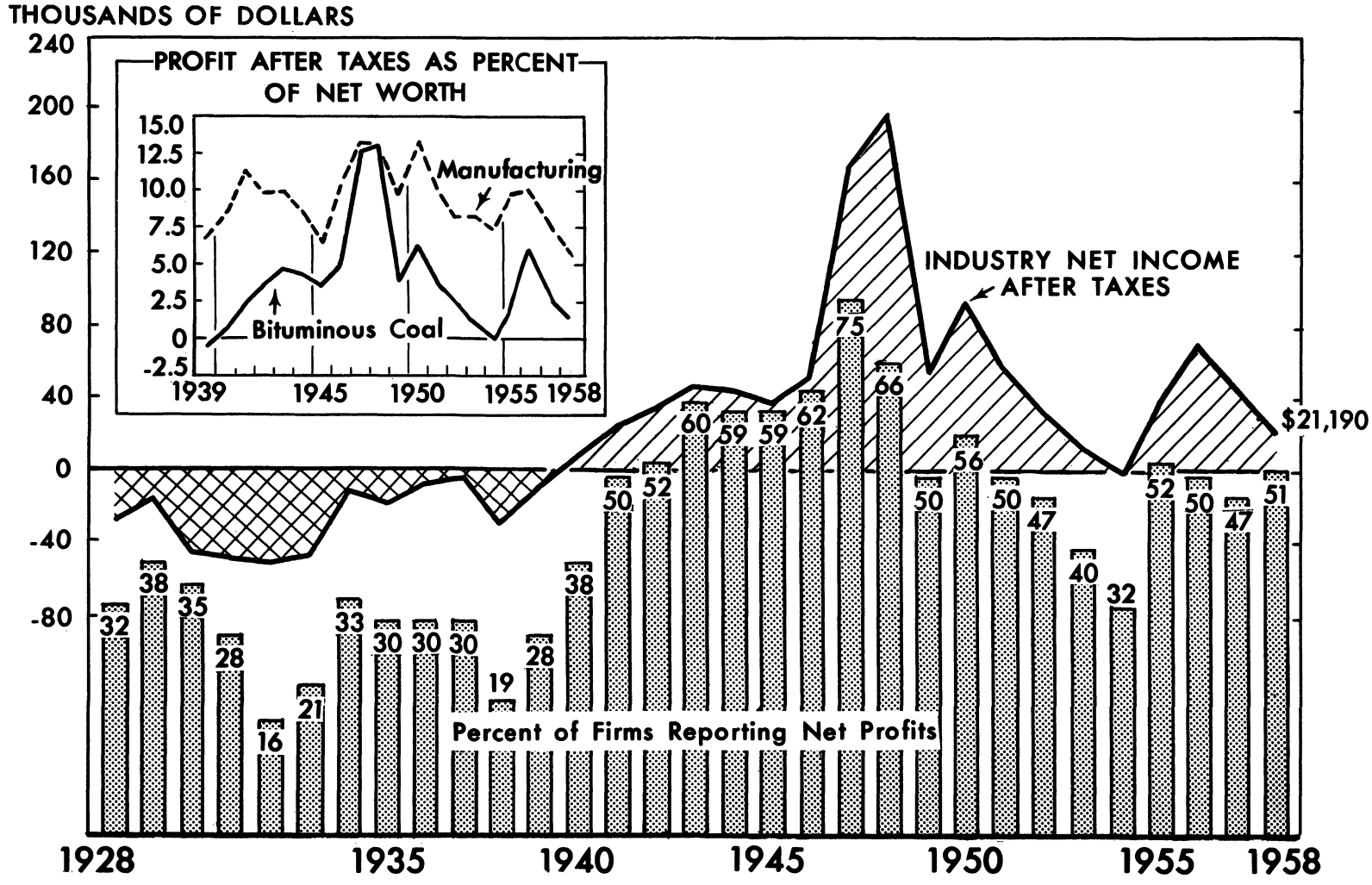
Corporate Profits in Bituminous Coal Mining, 1928-58



Source: U.S. Treasury Department, Internal Revenue Service.
Based on appendix tables 32A and 32B.

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Coal Research and Development

One of the most important steps towards increasing the coal industry's share of the growing energy market is widely held to be expanded scientific research. Interest in developing new ways of producing, transporting, and using coal has grown significantly since World War II.

The bulk of coal research is financed by groups outside the industry--chiefly as a result of the large number of relatively small coal producers. Of the $17.4 million spent on research in 1955, the most recent data available show only about 21 percent came from coal producers, both captive and independent. Federal and State Governments furnished 31 percent; coal-using industries, 29 percent; and coal equipment manufacturers, 19 percent. The total amount spent was only a small fraction of the research expenditures by the competitive petroleum industry. With the establishment of an Office of Coal Research in the U.S. Department of the Interior in 1960, government research expenditures will be significantly enlarged, particularly for projects that have possibilities for expanding markets in the near future. The industry also is increasing its financial support of Bituminous Coal Research, Inc., the cooperative research organization of producers and users.

Research to improve and expand the utilization of coal accounted for about 60 percent of total expenditures in 1955. One important area of study is the low-temperature carbonization of coal--a process which would lower the cost of coal as a boiler fuel by producing chemicals and synthetic fuels from ordinary steam coal. Research to reduce capital costs and increase the yields from hydrogenation, a process in which chemicals are produced from coal as a primary rather than a byproduct, constitutes a second major area. A third major area of research in coal use is the development of an economical coal-fired gas turbine suitable for stationary and locomotive use.

Investigations into new methods of mining, preparation, storage, and transportation accounted for about 20 percent of research expenditures in 1955. Equipment manufacturers are experimenting with remote controlled continuous mining machines. Research on hydraulic mining, in which water under high pressure is used to mine the coal and transport it to surface preparation plants, so transforming the entire sequence of mining steps into a continuous operation, also is receiving greater attention. Because transportation costs are important to the industry, engineers are seeking to improve coal pipelines through which pulverized coal suspended in water can be pumped as "slurry" a distance of more than 100 miles. Also under study, in order to reduce transportation costs, is the possibility of locating electric power plants close to coal deposits. As technology of electric power transmission is improved, this development becomes more feasible.

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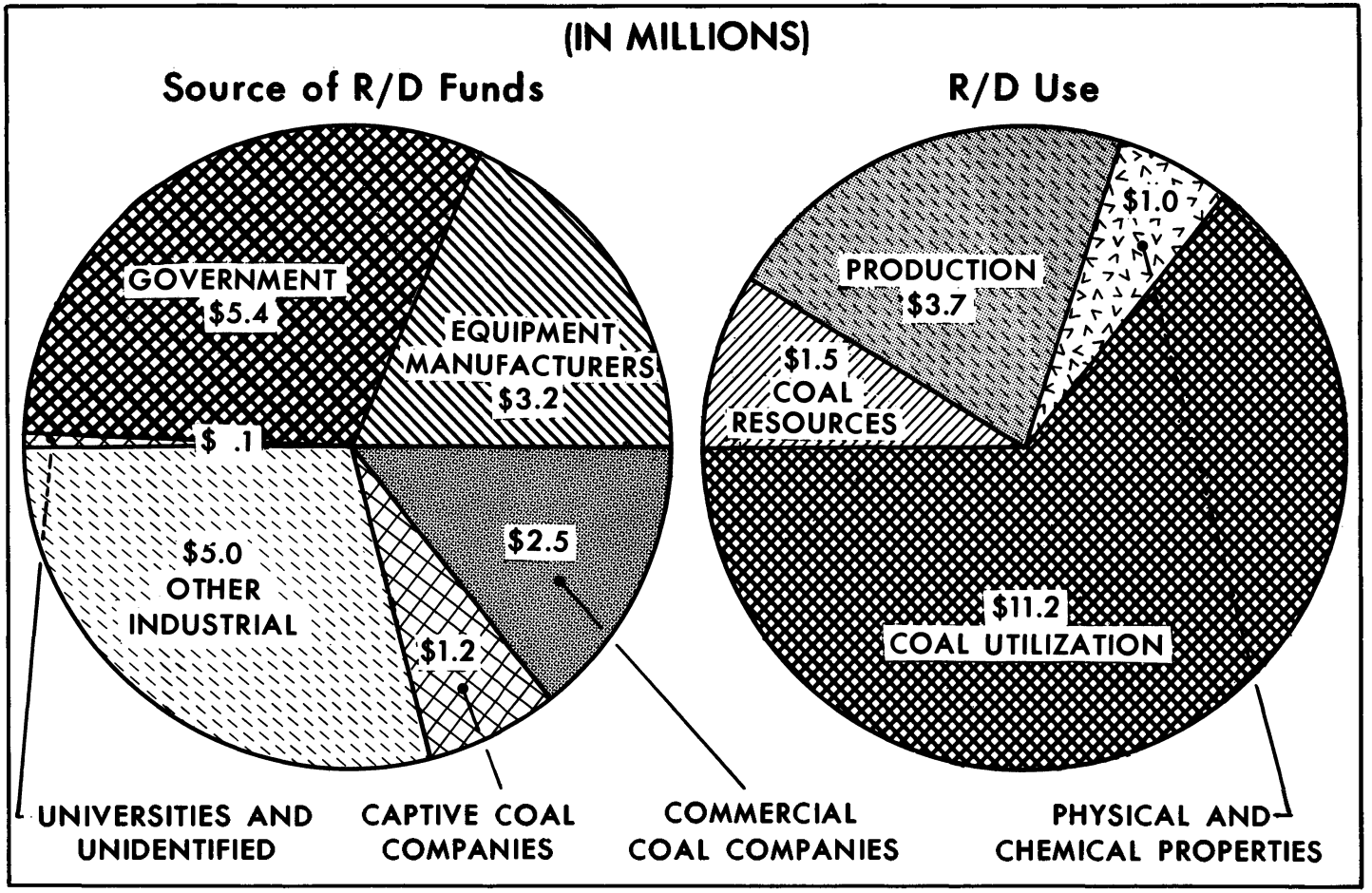
Distribution of Research and Development Expenditures in Bituminous Coal Mining, by Source and Use, 1955



Source: U.S. Department of Interior, Bureau of Mines.
Based on Appendix Table 33.

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Labor, Management, and Government Policies

The progress of the industry in the 1960's will be influenced by the increased activities of mine operators and mineworkers to promote the interests of the industry as a whole.

Pressure to increase productivity will continue to originate from both mine operators and mineworkers. The UMW, which represents the great majority of workers in the industry, has long held the view that mechanization and efficient organization of the industry are necessary to raise wage rates, improve working conditions, and provide adequate benefits for disabled and retired miners. John L. Lewis, union leader for almost 40 years, has asserted that high wages and high productivity would help solve the industry's basic problem of "too many mines and too many miners." The union's policy of increases in wages and welfare benefits is widely acknowledged to have been a major stimulus for introducing laborsaving machinery. With almost one-fifth of all U.S. coal currently produced by nonunion mines which have lower wage and welfare benefits, wage cost differentials are expected to continue to influence management decisions to mechanize.

Joint union-management efforts to expand coal markets are expected to receive greater attention in the 1960's. In 1957, the union in a unique step established a Research and Marketing Department to conduct, with the National Coal Association and other interested groups, promotional activities for coal, such as the campaign to show consumers the advantages of "electric living." Interruptions of coal shipments because of strikes, have been reduced. The last industrywide work stoppage occurred in 1952.

Cooperative efforts to secure legislation and public policies favorable to the coal industry are now being intensified. The National Coal Policy Conference, composed of coal operators, the UMW, railroads, coal equipment manufacturers, and leading electric power customers, was organized in 1959 to publicize the industry's needs. The conference seeks adoption by the Federal Government of a National Fuel Policy that would eliminate the "unfair competition of other fuels," particularly the importation of residual fuel oil for Eastern seaboard consumers and of natural gas from Canada.

Government measures to relieve hardships and unemployment among displaced coal miners also are advocated by the miners. The UMW strongly supported the Area Redevelopment Act of 1961, legislation to bring new industry to depressed mining areas, and urges the payment of unemployment insurance benefits for the full period of joblessness.

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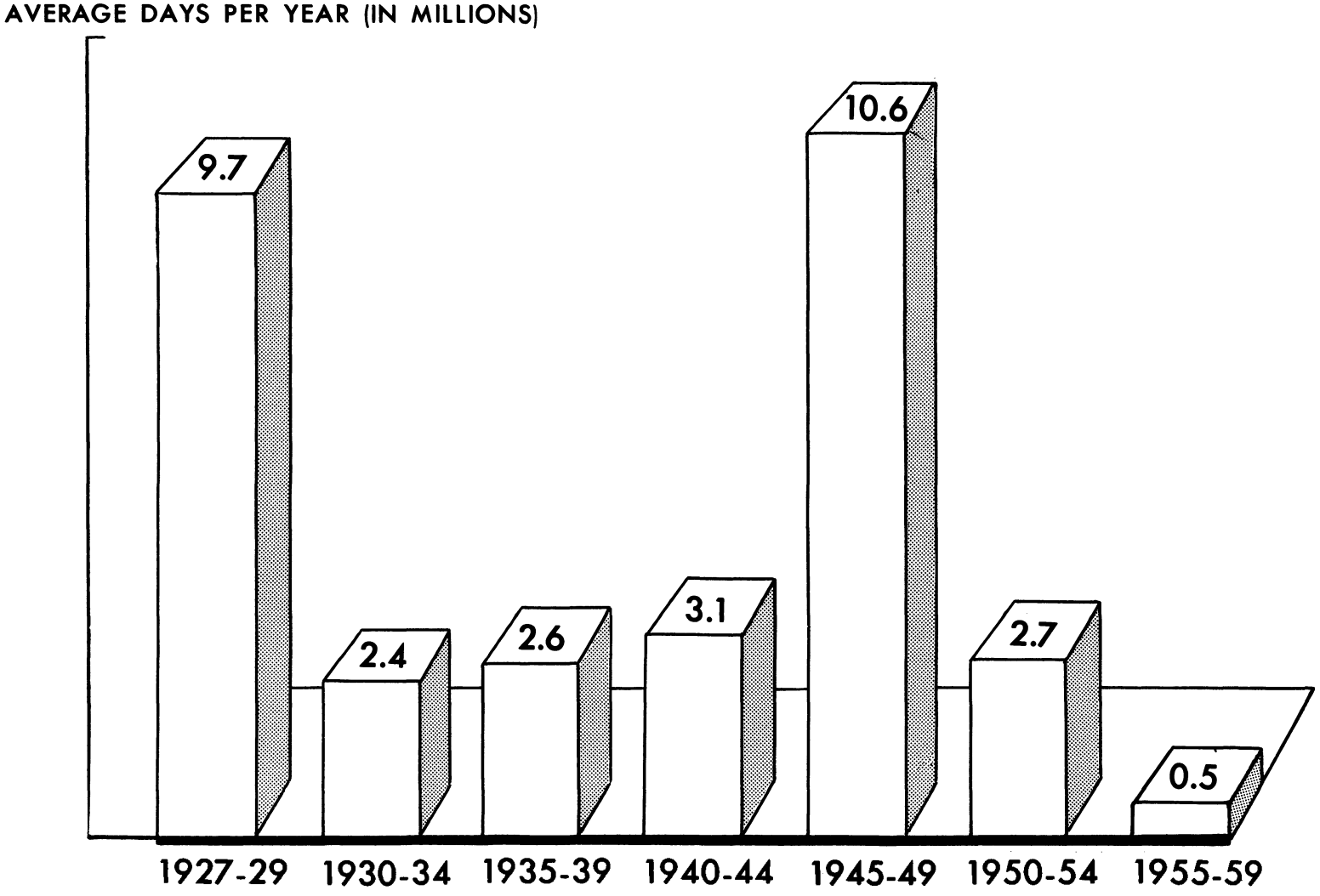
Man-Days of Idleness From Work Stoppages in Bituminous Coal Mining, 1927-59



Based on appendix table 34 B.

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Outlook for the 1960's

Output per man-hour is expected by many authorities to continue to rise, although probably at a slower rate than in the 1947-59 period. In underground mining, substantial gains are expected as continuous mining machines are adapted to thin seams; haulage is further mechanized; and new mines designed for mechanical mining are opened. The virtual completion of mechanical loading installations, on the other hand, eliminates an important source for gains in output per man-hour. In surface mining, moderate advances are likely as larger and more specialized equipment is utilized; the shift from underground to surface operations, significant in raising industry productivity in the past, is likely to be slow. Future technological improvements depend on operators' investment decisions and therefore will be influenced by the outlook for sales, costs, interest, taxes, and profits.

Coal production is expected to rise substantially above 1959 output during the 1960's according to a number of industry experts. Underlying the anticipated growth are forecasts of a rising demand for coal and a relatively stable coal price. Increased consumption of coal will result primarily from the increasing demand for electricity and the increasing importance of coal in generating electric power. Lesser increases are forecast for other industrial uses, largely iron and steel. Major reductions in coal consumption are not foreseen because railroads and residential heating have almost completely converted to other fuels, and atomic energy is not yet fully competitive for generating electric power. Stable prices are predicted on the basis of a continuing stability of unit labor costs arising from increases in output per man-hour; reduced costs of transporting coal to places of consumption; from increased competition among shipping services; and relatively greater pressure for price increases by the oil and natural gas industries.

Employment is expected (on the basis of the forecasts for productivity and production discussed above) to stabilize or increase only slowly, after further decline. Prospects for expansion are limited: continued gains in productivity will probably hold employment well below past levels. If coal production increases at the rate that gross national product is expected to increase, while productivity slows to its long-term rate of growth, the number of mineworkers employed in 1975 will be no higher than in 1959.

Unemployment is likely to continue to be a serious problem in coal mining areas until new jobs in other industries are provided for miners now displaced, and for those who will be displaced as older mines are abandoned.

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Outlook for Employment in Bituminous Coal Mining, 1960-1975

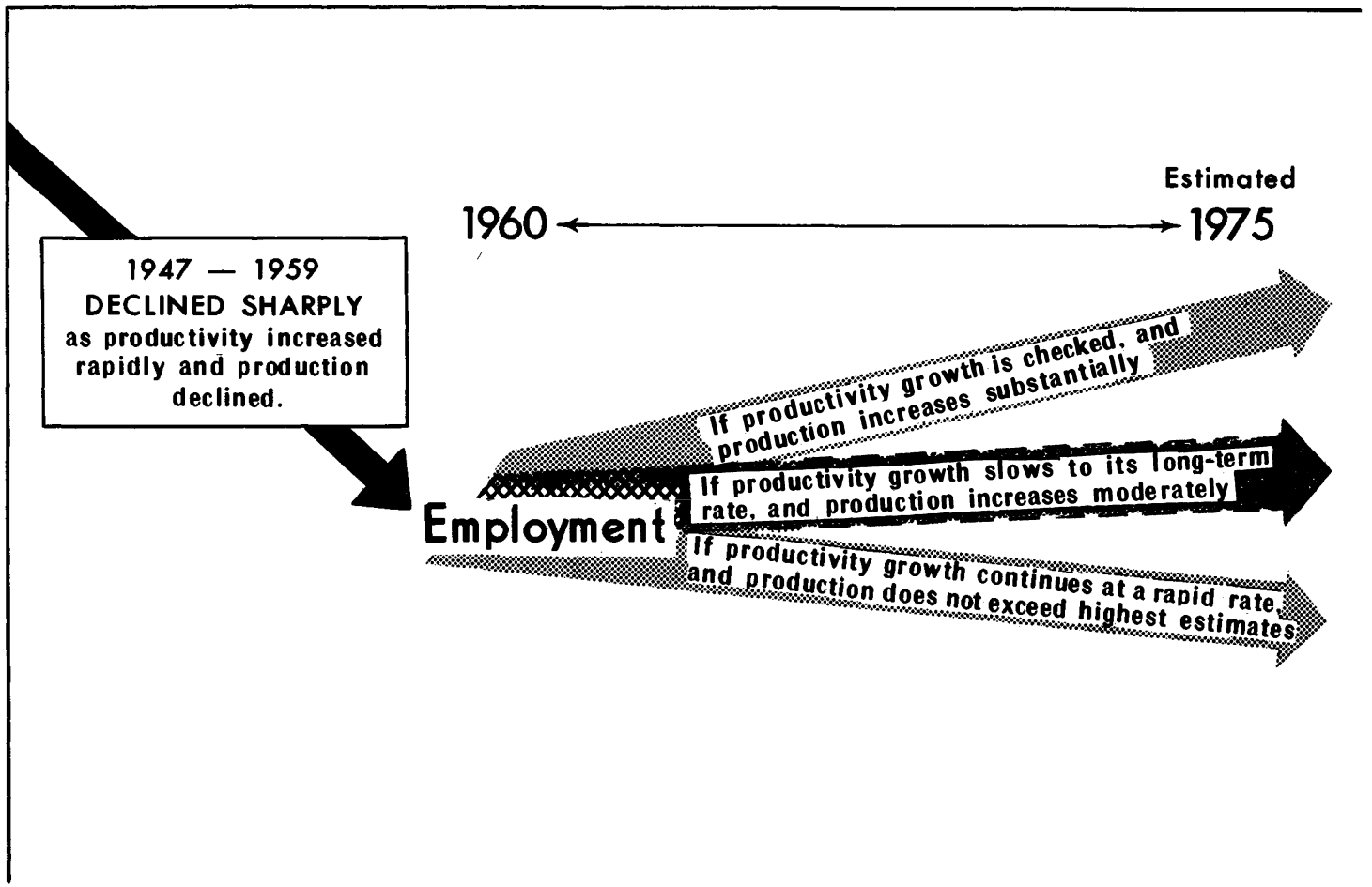

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Table 1. Estimated Recoverable Mineral-Fuel Reserves of the United States, Including Alaska, January 1, 1960

Kind of fuel	Reserves (quadrillion B.t.u.'s)		Percent of total fuel reserves	
	Proved	Total potential	Proved	Total potential
Total	6,200	28,515	100.0	100.0
Coal	5,400	22,000	87.1	77.2
Petroleum, including natural gas liquids	215	2,355	3.5	8.3
Natural gas	285	1,100	4.6	3.9
Bitumen from bituminous sandstone	10	60	.1	.1
Oil from oil shale	290	3,000	4.7	10.5

Note: The exact magnitude of fuel reserves is indeterminate because of the necessity of making assumptions regarding geological deposits and future economic and technological trends. For an extensive discussion of the problem of estimating reserves, see Schurr and Netschert, Energy in the American Economy, 1850-1975, pp. 295-346. John Hopkins Press, Baltimore, 1960.

Source: Mineral Facts, 1960, U.S. Department of the Interior, Bureau of Mines.

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Table 2A. Bituminous Coal Mining: Volume of Production, Employment, Proved Reserves, and Distribution of Coal Shipments by Major Producing State, 1959

State	Production			Employment			Reserves			Distribution		
	Rank	Thousands of tons	Percent	Rank	Number of workers	Percent	Rank	Billions of tons	Percent	Rank	Millions of tons	Percent
Total		412,028	100.0		179,636	100.0		1,899,739	100.0		369,988	100.0
West Virginia	1	119,692	29.1	1	53,847	30.0	6	105,762	5.6	--	--	--
Pennsylvania	2	65,347	15.9	2	36,323	20.2	--	72,376	3.8	2	46,021	12.5
Kentucky	3	62,810	15.3	3	27,428	15.3	5	118,973	6.3	--	--	--
Illinois	4	45,466	11.1	5	10,548	5.9	3	137,009	7.2	3	39,720	10.7
Ohio	5	35,112	8.5	6	9,275	5.2	10	82,972	4.4	1	50,071	13.5
Virginia	6	29,769	7.2	4	15,652	8.7	--	10,833	.6	--	--	--
Indiana	7	14,804	3.6	9	3,672	2.0	15	35,215	1.9	4	31,000	8.4
Alabama	8	11,947	2.9	7	6,694	3.7	12	65,848	3.5	--	--	--
Tennessee	9	5,913	1.4	8	5,238	2.9	--	24,985	1.3	--	--	--
Michigan	--	--	--	--	--	--	--	--	--	5	27,231	7.4
New York	--	--	--	--	--	--	--	--	--	6	22,974	6.2
North Dakota	--	--	--	--	--	--	1	350,756	18.5	--	--	--
Montana	--	--	--	--	--	--	2	221,719	11.7	--	--	--
Wyoming	--	--	--	--	--	--	4	120,788	6.4	--	--	--
Colorado	--	--	--	--	--	--	7	99,440	5.2	--	--	--
Utah	--	--	--	--	--	--	8	92,904	4.9	--	--	--
Washington	--	--	--	--	--	--	13	63,588	3.3	--	--	--
New Mexico	--	--	--	--	--	--	14	61,509	3.2	--	--	--
Missouri	--	--	--	--	--	--	11	78,828	4.1	--	--	--
Other western States	--	--	--	--	--	--	--	154,632	8.1	--	--	--
Other States	--	21,168	5.0	--	10,959	6.0	--	1,602	(1/)	--	152,971	41.4

1/ Less than 0.1 percent.

Note: Production is in net (marketable) tons produced by mines with annual output of 1,000 net tons or more. Employment is the average number of men working daily. Reserves are estimates of original gross reserves less production to January 1, 1959. Distribution is the quantity of coal transported into a State or produced for consumption there during a calendar year. Because of rounding, the components may not add to totals shown.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 2B. Bituminous Coal Mining: Total Value of Production, 1920-60

Year	Total	Year	Total
1920	$2,129,933,000	1940	$879,327,227
1921	1,199,983,600	1941	1,125,362,836
1922	1,274,820,000	1942	1,373,990,608
1923	1,514,621,000	1943	1,584,644,477
1924	1,062,626,000	1944	1,810,900,542
1925	1,060,402,000	1945	1,768,204,320
1926	1,183,412,000	1946	1,835,539,476
1927	1,029,657,000	1947	2,622,634,946
1928	933,774,000	1948	2,993,267,021
1929	952,781,000	1949	2,136,870,571
1930	795,483,000	1950	2,500,373,779
1931	588,895,000	1951	2,626,030,137
1932	406,677,000	1952	2,289,180,401
1933	445,788,000	1953	2,247,828,694
1934	628,383,000	1954	1,769,619,723
1935	658,063,000	1955	2,092,382,737
1936	770,955,000	1956	2,412,004,151
1937	864,042,000	1957	2,504,406,042
1938	678,653,000	1958	1,996,281,274
1939	728,348,366	1959	1,965,606,901
		1960	1,953,490,000

Note: Total value represents the value of total production based on the average selling price per ton (f.o.b. mine). Coal not sold is valued at average selling price.

Data for 1960 are preliminary.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 3A. Bituminous Coal Mining: Concentration of Employment, Production and Assets by Size Class, Selected Years

Size of mine	Employment, 1958			
	Number of mines	Number of workers	Percent of mines	Percent of employment
All mines	7,381	165,697	100.0	100.0
500 employees and over	41	26,236	0.6	15.8
100 to 499 employees	340	75,363	4.6	45.5
10 to 99 employees	2,020	43,667	27.4	26.4
1 to 9 employees	4,980	20,431	67.4	12.3
	Production, 1959			
	Number of mines	Millions of tons	Percent of mines	Percent of total tonnage
All mines	7,719	412.0	100.0	100.0
500,000 tons or more	212	205.4	2.7	49.9
100,000 to 499,000 tons	509	116.3	6.6	28.2
10,000 to 99,000 tons	2,331	70.1	30.2	17.0
Less than 10,000 tons	4,667	20.2	60.5	4.9
	Assets, 1957			
	Total assets (thousands of dollars)	Number of companies	Percent of all companies	Percent of industry assets
All corporate returns	2,359,733	1,549	100.0	100.0
$50,000,000 and above	982,384	7	.5	41.7
$1,000,000 to $49,000,000	1,161,622	199	12.8	49.1
$100,000 to $999,000	193,198	564	36.4	8.2
Under $100,000	22,529	779	50.3	1.0

Source: Employment and production data are from U.S. Department of the Interior, Bureau of Mines. Assets data are from U.S. Treasury Department, Internal Revenue Service.

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Table 3B. Bituminous Coal Production in Captive Mines, by Industry Ownership, 1936 and 1950-60

/In thousands of tons/

Year	Total	Percent of total U.S. production	Steel	Railroads	Electric utilities	Other
1936	81,880	19.7	---	---	---	---
1950	86,881	17.0	---	---	---	---
1951	94,506	17.7	63,305	11,755	10,037	9,409
1952	81,062	17.4	53,818	8,719	10,163	8,362
1953	90,931	19.9	66,363	7,187	10,207	7,174
1954	74,057	18.9	54,726	3,836	10,198	5,297
1955	86,545	18.6	65,282	2,949	11,129	7,185
1956	84,568	16.9	62,953	2,239	11,697	7,679
1957	88,612	18.0	68,245	1,317	11,733	7,317
1958	68,728	16.7	52,581	500	9,547	6,100
1959	64,622	15.7	48,142	184	9,554	6,742
1960	68,044	16.5	52,515	171	9,314	6,044

Note: A captive mine is one in which 40 percent or more of total production is billed to an owning, controlling, or affiliated corporation.

Dashes indicate data not available. Data for 1960 are preliminary.

Sources: Data for 1950-60 are from Bituminous Coal Facts, published by National Coal Association. Data for 1936, from National Bureau of Economic Research, Minimum Price Fixing in the Bituminous Coal Industry.

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Table 4A. Bituminous Coal Mining: Fixed Capital (Plant and Equipment) per Worker, Selected Years, 1870-1958
(Based on estimates of the National Bureau of Economic Research.)

Year	Fixed capital--(plant and equipment) (1929 dollars, millions)	Workers (wage earners--NBER) (thousands)	Fixed capital per worker		
			Value (1929 dollars)	Index (1929 dollars)	Average annual percent change in value per period
1870	23.3	42	555	36.4	
1880	40.2	109	367	24.1	-4.0
1889	100.6	169	595	39.0	5.5
1909	605.9	488	1,242	81.4	3.7
1919	882.8	546	1,617	106.0	2.7
1929	700.0	459	1,525	100.0	- .6
1939	394.9	371	1,064	69.8	-3.5
1948	521.8	412	1,267	83.1	2.0
1953	596.2	268	2,223	145.8	11.9
1958	570.7	174	3,276	214.8	8.1

Average annual rates of change for selected periods

Period	Fixed capital	Workers	Fixed capital per worker
1880-1919--Growth period	8.3	4.2	3.9
1919-39--Post-World War I	-3.9	-1.9	-2.1
1948-58--Post-World War II	.9	-8.2	10.0

Sources: Data on fixed capital (plant and equipment) per worker (wage earner) for 1870-1948 from Capital and Output Trends in Mining Industries, 1870-1948, National Bureau of Economic Research, 1954. Estimate for 1953, from NBER, 1958, estimated by the Bureau of Labor Statistics on basis of National Bureau of Economic Research methods and sources. Data for workers, 1953 and 1958, represent Bureau of Labor Statistics production worker employment figures raised to levels implicit in National Bureau of Economic Research estimates. Bureau of Labor Statistics data as published in Employment and Earnings are: 410.8 (1948), 267.5 (1953), and 173.8 (1958). Average annual rates of change derived by compound interest method.

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Table 4B. Bituminous Coal Mining: Installed Horsepower and Electrical Energy Consumed, Selected Years, 1909-54

Year	Installed Horsepower			Electrical energy consumed		
	Total	Per worker		Total (millions of kw. hrs.)	Per worker	
		Amount	Percent change from previous census year		Amount (millions of kw. hrs.)	Percent change from previous census year
1909	1,230,635	3	--	--	--	--
1919	2,157,946	4	25.0	--	--	--
1929	3,125,103	7	75.0	2,509	5.8	--
1939	3,364,731	9	28.6	2,574	6.9	18.9
1954	6,167,484	31	244.4	3,760	18.8	172.5

Note: Dashes indicate data not available.

Source: Census of Minerals Industries, 1954 (table 1, page 12A-4), U.S. Department of Commerce, Bureau of the Census.

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Table 5A. Bituminous Coal Mining: Percent of Underground Coal Mechanically Cut and Loaded, 1920-60

Year	Coal mined underground		Year	Coal mined underground	
	Percent machine cut	Percent machine loaded		Percent machine cut	Percent machine loaded
1920	60.7	--	1940	88.4	35.4
1921	66.4	--	1941	89.0	40.7
1922	64.8	--	1942	89.7	45.2
1923	68.3	0.3	1943	90.3	48.9
1924	71.5	.7	1944	90.5	52.9
1925	72.9	1.2	1945	90.8	56.1
1926	73.8	1.9	1946	90.8	58.4
1927	74.9	3.3	1947	90.0	60.7
1928	76.9	4.5	1948	90.7	64.3
1929	78.4	7.4	1949	91.4	67.0
1930	81.0	10.5	1950	92.6	69.4
1931	83.2	13.1	1951	94.9	73.1
1932	84.1	12.3	1952	95.1	75.6
1933	84.7	12.0	1953	95.7	79.6
1934	84.1	12.2	1954	94.5	84.0
1935	84.2	13.5	1955	96.1	84.6
1936	84.8	16.3	1956	95.5	84.0
1937	--	20.2	1957	95.8	84.8
1938	87.5	26.7	1958	94.9	84.9
1939	87.9	31.0	1959	95.3	86.0
			1960	--	91.3

Note: The percent mined by continuous mining machines is included in both the percent machine cut and percent machine loaded.

Dashes indicate data not available.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 5B. Bituminous Coal Mining: Conveyors in Underground Mines and Percent of Coal Hauled by Conveyors, 1945-59

Year	Percent of total underground coal produced in mines with conveyors	Conveyors in use (Gathering and haulage)		
		Number (units)	Average length (feet)	Total length (miles)
1945	8.6	359	1,438	97.6
1946	10.9	457	1,484	128.5
1947	14.4	594	1,470	165.3
1948	17.8	755	1,460	208.8
1949	21.1	860	1,514	246.7
1950	23.5	1,013	1,538	294.9
1951	23.9	1,094	1,568	325.0
1952	25.9	1,066	1,526	308.2
1953	28.7	1,042	1,541	303.9
1954	28.8	1,081	1,626	332.9
1955	28.4	1,002	1,682	319.6
1956	34.6	1,114	1,656	349.4
1957	38.0	1,233	1,672	390.6
1958	40.2	1,235	1,711	400.3
1959	44.7	1,416	1,723	462.1

Note: Conveyors include only gathering and haulage conveyors of 500 feet or more in length.

Data for earlier years are not available.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 6A. Bituminous Coal Mining: Extent of Use of Continuous Mining Machines, 1950-59

Year	Number of continuous mining machines in use	Number of mines using continuous mining machines exclusively	Mined by continuous mining machines	
			Thousands of tons	Percent of total underground production
1950	--	--	3,143	0.8
1951	--	--	6,241	1.5
1952	152	7	8,215	2.3
1953	219	13	11,830	3.4
1954	325	17	16,336	5.7
1955	385	21	27,460	8.0
1956	510	24	39,907	10.9
1957	614	33	53,783	14.9
1958	679	45	56,373	19.7
1959	776	59	65,792	23.2
1960	--	--	77,928	31.7

Note: Dashes indicate data not available.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 6B. Bituminous Coal Mining: Tons Per Man-Day, by Method of Mining and Loading, 1959

Method	Average tons per man-day	Percent continuous mining exceeds other methods	Percent of underground production
All underground mining	10.08	38.6	100.0
Continuous mining	13.97	--	5.8
Mixed continuous and conventional mining	11.33	23.3	38.4
Conventional mining:			
With mechanical loading	11.26	24.1	42.3
With hand loading only	5.73	143.8	13.5

Note: Conventional mining with mechanical loading excludes production by continuous mining machines.

Source: "1960 Sales: Coal-Mining and Cleaning Equipment," Coal Age, February 1961, table II, p. 84.

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Table 7A. Bituminous Coal Mining: Distribution of Production, by Method of Mining, 1920-60

[In thousands of net tons]

Year	Total	Underground	Surface	
			Strip	Auger
1920	568,667	559,807	8,860	--
1921	415,922	410,865	5,057	--
1922	422,268	412,059	10,209	--
1923	564,565	552,625	11,940	--
1924	483,687	470,080	13,607	--
1925	520,053	503,182	16,871	--
1926	573,367	556,444	16,923	--
1927	517,763	499,385	18,378	--
1928	500,745	480,956	19,789	--
1929	534,989	514,721	20,268	--
1930	467,526	447,684	19,842	--
1931	382,089	363,157	18,932	--
1932	309,710	290,069	19,641	--
1933	333,630	315,360	18,270	--
1934	359,368	338,578	20,790	--
1935	372,373	348,726	23,647	--
1936	439,088	410,962	28,126	--
1937	445,531	413,780	31,751	--
1938	348,545	318,138	30,407	--
1939	394,855	357,133	37,722	--
1940	460,771	417,604	43,167	--
1941	514,149	459,078	55,071	--
1942	582,693	515,490	67,203	--
1943	590,177	510,492	79,685	--
1944	619,576	518,678	100,898	--
1945	577,617	467,630	109,987	--
1946	533,922	420,958	112,964	--
1947	630,624	491,229	139,395	--
1948	599,518	460,012	139,506	--
1949	437,868	331,823	106,045	--
1950	516,311	392,844	123,467	--
1951	533,665	416,047	117,618	--
1952	466,841	356,425	108,910	1,506
1953	457,290	349,551	105,448	2,291
1954	391,706	289,112	98,134	4,460
1955	464,633	343,465	115,093	6,075
1956	500,874	365,774	127,055	8,045
1957	492,704	360,649	124,109	7,946
1958	410,446	286,884	116,242	7,320
1959	412,028	283,434	120,953	7,641
1960	413,000	285,000	120,000	8,000

Note: Data for 1960 are preliminary.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 7B. Bituminous Coal Mining: Percent Distribution of Production, by Method of Mining, 1920-60

Year	Total	Underground	Surface	
			Strip	Auger
1920	100.0	98.5	1.5	--
1921	100.0	98.8	1.2	--
1922	100.0	97.6	2.4	--
1923	100.0	97.9	2.1	--
1924	100.0	97.2	2.8	--
1925	100.0	96.8	3.2	--
1926	100.0	97.0	3.0	--
1927	100.0	96.4	3.6	--
1928	100.0	96.0	4.0	--
1929	100.0	96.2	3.8	--
1930	100.0	95.7	4.3	--
1931	100.0	95.0	5.0	--
1932	100.0	93.7	6.3	--
1933	100.0	94.5	5.5	--
1934	100.0	94.2	5.8	--
1935	100.0	93.6	6.4	--
1936	100.0	93.6	6.4	--
1937	100.0	92.9	7.1	--
1938	100.0	91.3	8.7	--
1939	100.0	90.4	9.6	--
1940	100.0	90.6	9.4	--
1941	100.0	89.3	10.7	--
1942	100.0	88.5	11.5	--
1943	100.0	86.5	13.5	--
1944	100.0	83.7	16.3	--
1945	100.0	81.0	19.0	--
1946	100.0	78.9	21.1	--
1947	100.0	77.9	22.1	--
1948	100.0	76.7	23.3	--
1949	100.0	75.8	24.2	--
1950	100.0	76.1	23.9	--
1951	100.0	78.0	22.0	--
1952	100.0	76.4	23.3	.3
1953	100.0	76.4	23.1	.5
1954	100.0	73.8	25.1	1.1
1955	100.0	73.9	24.8	1.3
1956	100.0	73.0	25.4	1.6
1957	100.0	73.2	25.2	1.6
1958	100.0	69.9	28.3	1.8
1959	100.0	68.8	29.3	1.9
1960	100.0	69.0	29.1	1.9

Note: Data for 1960 are preliminary.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 8A. Bituminous Coal Mining: Average Tons Produced per Man-Day, by Type of Mining, 1920-60

Year	Total	Underground	Strip	Auger	Year	Total	Underground	Strip	Auger
1920	4.00	3.97	7.20	--	1940	5.19	4.86	15.63	--
1921	4.20	4.18	8.28	--	1941	5.20	4.83	15.59	--
1922	4.28	4.24	8.09	--	1942	5.12	4.74	15.52	--
1923	4.47	4.43	9.32	--	1943	5.38	4.89	15.15	--
1924	4.56	4.50	9.91	--	1944	5.67	5.04	15.89	--
1925	4.52	4.45	11.18	--	1945	5.78	5.04	15.46	--
1926	4.50	4.42	11.13	--	1946	6.30	5.43	15.73	--
1927	4.55	4.47	11.06	--	1947	6.42	5.49	15.93	--
1928	4.73	4.61	13.02	--	1948	6.26	5.31	15.28	--
1929	4.85	4.73	14.08	--	1949	6.43	5.42	15.33	--
1930	5.06	4.93	16.21	--	1950	6.77	5.75	15.66	--
1931	5.30	5.12	17.68	--	1951	7.04	6.08	16.02	--
1932	5.22	4.99	16.95	--	1952	7.47	6.37	16.77	20.07
1933	4.78	4.60	13.59	--	1953	8.17	7.01	17.62	25.30
1934	4.40	4.23	13.28	--	1954	9.47	7.99	19.64	24.12
1935	4.50	4.32	12.01	--	1955	9.84	8.28	21.12	22.22
1936	4.62	4.42	13.91	--	1956	10.28	8.62	21.18	24.85
1937	4.69	--	--	--	1957	10.59	8.91	21.64	26.19
1938	4.89	4.60	15.00	--	1958	11.33	9.38	21.54	28.15
1939	5.25	4.92	14.68	--	1959	12.22	10.08	22.65	28.77
					1960	13.30	--	--	--

Note: Average tons produced per man-day represent the net marketable tons for the year divided by the total number of man-days worked by mineworkers. Bureau of Mines employment data do not cover some store and office workers, but include certain supervisory and technical workers excluded from BLS data on production workers.

Dashes indicate data not available. The figure for 1960 is an estimate for 11 months.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 8B. Bituminous Coal Mining: Number of Draglines and Shovels in Use, by Type, 1932-59

Year	Diesel and gasoline	Electric and diesel electric	Steam-powered
1932	61	105	166
1933	103	117	169
1934	149	121	188
1935	194	139	174
1936	223	151	188
1937	--	--	--
1938	440	155	142
1939	524	184	206
1940	697	194	180
1941	911	210	200
1942	1,020	219	199
1943	1,433	234	172
1944	1,902	244	166
1945	2,042	256	141
1946	2,372	261	111
1947	2,870	301	83
1948	3,321	337	54
1949	3,173	352	51
1950	3,487	348	42
1951	3,438	346	26
1952	3,184	321	19
1953	3,075	317	17
1954	2,991	381	18
1955	2,940	315	10
1956	3,279	421	5
1957	3,228	489	6
1958	2,922	588	5
1959	2,886	524	7

Note: Dashes indicate data not available.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 9. Bituminous Coal Mining: Trends in Coal Processing, 1920-59

Year	Number of processing plants	Percent of coal mechanically cleaned	Percent of refuse removed	Percent of coal mechanically crushed	Percent of coal dust treated	Percent of coal thermally dried
1920	--	3.3	--	--	--	--
1921	--	3.4	--	--	--	--
1922	--	3.6	--	--	--	--
1923	--	3.8	--	--	--	--
1924	--	--	--	--	--	--
1925	--	--	--	--	--	--
1926	--	--	--	--	--	--
1927	--	5.3	--	--	--	--
1928	236	5.7	--	--	--	--
1929	280	6.9	8.6	--	--	--
1930	297	8.3	9.0	--	--	--
1931	312	9.5	8.5	--	--	--
1932	309	9.8	8.0	--	--	--
1933	290	10.4	8.3	--	--	--
1934	293	11.1	8.6	--	--	--
1935	320	12.2	8.3	--	--	--
1936	342	13.9	9.0	--	--	--
1937	--	14.6	--	--	--	--
1938	374	18.2	10.9	--	--	--
1939	366	20.1	10.6	--	--	--

See note and source at end of table.

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Table 9. Bituminous Coal Mining: Trends in Coal Processing, 1920-59--Continued

Year	Number of processing plants	Percent of coal mechanically cleaned	Percent of refuse removed	Percent of coal mechanically crushed	Percent of coal dust treated	Percent of coal thermally dried
1940	387	22.2	11.6	7.7	7.7	--
1941	417	22.9	11.9	--	7.7	--
1942	438	24.4	12.6	--	6.0	--
1943	432	24.7	13.0	--	4.5	--
1944	439	25.6	12.8	10.8	5.0	--
1945	439	25.6	14.5	12.3	5.8	--
1946	445	26.0	15.3	12.5	6.9	--
1947	461	27.7	15.6	14.1	8.2	--
1948	502	30.2	16.0	15.3	8.4	--
1949	571	35.1	16.8	17.7	9.5	--
1950	612	38.5	16.7	19.7	10.5	--
1951	631	45.0	17.2	22.2	11.0	--
1952	625	48.7	17.1	23.2	11.0	--
1953	611	52.9	18.2	25.5	10.7	--
1954	613	59.4	18.9	31.2	14.4	--
1955	575	58.7	18.7	34.8	13.5	--
1956	583	58.4	18.6	34.4	12.9	--
1957	593	61.7	19.3	35.0	12.5	--
1958	573	63.1	19.3	35.8	13.0	12.2
1959	555	65.5	20.0	36.7	13.3	13.3

Note: Dashes indicate data not available.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 10A. Bituminous Coal Mining: Indexes of Output per Man-Hour and per Worker, 1920-60

(1947=100)

Year	Output per--			Year	Output per--		
	Production worker man-hour	Production worker	Employee		Production worker man-hour	Production worker	Employee
1920	59.2	63.5	--	1940	92.6	70.5	71.4
1921	62.1	44.6	--	1941	93.0	79.4	80.4
1922	63.2	42.9	--	1942	91.6	81.7	82.7
1923	66.0	56.0	--	1943	88.1	90.0	91.1
1924	67.0	54.6	--	1944	91.4	98.4	99.7
1925	66.6	61.8	--	1945	94.2	100.4	101.4
1926	66.1	67.5	--	1946	97.8	95.8	96.6
1927	67.1	61.0	--	1947	100.0	100.0	100.0
1928	69.5	67.0	--	1948	100.0	93.0	92.7
1929	71.5	74.3	--	1949	104.4	75.7	75.0
1930	74.4	67.5	--	1950	114.5	95.9	94.8
1931	77.9	59.7	--	1951	113.8	97.8	96.8
1932	76.5	56.4	--	1952	120.1	97.8	95.8
1933	72.7	58.1	--	1953	129.0	108.9	106.6
1934	74.1	54.2	--	1954	149.2	119.2	115.5
1935	76.1	54.4	--	1955	159.9	147.8	143.2
1936	79.7	62.3	--	1956	164.3	152.5	147.7
1937	81.6	61.7	--	1957	166.9	150.3	144.2
1938	85.9	54.7	--	1958	179.2	150.2	141.4
1939	89.1	67.7	68.6	1959	193.3	175.7	165.1
				1960	212.5	189.0	174.9

Note: Indexes for 1920 to 1934, inclusive, have not been previously published. Indexes for 1960 are preliminary. Index of output per production worker man-hour are derived from an index of coal production based on Bureau of Mines data and from an index of man-hours based on BLS data on production worker employment and average weekly hours. The data on average weekly hours cover payroll hours, which include hours at the mine plus company paid sick leave, holidays, vacations, etc., adjusted to exclude travel time for underground employees. Production worker employment covers production and related workers through the working foreman level. BLS data for all employees cover production and related workers and administrative, supervisory, professional, and clerical employees.

Dashes indicate data not available.

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Table 10B. Bituminous Coal Mining: Indexes of Unit Labor Requirements, 1920-60

/1947=100/

Year	Labor requirements per unit			Year	Labor requirements per unit		
	All employees	Production worker man-hours	Production workers		All employees	Production worker man-hours	Production workers
1920	--	169.0	157.5	1940	140.1	107.9	141.8
1921	--	161.2	224.1	1941	124.4	107.4	125.9
1922	--	158.3	232.8	1942	120.9	109.2	122.4
1923	--	151.5	178.7	1943	109.8	113.5	111.1
1924	--	149.0	183.3	1944	100.3	109.4	101.6
1925	--	149.9	161.8	1945	98.6	106.1	99.6
1926	--	151.3	148.1	1946	103.5	102.2	104.4
1927	--	149.0	164.1	1947	100.0	100.0	100.0
1928	--	144.0	149.2	1948	107.9	99.9	107.6
1929	--	140.0	134.6	1949	133.3	95.8	132.0
1930	--	134.4	148.0	1950	105.5	87.3	104.3
1931	--	128.8	167.5	1951	103.3	87.8	102.2
1932	--	130.5	177.2	1952	104.3	83.2	102.3
1933	--	137.4	172.0	1953	93.8	77.5	91.9
1934	--	134.9	184.6	1954	86.6	67.1	83.9
1935	--	131.4	183.7	1955	69.8	62.5	67.7
1936	--	125.4	160.6	1956	67.7	60.9	65.6
1937	--	122.5	162.1	1957	69.4	59.9	66.5
1938	--	116.5	183.0	1958	70.7	55.8	66.6
1939	145.7	112.1	147.6	1959	60.6	51.7	56.9
				1960	57.2	46.9	52.9

Note: Indexes of unit labor requirements are the reciprocals of the indexes of output per man-hour, shown in table 10A. Footnotes to table 10A applicable.

Dashes indicate data not available. Data for 1960 are preliminary.

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Table 10C. Bituminous Coal Mining: Average Annual Rates of Change in Output per Man-Hour, Selected Periods, 1919-59

	Average annual percent increase		Average annual percent increase
Postwar and preceding periods:		Decade changes:	
1919-47	1.9	1919-29	2.0
1947-59	6.1	1929-39	1.8
		1939-49	1.4
		1949-59	6.4

Note: Average annual increases calculated by least squares of the logarithms.

Table 10D. Bituminous Coal Mining: Average Annual Rates of Change in Output per Man-Hour and Tons per Man-Day, 1949-59

Period	Output per man-hour		Tons per man-day		
	All employees	Production workers	All mines	Underground	Strip
	Average annual percent increase				
1949-54	6.0	6.5	7.6	7.7	4.8
1949-52	4.3	4.2	5.0	5.6	3.0
1952-54	10.7	11.5	12.6	12.0	8.2
1954-59	4.1	4.8	5.1	4.6	2.3
1954-57	3.8	3.7	3.9	3.7	3.0
1957-59	6.3	7.6	7.4	6.4	2.3

Note: Because of changes in the proportion of coal mined in underground and strip mines, the average annual rates of change in tons per man-day of all mines may lie outside the range of average changes shown for the components. Average annual increases calculated by least squares of the logarithms. The indexes of output per all employee man-hour, underlying these calculations, are described in table 10A. Proportions mined in underground and strip mines are shown in table 7B.

Sources: Output per man-hour from U.S. Department of Labor, Bureau of Labor Statistics. Tons per man-day from U.S. Department of the Interior, Bureau of Mines.

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Table 11. Indexes of Output per Man-Hour: Bituminous Coal Mining and Selected Major Sectors of the Economy, 1939-60

[1947=100]

Year	Bituminous coal mining (Man-hours of all employees)	Total private economy (Man-hours of all persons)	Agriculture (Man-hours of all persons)	Nonagriculture (Man-hours of all persons)
1939	89.0	80.2	89.5	84.7
1940	92.6	84.1	88.7	88.3
1941	93.6	88.8	97.1	91.2
1942	92.5	89.7	101.4	91.2
1943	89.4	91.0	94.6	92.5
1944	93.0	97.2	97.3	99.2
1945	95.6	101.9	98.6	103.9
1946	98.5	99.3	103.6	100.0
1947	100.0	100.0	100.0	100.0
1948	99.3	103.6	118.3	101.9
1949	100.7	106.6	112.9	105.9
1950	111.6	114.2	128.4	111.6
1951	111.3	117.1	126.5	113.4
1952	115.8	119.6	137.6	114.9
1953	124.6	124.5	153.1	118.1
1954	141.0	126.8	163.9	119.9
1955	153.3	132.4	169.6	125.0
1956	157.4	132.7	172.8	124.6
1957	158.1	137.5	184.2	128.4
1958	164.7	141.1	200.7	130.9
1959	178.5	146.9	200.9	136.5
1960	192.5	150.7	212.5	139.3

Note: Index of output per man-hour of all employees in bituminous coal has not been previously published. This index is based on an index of coal output and an index of man-hours for all employees derived from BLS published data on average weekly hours and employment of production workers and from BLS data on employment of nonproduction workers and an assumed constant 40-hour week. Proprietors and unpaid family workers are excluded from these estimates. The indexes of output per man-hour for the total private economy, agriculture and nonagriculture, are based on indexes of real product and indexes of man-hours of all persons engaged. Indexes of real product are based on a measure of value added in constant dollars and differ in concept from the physical output index used in the bituminous coal index. The man-hours indexes cover estimated hours of all persons engaged, including proprietors and unpaid family workers, and are based primarily on BLS establishment data.

Indexes for 1960 are preliminary.

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Table 12. Bituminous Coal Mining: Output per Man-Shift in Underground Coal Mines, United States and Europe, 1947 and 1959

Country	1947	1959	Percent increase, 1947-59
United States	5.49	10.08	83.6
France	1.05	1.89	80.0
United Kingdom	1.61	1.90	18.0
West Germany	1.32	2.03	53.8
Belgium	.95	1.39	46.3
The Netherlands	1.81	1.78	-1.7
Poland	1.86	1.91	2.7

Note: Data for the United States and other countries are not strictly comparable and may be used only as broad indicators of long-term trends. U.S. data are on a man-day basis and include all production and development workers engaged in bituminous coal and lignite production. European data are on an undefined man-shift basis, include only underground workers, and exclude the production of lignite.

Source: United Nations Economic Commission for Europe; U.S. Department of the Interior, Bureau of Mines.

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Table 13. Bituminous Coal Mining: Output Per Man-Day in the United States and U.S.S.R., Selected Years

	Levels of output per man-day (short tons)					
	United States			U.S.S.R.		
	Total	Underground	Strip	Total	Underground	Strip
1940	5.19	4.86	15.63	1.46	1.42	3.19
1945	5.78	5.04	15.46	1.07	.96	3.92
1950	6.77	5.75	15.66	1.43	1.32	4.61
1955	9.84	8.28	21.12	1.84	1.58	8.41
1957	10.59	8.91	21.64	1.91	--	--
1958	11.33	9.38	21.54	1.95	--	--
1959	12.22	10.08	22.65	--	--	--
	Indexes of output per man-day (1945=100)					
1940	89.8	96.4	101.1	136.4	147.9	81.4
1945	100.0	100.0	100.0	100.0	100.0	100.0
1950	117.1	114.1	101.3	133.6	137.5	117.6
1955	170.2	164.3	136.6	178.5	164.6	214.5
1957	183.2	176.8	140.0	178.5	--	--
1958	196.0	186.1	139.3	182.2	--	--
1959	209.7	--	--	--	--	--

Note: U.S.S.R. data include anthracite production and are for mines under the Ministry of Coal Industries only.

Dashes indicate data not available.

Sources: Some Aspects of the Coal Industry of the U.S.S.R., Information Circular No. 7876 and published materials, U.S. Department of the Interior, Bureau of Mines.

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Table 14. Bituminous Coal Mining: Production Trends, 1920-60

Year	Production (thousands of net tons)	Indexes of production (1947=100)			Year	Production (thousands of net tons)	Indexes of production (1947=100)		
		Bituminous coal	Industrial Production	Total private GNP			Bituminous coal	Industrial Production	Total private GNP
1920	568,667	90.2	39.9	45.0	1940	460,772	73.1	66.9	72.5
1921	416,922	66.0	30.7	41.0	1941	514,149	81.5	86.1	83.2
1922	422,268	67.0	38.9	48.1	1942	582,693	92.4	105.7	90.5
1923	564,565	89.6	46.5	54.3	1943	590,177	93.6	126.3	95.0
1924	483,687	76.7	43.5	54.1	1944	619,576	98.2	124.3	100.1
1925	520,053	82.5	48.0	58.8	1945	577,617	91.6	107.3	99.0
1926	573,367	91.0	50.8	62.2	1946	533,922	84.7	90.1	97.3
1927	517,763	82.1	50.7	61.9	1947	630,623	100.0	100.0	100.0
1928	500,745	79.4	52.9	62.4	1948	599,518	95.0	104.3	104.1
1929	534,989	84.9	58.5	66.1	1949	437,868	69.3	98.5	103.5
1930	467,526	74.2	48.7	59.2	1950	516,311	81.9	114.1	113.0
1931	382,089	60.6	40.3	54.7	1951	533,665	84.6	123.7	119.9
1932	309,710	49.1	31.6	46.1	1952	466,841	73.9	128.5	123.5
1933	333,631	52.9	37.2	44.3	1953	457,290	72.4	139.2	130.2
1934	359,368	57.0	40.4	48.2	1954	391,706	62.0	130.8	127.5
1935	372,373	59.1	46.8	53.4	1955	464,633	73.6	147.1	138.9
1936	439,088	69.6	55.4	60.3	1956	500,874	79.3	152.2	141.8
1937	445,581	70.7	60.6	64.6	1957	492,704	78.0	153.3	144.6
1938	348,545	55.3	47.9	60.9	1958	410,446	64.9	142.4	141.6
1939	394,855	62.6	58.4	66.4	1959	412,428	65.2	160.6	151.9
					1960	413,000	65.5	165.7	156.0

Note: The index of bituminous coal production is based on the total net production in tons. The index of industrial production (from the Federal Reserve Board) combines indexes for bituminous coal and other industries with value added weights; the index of private GNP is based on the value added in constant dollars for industries in the private sector.

Data for 1960 are preliminary.

Sources: Data on bituminous coal production are from the U.S. Department of the Interior, Bureau of Mines; index of industrial production are from the Federal Reserve Board; and index of private GNP, from the U.S. Department of Labor, Bureau of Labor Statistics.

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Table 15. Bituminous Coal Mining: Trends in Capacity and Capacity Utilization, 1920-60

Year	Capacity (millions of tons)	Idle capacity (millions of tons)	Percent of capacity utilized	Year	Capacity (millions of tons)	Idle capacity (millions of tons)	Percent of capacity utilized
1920	725	156	78.2	1940	639	178	72.1
1921	781	365	53.3	1941	666	152	77.1
1922	832	410	50.8	1942	663	80	87.9
1923	885	320	63.8	1943	626	36	94.3
1924	792	308	61.1	1944	624	4	99.3
1925	748	228	69.5	1945	620	42	93.2
1926	747	174	76.8	1946	699	165	76.4
1927	759	241	68.2	1947	755	124	83.6
1928	691	190	72.5	1948	774	174	77.5
1929	679	144	78.8	1949	781	343	56.1
1930	700	232	66.8	1950	790	274	65.2
1931	669	287	57.1	1951	736	202	72.5
1932	594	284	52.1	1952	703	236	66.4
1933	559	225	59.7	1953	670	203	68.3
1934	565	206	63.6	1954	603	211	65.0
1935	582	210	64.0	1955	620	155	74.9
1936	618	179	71.0	1956	655	154	76.5
1937	646	200	69.0	1957	680	187	72.5
1938	602	253	57.9	1958	625	215	65.7
1939	621	226	63.6	1959	614	202	67.1
				1960	591	178	69.9

Note: The Bureau of Mines defines capacity as the industry's potential output if all mines operated 280 days per year at that year's average output per day. The 280-day standard was suggested by the American Institute of Mining, Metallurgical and Petroleum Engineers. Idle capacity represents capacity less actual production. Percent of capacity utilized represents production divided by capacity.

Data for 1960 are estimated.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 16. Bituminous Coal Mining: Changing Structure of Employment, Production, and Assets, Selected Years

Size class	Employment						
	1948				Percent change, 1948-58		
	Number of employees	Number of mines	Percent of employment	Percent of mines	Number of employees	Number of mines	Share of employment
All mines	386,263	7,633	100.0	100.0	-57.1	- 3.3	--
500 employees and over	81,694	111	21.1	1.5	-67.9	-63.1	-25.2
100 to 499 employees	200,396	927	51.9	12.1	-62.4	-63.3	-12.3
10 to 99 employees	83,950	2,864	21.8	37.5	-48.0	-29.5	21.1
1 to 9 employees	20,223	3,731	5.2	48.9	1.0	33.5	136.5
	Production						
	1947				Percent change, 1947-59		
	Millions of tons	Number of mines	Percent of total tonnage	Percent of mines	Millions of tons	Number of mines	Share of production
All mines	630.5	8,700	100.0	100.0	-34.7	-11.3	--
500,000 tons and over	261.7	303	41.5	3.5	-21.5	-30.0	20.2
100,000 to 499,000 tons	243.4	1,116	38.6	12.8	-52.2	-54.4	-26.9
10,000 to 99,000 tons	109.8	3,369	17.4	38.7	-36.2	-30.8	- 2.3
Less than 10,000 tons	15.6	3,912	2.5	45.0	29.5	19.3	96.0
	Assets						
	1947				Percent change, 1947-57		
	Number of corporate returns	Total assets (thousands)	Percent of industry assets	Percent of all corporate returns	Number of corporate returns	Total assets (thousands)	Share of assets
All corporate returns	1,598	1,785,310	100.0	100.0	- 3.1	32.2	--
$50,000,000 and above	2	283,215	15.9	0.1	250.0	246.9	162.3
$1,000,000 to $49,000,000	260	1,213,992	67.9	16.3	-23.4	- 4.3	-27.7
$100,000 to $999,000	730	265,179	14.9	45.7	-22.7	-27.1	-45.0
Under $100,000	606	22,924	1.3	37.9	28.5	- 1.7	-23.1

Note: See table 3A for comparison data.

Source: Employment data are from Accident Analysis Reports, U.S. Department of the Interior, Bureau of Mines; production data, Minerals Yearbook, U.S. Department of the Interior, Bureau of Mines; assets data, Statistics of Income, Corporations, U.S. Treasury Department, Internal Revenue Service.

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Table 17A. Bituminous Coal Mining: Consumption of Mineral Fuels and Waterpower in the United States, 1920-60

[In trillion B.t.u.'s]

Year	Total	Bituminous coal and lignite	Petroleum products	Natural gas	Other	Year	Total	Bituminous coal and lignite	Petroleum products	Natural gas	Other
1920	19,782	13,325	2,634	869	2,954	1940	23,908	11,290	7,487	2,969	2,162
1921	16,410	10,266	2,674	732	2,738	1941	26,625	12,893	8,204	3,215	2,313
1922	17,215	11,185	3,071	841	2,118	1942	27,897	14,149	7,667	3,469	2,612
1923	21,685	13,598	4,030	1,122	2,935	1943	30,442	15,557	8,228	3,860	2,797
1924	20,453	12,681	3,764	1,273	2,735	1944	31,821	15,447	9,261	4,217	2,896
1925	20,899	13,079	4,156	1,336	2,328	1945	31,541	14,661	9,619	4,464	2,797
1926	22,495	13,954	4,331	1,484	2,726	1946	30,494	13,110	9,987	4,582	2,815
1927	21,828	13,095	4,377	1,644	2,712	1947	32,870	14,302	10,803	5,082	2,683
1928	22,381	13,069	4,763	1,788	2,761	1948	33,994	13,622	11,938	5,652	2,782
1929	23,756	13,612	5,294	2,188	2,662	1949	31,604	11,673	11,459	5,949	2,523
1930	22,288	11,921	5,652	2,212	2,503	1950	34,153	11,900	12,706	6,933	2,614
1931	18,799	9,743	4,965	1,915	2,176	1951	36,913	12,285	13,974	8,122	2,532
1932	16,392	8,041	4,590	1,752	2,009	1952	36,576	10,971	14,380	8,714	2,511
1933	16,900	8,323	4,844	1,744	1,989	1953	37,697	11,182	15,092	9,162	2,261
1934	17,937	9,008	4,818	1,980	2,131	1954	36,360	9,512	15,090	9,596	2,162
1935	19,107	9,336	5,499	2,143	2,129	1955	39,956	11,104	16,328	10,428	2,096
1936	21,418	10,697	6,124	2,405	2,192	1956	42,007	11,338	17,418	11,043	2,208
1937	22,751	11,286	6,604	2,676	2,185	1957	41,920	10,838	17,328	11,658	2,096
1938	19,880	8,811	6,465	2,557	2,047	1958	41,483	9,607	17,418	12,235	2,223
1939	21,589	9,854	6,841	2,760	2,134	1959	43,411	9,596	18,307	13,339	2,169
						1960	44,864	9,928	18,616	14,125	2,195

Note: Data through 1959 are on a 48-State basis, except bituminous coal and lignite, which include Alaska for all years. Data for 1960 are on a 50-State basis. Other includes sum of waterpower and anthracite. In 1960, waterpower equaled 1,766 trillion B.t.u.'s and anthracite, 429 trillion B.t.u.'s.

Data for 1960 are preliminary.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 17B. Bituminous Coal Mining: Percent Distribution of Consumption of Mineral Fuels and Waterpower in the United States, 1920-60

Year	Total	Bituminous coal and lignite	Petroleum products	Natural gas	Other	Year	Total	Bituminous coal and lignite	Petroleum products	Natural gas	Other
1920	100.0	67.4	13.3	4.4	14.9	1940	100.0	47.2	31.4	12.4	9.0
1921	100.0	62.6	16.3	4.4	16.7	1941	100.0	48.4	30.8	12.1	8.7
1922	100.0	65.0	17.8	4.9	12.3	1942	100.0	50.7	27.5	12.4	9.4
1923	100.0	62.7	18.6	5.2	13.5	1943	100.0	51.1	27.1	12.6	9.2
1924	100.0	62.0	18.4	6.2	13.4	1944	100.0	48.5	29.1	13.3	9.1
1925	100.0	62.6	19.9	6.4	11.1	1945	100.0	46.5	30.5	14.1	8.9
1926	100.0	62.0	19.3	6.6	12.1	1946	100.0	43.0	32.8	15.0	9.2
1927	100.0	60.0	20.0	7.5	12.5	1947	100.0	43.5	32.9	15.5	8.1
1928	100.0	58.4	21.3	8.0	12.3	1948	100.0	40.1	35.1	16.6	8.2
1929	100.0	57.3	22.3	9.2	11.2	1949	100.0	36.9	36.3	18.8	8.0
1930	100.0	53.5	25.4	9.9	11.2	1950	100.0	34.8	37.2	20.3	7.7
1931	100.0	51.8	26.4	10.2	11.6	1951	100.0	33.3	37.9	22.0	7.8
1932	100.0	49.1	28.0	10.7	12.2	1952	100.0	30.0	39.4	23.8	6.8
1933	100.0	49.2	28.6	10.4	11.8	1953	100.0	29.7	40.0	24.3	6.0
1934	100.0	50.2	26.8	11.1	11.9	1954	100.0	26.2	41.5	26.3	6.0
1935	100.0	48.9	28.8	11.2	11.1	1955	100.0	27.8	40.8	26.1	5.3
1936	100.0	49.9	28.6	11.3	10.2	1956	100.0	27.0	41.5	26.3	5.2
1937	100.0	49.6	29.1	11.7	9.6	1957	100.0	25.8	41.4	27.8	5.0
1938	100.0	44.3	32.5	12.9	10.3	1958	100.0	23.1	42.0	29.5	5.4
1939	100.0	45.6	31.7	12.8	9.9	1959	100.0	22.1	42.2	30.7	5.0
						1960	100.0	22.1	41.5	31.5	4.9

Note: Based on table 17A. Other includes sum of waterpower and anthracite. In 1960, waterpower equaled 3.9 percent and anthracite, 1.0 percent.

Data for 1960 are preliminary.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 18A. Consumption of Bituminous Coal, by Major Consumption Classes, 1933-60

[In thousands of tons]

Year	Total domestic consumption and exports	Railroads	Retail deliveries	Industrial use, except coke	Coke ovens	Electric utilities	Exports
1933	326,722	72,548	77,396	100,564	40,089	27,088	9,037
1934	354,683	76,037	83,507	108,585	45,978	29,707	10,869
1935	366,068	77,109	80,444	117,322	50,515	30,936	9,742
1936	418,948	86,391	80,044	137,812	65,942	38,104	10,655
1937	443,922	88,080	76,331	150,819	74,502	41,045	13,145
1938	346,711	73,921	66,498	112,796	46,626	36,440	10,430
1939	387,688	79,072	68,770	122,438	63,514	42,304	11,590
1940	447,376	85,130	84,687	130,581	81,386	49,126	16,466
1941	512,855	97,384	94,402	147,303	93,138	59.888	20,740
1942	562,993	115,410	102,141	158,177	100,850	63,472	22,943
1943	619,633	130,283	120,121	166,897	102,460	74,036	25,836
1944	615,631	132,049	122,112	153,486	105,296	76,656	26,032
1945	587,523	125,120	119,297	148,198	95,349	71,603	27,956
1946	541,595	110,166	98,684	139,505	83,288	68,743	41,209
1947	614,558	109,296	96,657	149,129	104,800	86,009	68,667
1948	565,839	94,838	86,794	135,351	107,306	95,620	45,930
1949	473,380	68,123	88,389	117,180	91,236	80,610	27,842
1950	479,670	60,969	84,422	116,704	103,845	88,262	25,468
1951	525,630	54,005	74,378	125,175	113,448	101,898	56,726
1952	466,400	37,962	66,861	113,011	97,614	103,309	47,643
1953	460,558	27,735	59,976	113,930	112,874	112,283	33,760
1954	394,101	17,370	51,798	93,266	85,391	115,235	31,041
1955	474,689	15,473	53,020	106,992	107,377	140,550	51,277
1956	501,411	12,308	48,667	110,987	105,913	154,983	68,553
1957	490,114	8,401	35,712	104,137	108,020	157,398	76,446
1958	416,983	3,725	35,619	97,851	76,580	152,928	50,280
1959	403,483	2,600	29,138	89,549	79,181	165,788	37,227
1960	416,861	2,113	30,405	93,037	81,000	173,811	36,495

See note and source in table 18B, p. 104.

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Table 18B. Percent Distribution of Consumption of Bituminous Coal, by Major Consumption Classes, 1933-60

Year	Total domestic consumption and exports	Railroads	Retail deliveries	Industrial use, except coke	Coke ovens	Electric utilities	Exports
1933	100.0	22.2	23.7	30.7	12.3	8.3	2.8
1934	100.0	21.4	23.5	30.6	13.0	8.4	3.1
1935	100.0	21.1	22.0	31.9	13.8	8.5	2.7
1936	100.0	20.7	19.2	32.8	15.7	9.1	2.5
1937	100.0	19.8	17.2	34.0	16.8	9.2	3.0
1938	100.0	21.3	19.2	32.6	13.4	10.5	3.0
1939	100.0	20.4	17.7	31.6	16.4	10.9	3.0
1940	100.0	19.0	18.9	29.2	18.2	11.0	3.7
1941	100.0	19.0	18.4	28.7	18.2	11.7	4.0
1942	100.0	20.5	18.1	28.1	17.9	11.3	4.1
1943	100.0	21.0	19.4	27.0	16.5	11.9	4.2
1944	100.0	21.4	19.8	25.0	17.1	12.5	4.2
1945	100.0	21.3	20.3	25.2	16.2	12.2	4.8
1946	100.0	20.3	18.2	25.8	15.4	12.7	7.6
1947	100.0	17.8	15.7	24.2	17.1	14.0	11.2
1948	100.0	16.8	15.3	23.9	19.0	16.9	8.1
1949	100.0	14.4	18.7	24.7	19.3	17.0	5.9
1950	100.0	12.7	17.6	24.4	21.6	18.4	5.3
1951	100.0	10.3	14.2	23.7	21.6	19.4	10.8
1952	100.0	8.1	14.3	24.3	20.9	22.2	10.2
1953	100.0	6.0	13.0	24.8	24.5	24.4	7.3
1954	100.0	4.4	13.1	23.7	21.7	29.2	7.9
1955	100.0	3.3	11.2	22.5	22.6	29.6	10.8
1956	100.0	2.5	9.7	22.1	21.1	30.9	13.7
1957	100.0	1.7	7.3	21.3	22.0	32.1	15.6
1958	100.0	0.9	8.5	23.4	18.4	36.7	12.1
1959	100.0	0.6	7.2	22.3	19.6	41.1	9.2
1960	100.0	0.5	7.3	22.3	19.4	41.7	8.8

Note: Consumption cannot be precisely reconciled to production because data for calculating changes in inventories, the major difference between production and consumption, are incomplete.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 19. Bituminous Coal Mining: United States Exports to Major Markets, 1947-60

Year	Exports (thousands of short tons)				Exports as percent of total U.S. production	Imports
	Total	Canada	Europe	All other areas		
1935-39 average	11,125	10,105	49	971	2.8	266
1940-46 average	25,883	20,693	3,127	2,063	4.7	508
1947	68,667	25,848	36,703	6,116	10.9	290
1948	45,930	25,843	16,093	3,994	7.6	291
1949	27,842	15,982	8,862	2,998	6.4	315
1950	25,468	23,009	794	1,665	4.9	347
1951	56,722	22,823	27,926	5,973	10.6	292
1952	47,643	20,957	20,672	6,014	10.2	262
1953	33,760	19,584	8,312	5,864	7.4	227
1954	31,041	15,911	10,471	4,659	7.9	199
1955	51,277	17,185	28,677	5,415	11.0	337
1956	68,546	20,654	41,156	6,736	13.7	336
1957	76,445	18,445	49,701	8,299	15.5	367
1958	50,293	12,238	32,889	5,166	12.3	307
1959	37,227	12,400	19,109	5,718	9.0	375
1960	36,495	--	--	--	8.7	260

Note: Dashes indicate data not available.

Sources: Data for the years 1935-39 are from the Bituminous Coal Annual, 1950; and data for 1940-60, from Bituminous Coal Data, 1960, National Coal Association. Figures on total exports differ slightly from Bureau of Mines data.

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Table 20. Bituminous Coal Mining: Coal Requirements per Unit of Production, Selected Industries and Years

Industry	1920	1947	1959
Electric power generation:			
Pounds of coal per kilowatt-hour	3.00	1.31	0.89
Index (1920=100)	100.0	43.7	29.7
Blast furnaces:			
Pounds of coal per ton of pig iron and ferroalloys	3,055	2,755	2,297
Index (1920=100)	100.0	90.2	75.2
	1927	1947	1959
Cement production:			
Pounds of coal per barrel of cement	132	123	105
Index (1927=100)	100.0	93.2	79.5

Sources: Data on pounds of coal per kilowatt-hour are from Federal Power Commission; on pounds of coal per ton of pig iron and ferroalloys, for 1920 and 1947, from National Coal Association, for 1959, from American Iron and Steel Institute; and on pounds of coal per barrel of cement, from U.S. Department of the Interior, Bureau of Mines.

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Table 21A. Bituminous Coal Mining: Employment Trends--Production Workers, 1920-60

[In thousands]

Year	Production workers (Bureau of Labor Statistics data)	Number of men working daily (Bureau of Mines data)	Year	Production workers (Bureau of Labor Statistics data)	Number of men working daily (Bureau of Mines data)
1920	566.3	639.5	1940	416.4	439.1
1921	594.3	663.8	1941	413.0	457.0
1922	621.8	688.0	1942	454.4	462.0
1923	643.2	704.8	1943	418.5	416.0
1924	565.4	619.6	1944	401.3	393.3
1925	537.0	588.5	1945	366.5	383.1
1926	541.7	593.6	1946	355.1	396.4
1927	542.0	593.9	1947	402.1	419.2
1928	476.5	522.2	1948	410.8	441.6
1929	459.0	503.0	1949	367.8	433.7
1930	441.0	493.2	1950	343.7	415.6
1931	408.0	450.2	1951	348.0	372.9
1932	350.0	406.4	1952	304.4	335.2
1933	366.0	418.7	1953	267.5	293.1
1934	423.0	458.0	1954	209.0	227.4
1935	436.0	462.4	1955	200.5	225.1
1936	450.0	477.2	1956	208.8	228.2
1937	461.0	491.9	1957	208.4	228.6
1938	406.0	441.3	1958	173.8	197.4
1939	371.7	421.8	1959	149.2	179.6
			1960	139.4	164.2

Note: Bureau of Labor Statistics annual data on employment are the average of 12 monthly employment estimates. They refer to persons on establishment payrolls who received pay for any part of the pay period ending nearest the 15th of the month. Production and related workers include all nonsupervisory workers and working foremen engaged in production operations; excluded are salaried officers, supervisory, professional, technical and, generally, clerical employees. Bureau of Mines data represent the average number of men working daily during the year; included are workers in production, maintenance, and repair and some supervisory and technical personnel.

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Table 21B. Bituminous Coal Mining: Employment Trends--All Employees, 1939-60

[Indexes, 1947=100]

Year	Bituminous coal		Manufacturing		Total nonagricultural (private)		Farm	
	Thousands	Index	Thousands	Index	Thousands	Index	Thousands	Index
1939	388.3	91.2	10,078	65.9	26,316	69.3	11,338	109.2
1940	434.9	102.2	10,780	70.5	27,856	73.3	10,979	105.8
1941	431.4	101.4	12,974	84.9	31,560	83.1	10,669	102.8
1942	474.6	111.5	15,051	98.4	34,296	90.3	10,504	101.2
1943	437.2	102.7	17,381	113.7	36,026	94.8	10,446	100.6
1944	419.2	98.5	17,111	111.9	35,491	93.4	10,219	98.4
1945	383.7	90.2	15,302	100.1	34,093	89.7	10,000	96.3
1946	372.7	87.6	14,461	94.6	35,692	94.0	10,295	99.2
1947	425.6	100.0	15,290	100.0	37,988	100.0	10,382	100.0
1948	436.1	102.5	15,321	100.2	38,798	102.1	10,363	99.8
1949	393.3	92.4	14,178	92.7	37,459	98.6	9,964	96.0
1950	367.9	86.4	14,967	97.9	38,712	101.9	9,926	95.6
1951	372.0	87.4	16,104	105.3	40,958	107.8	9,546	91.9
1952	327.8	77.0	16,334	106.8	41,694	109.8	9,149	88.1
1953	288.9	67.9	17,238	112.7	43,036	113.3	8,864	85.4
1954	228.5	53.7	15,995	104.6	41,680	109.7	8,639	83.2
1955	218.7	51.4	16,563	108.3	43,142	113.6	8,364	80.6
1956	228.6	53.7	16,903	110.5	44,489	117.1	7,820	75.3
1957	230.0	54.0	16,782	109.8	44,536	117.2	7,577	73.0
1958	195.2	45.9	15,468	101.2	42,650	112.3	7,525	72.5
1959	168.1	39.5	16,168	105.7	43,848	115.4	7,384	71.1
1960	158.9	37.3	16,337	106.8	44,440	117.0	7,118	68.6

Note: Farm employment data include proprietors and unpaid family workers.

Source: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Department of Agriculture.

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Table 22A. Bituminous Coal Mining: Unemployment Rates in Selected Major Areas of Substantial Unemployment, Selected Months

Area	Unemployed as percent of labor force		Number in labor force	
	May 1950	March 1959	May 1950	March 1959
Areas with bituminous coal mining	10.2	12.1	527,952	493,900
Nonbituminous coal mining areas	7.1	9.2	2,253,347	2,409,800

Note: Data for 1950 include 5 bituminous coal mining areas and 11 nonbituminous coal mining areas. Data for 1959 include 5 bituminous coal mining areas and 12 nonbituminous coal mining areas.

Table 22B. Distribution of Unemployment Rates in Selected Small Areas of Substantial Unemployment, Spring 1959

Unemployed as percent of labor force	Bituminous coal mining areas	Nonbituminous coal mining areas	Bituminous coal mining areas	Nonbituminous coal mining areas
	Percent		Number	
Total	100	100	25	28
17 percent and over	32	11	8	3
11-16 percent	52	25	13	7
10 percent or less	16	64	4	18

Note: An area where substantial unemployment is "chronic" is one that has had an unemployment rate 50 percent above the national average during 4 of the previous 5 years. Major areas are those which have a central city with a 1950 population of at least 50,000. Smaller areas have a labor force of 15,000 or more.

Source: U.S. Department of Labor, Bureau of Employment Security.

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Table 23. Changes in Bituminous Coal Production and Employment, and Population, Households, Personal Income, and Retail Trade Receipts, Five Counties in Kentucky and Rest of State, Selected Years

Item	Five counties in Kentucky			Rest of State		
	1950	1959	Percent change	1950	1959	Percent change
Bituminous coal:						
Production (thousands of tons)	38,447	23,755	-38	40,049	39,055	- 2
Employment, total	42,186	13,408	-68	29,074	13,948	-52
	1950	1960	Percent change	1950	1960	Percent change
Population, total (thousands)	292	226	-23	2,652	2,812	6
Under 18 years	137	103	-25	921	1,037	12
18-64 years	144	108	-25	1,507	1,497	- 1
65 years and over	11	15	37	225	278	23
Households	63,841	54,356	-15	715,828	797,511	11
	1947	1955	Percent change	1947	1955	Percent change
Personal income (thousands)	$208,582	$207,444	- 5	$2,383,000	$3,728,000	56
	1948	1958	Percent change	1948	1958	Percent change
Retail trade receipts (thousands)	$126,902	$124,780	- 2	$1,555,905	$2,455,737	58

Note: Five county area includes Floyd, Harlan, Letcher, Perry and Pike counties.

Sources: Data on production and employment are from the Minerals Yearbook, U.S. Department of the Interior, Bureau of Mines; population, households, and retail trade, from U.S. Department of Commerce, Bureau of the Census; personal income, from estimates by Bureau of Business Research, University of Kentucky.

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Table 24A. Bituminous Coal Mining: Average Weekly Hours of Production Workers in Bituminous Coal Mining and Manufacturing and Average Number of Days Worked per Year in All Bituminous Coal Mines, 1920-60

Year	Average weekly hours (production workers)		Average number of days worked (all bituminous coal mines)	Year	Average weekly hours (production workers)		Average number of days worked (all bituminous coal mines)
	Bituminous coal	Manufacturing			Bituminous coal	Manufacturing	
1920	--	47.4	220	1940	28.1	38.1	202
1921	--	43.1	149	1941	31.1	40.6	216
1922	--	44.2	142	1942	32.9	42.9	246
1923	37.3	45.6	179	1943	36.6	44.9	264
1924	30.0	43.7	171	1944	43.4	45.2	278
1925	34.2	44.5	195	1945	42.3	43.4	261
1926	37.7	45.0	215	1946	41.6	40.4	214
1927	33.5	45.0	191	1947	40.7	40.4	234
1928	35.6	44.4	203	1948	38.0	40.1	217
1929	38.4	44.2	219	1949	32.6	39.2	157
1930	33.5	42.1	187	1950	35.0	40.5	183
1931	28.3	40.5	160	1951	35.2	40.7	203
1932	27.2	38.3	146	1952	34.1	40.7	186
1933	29.5	38.1	167	1953	34.4	40.5	191
1934	27.0	34.6	178	1954	32.6	39.7	182
1935	26.4	36.6	179	1955	37.6	40.7	210
1936	28.8	39.2	199	1956	37.8	40.4	214
1937	27.9	38.6	193	1957	36.6	39.8	203
1938	23.5	35.6	162	1958	33.9	39.2	184
1939	27.1	37.7	178	1959	36.4	40.3	188
				1960	36.0	39.7	190

Note: Data on average weekly hours of production workers in bituminous coal and manufacturing are from the U.S. Department of Labor, Bureau of Labor Statistics and cover the average hours for which pay is received. They differ from standard or scheduled hours. Data on average number of days worked are from the U.S. Department of the Interior, Bureau of Mines and cover men employed in all bituminous coal mines.

Dashes indicate data not available. Data for 1960 are preliminary.

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Table 24B. Bituminous Coal Mining: Daily Wage Rates and Normal Work Schedules of Mine Workers, by Date of Contract Agreement, Selected Years

Effective date of agreement	Inside (mobile loading machine operator)	Outside (car repairmen)	Effective date of agreement	Inside (mobile loading machine operator)	Outside (car repairmen)
Oct. 2, 1933	$5.80	$3.84	July 1, 1948	$16.48	$13.03
Apr. 1, 1934	6.20	4.24	Mar. 5, 1950	17.18	13.73
Oct. 1, 1935	6.90	4.74	Feb. 1, 1951	18.78	15.33
Apr. 1, 1937	7.60	5.24	Oct. 1, 1952	20.68	17.23
Apr. 1, 1941	9.00	6.24	Sept. 1, 1955	21.88	18.43
Jan. 1, 1943	9.00	6.24	Apr. 1, 1956	22.68	19.23
Nov. 3, 1943	10.93	7.91	Oct. 1, 1956	23.88	20.43
Apr. 1, 1945	12.43	8.98	Apr. 1, 1957	24.68	21.23
May 22, 1946	14.28	10.83	Jan. 1, 1959	25.88	22.43
July 1, 1947	15.48	12.03	Apr. 1, 1959	26.68	23.23

Normal Schedule of Work

Effective date of agreement	Days per week	Inside worker (day and piece rate)				Days per week	Outside worker		
		Daily hours paid for--					Daily hours paid for--		
		Total	Work	Travel	Lunch		Total	Work	Lunch
Oct. 2, 1933--Mar. 31, 1934	5	8	8	0	0	5	8	8	0
Apr. 1, 1934--Dec. 31, 1942	5	7	7	0	0	5	7	7	0
Jan. 1, 1943--Nov. 2, 1943	5-6	7	7	0	0	5-6	7	7	0
Nov. 3, 1943--Mar. 31, 1945	5-6	8 3/4	8	3/4	0	5-6	8 1/4	8 1/4	0
Apr. 1, 1945--June 30, 1947	5-6	9	8 3/4		1/4	5-6	8 1/4	8	1/4
July 1, 1947--	5-6	8	7 1/2		1/2	5-6	7 1/4	6 3/4	1/2

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Table 25A. Employment Structure in Bituminous Coal Mining and Selected Industries, 1947, 1959 and 1960.

Type of worker	1947	1959	1960
All employees (thousands)	425.6	168.1	158.9
Production workers	402.1	149.2	139.4
Nonproduction workers	23.5	18.9	19.5
Nonproduction workers as percent of all employees	5.5	11.2	12.3

Percent of nonproduction workers to all workers, by industry, 1947 and 1959

Industry	1947	1959	1947-59 Percent change
Bituminous coal mining	5.5	11.2	103.6
Steel	12.1	20.2	66.9
Petroleum refining	23.0	33.4	45.2
Automobiles	16.4	21.5	31.1
All manufacturing	16.3	24.3	49.1

Note: For definitions of production and nonproduction workers, see table 21A. Data for 1960 are preliminary.

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Table 25B. Bituminous Coal Mining: Occupational Structure in Underground Mines, Illinois, Selected Years

Occupation	1923		1933		1947		1956	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All workers	98,640	100.0	38,812	100.0	25,790	100.0	8,819	100.0
All surface workers	9,691	9.8	5,219	13.4	5,779	22.4	2,014	22.8
All underground workers	88,949	90.2	33,593	86.6	20,011	77.6	6,805	77.2
Direct production workers	65,362	66.2	20,585	53.0	6,005	23.3	1,540	17.5
Miners	59,311	60.1	17,208	44.3	2,277	8.8	183	2.1
Mechanical loading machine operators and helpers	---	---	839	2.2	1,112	4.3	505	5.7
Machine runners and helpers	5,243	5.3	2,054	5.3	1,502	5.9	473	5.4
Shot firers and runners	808	.8	484	1.2	1,114	4.3	142	1.6
Shooters and drillers	---	---	---	---	---	---	237	2.7
Other underground workers	23,587	24.0	13,008	33.6	14,006	54.3	5,265	59.7
Mine managers and assistants	683	.7	626	1.6	839	3.2	417	4.7
Mine examiners	642	.7	291	.8	305	1.2	140	1.6
Electricians and helpers	1,014	1.0	764	2.0	1,212	4.7	694	7.9
Timbermen and roofbolters	2,165	2.2	1,188	3.1	1,648	6.4	597	6.8
Stablemen	190	.2	52	.1	20	.1	---	---
Motormen and assistants	3,008	3.1	2,224	5.7	2,653	10.3	713	8.0
Shuttlecar operators and drivers	4,361	4.4	1,041	2.7	371	1.4	255	2.9
Cagers and spraggers	1,299	1.3	434	1.1	287	1.1	53	.6
Trackmen and bratticemen	3,657	3.7	1,854	4.8	2,109	8.2	361	4.1
Beltmen	---	---	---	---	---	---	76	.9
Unclassified	6,568	6.7	4,534	11.7	4,562	17.7	1,959	22.2

Note: Dashes indicate group not reported.

Source: Derived from Coal Report of Illinois, Illinois Department of Mines and Minerals, Springfield.

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Table 26A. Bituminous Coal Mining: Injury Rates, 1930-59, and Major Disasters, 1910-59

Year	Per million man-hours		Per million tons	
	Fatal	Nonfatal	Fatal	Nonfatal
1930	1.9	83.8	3.5	152.3
1931	1.6	80.0	2.8	141.3
1932	1.8	72.6	3.1	127.1
1933	1.3	68.9	2.5	131.7
1934	1.4	69.4	2.7	130.7
1935	1.5	71.5	2.6	127.6
1936	1.4	65.6	2.5	115.7
1937	1.5	68.1	2.7	118.2
1938	1.5	63.5	2.5	105.3
1939	1.4	60.5	2.2	97.2
1940	1.7	61.3	2.6	95.4
1941	1.4	58.9	2.1	90.4
1942	1.4	60.2	2.1	91.4
1943	1.4	57.8	2.1	86.1
1944	1.2	56.0	1.8	82.5
1945	1.1	56.5	1.6	80.1
1946	1.1	58.8	1.5	80.3
1947	1.3	57.3	1.6	73.3
1948	1.2	56.3	1.5	71.0
1949	.9	51.7	1.1	63.2
1950	.9	47.7	1.1	54.8
1951	1.2	46.6	1.3	52.7
1952	.9	47.6	1.0	50.5
1953	.9	45.3	.9	44.1
1954	1.0	43.7	.9	37.6
1955	1.0	42.8	.8	34.5
1956	1.0	43.0	.8	33.2
1957	1.2	43.7	.9	32.5
1958	1.2	43.9	.8	29.8
1959	.9	41.4	.6	26.9
1960	1.2	42.2	.7	25.3

Major Disasters

Years	Number of disasters	Number of men killed
1910-19	116	2,932
1920-29	110	2,409
1930-39	49	740
1940-49	52	1,072
1950-59	19	316

Source: Accident Analysis Reports, U.S. Department of the Interior, Bureau of Mines.

Data for 1960 are preliminary.

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Table 26B. Bituminous Coal Mining: Average Number of Days Lost per Injury, 1945-58

Year	All injuries	Permanent-partial injuries	Temporary-total injuries
1945	161	704	27
1946	152	622	29
1947	172	729	29
1948	167	638	28
1949	167	756	36
1950	173	701	34
1951	206	739	35
1952	173	674	37
1953	174	708	36
1954	190	679	35
1955	187	624	33
1956	189	663	31
1957	206	584	32
1958	224	663	41

Note: Data on average number of days lost due to permanent-partial injuries cover days lost from work due to permanent impairment or loss of some body functions. Temporary-total injuries cover work injuries, other than death or permanent impairment, which completely incapacitates the worker from work for 1 or more days following the injury. The data on days lost due to all injuries cover, in addition to the above types of injuries, days lost due to permanent total injuries and fatal injuries.

Source: Accident Analysis Reports, U.S. Department of the Interior, Bureau of Mines.

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Table 27A. Average Hourly Earnings of Production and Related Workers in Bituminous Coal and Manufacturing Industries, 1923-60

Year	Bituminous coal	All manufacturing	Year	Bituminous coal	All manufacturing	Year	Bituminous coal	All manufacturing
1923	$0.84	$0.52	1935	$0.74	$0.55	1947	$1.64	$1.24
1924	.81	.55	1936	.79	.56	1948	1.90	1.35
			1937	.86	.62	1949	1.94	1.40
1925	.80	.55	1938	.88	.63			
1926	.79	.55	1939	.89	.63	1950	2.01	1.47
1927	.75	.55				1951	2.21	1.59
1928	.72	.56	1940	.88	.66	1952	2.29	1.67
1929	.68	.57	1941	.99	.73	1953	2.48	1.77
			1942	1.06	.85	1954	2.48	1.81
1930	.68	.55	1943	1.14	.96			
1931	.65	.52	1944	1.19	1.02	1955	2.56	1.88
1932	.52	.45				1956	2.81	1.98
1933	.50	.44	1945	1.24	1.02	1957	3.02	2.07
1934	.67	.53	1946	1.40	1.09	1958	3.02	2.13
						1959	3.25	2.22
						1960	3.27	2.29

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Table 27B. Estimated Average Annual Wage of Wage and Salaried Workers in Bituminous Coal and Selected Industries

Year	Bituminous coal	Petroleum and coal products	Primary metals	All manufacturing
	(Current dollars)			
1947	$3,223	$3,607	$3,128	$2,802
1951	3,857	4,639	4,165	3,625
1954	4,090	5,351	4,628	4,135
1955	4,602	5,591	5,156	4,371
1959	5,348	6,952	6,329	5,231

Note: Average annual wages are derived from data on average annual employment and total annual wages of workers covered by State unemployment insurance laws. Average annual wages shown tend to be overstated because the number of different workers actually employed during the year is substantially larger than average annual employment. Relative wage levels however are about the same as those indicated by wage records of the Bureau of Old-Age and Survivors Insurance.

Source: U.S. Department of Labor, Bureau of Employment Security.

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Table 28. Compensation of Employees in Bituminous Coal Mining and Indexes of Change, 1939-60

/Dollars in millions/

Year	Wages and salaries		Supplements to wages and salaries		Compensation of employees	Supplements as percent of employees' compensation
	Amount	Index (1947=100)	Amount	Index (1947=100)		
1939	$456	33.1	$24	28.2	$480	5.0
1940	542	39.3	28	32.9	570	4.9
1941	678	49.2	34	40.0	712	4.8
1942	823	59.7	35	41.2	858	4.1
1943	918	66.6	39	45.9	957	4.1
1944	1,052	76.3	39	45.9	1,091	3.5
1945	1,020	74.0	36	42.4	1,056	3.4
1946	1,065	77.3	46	54.1	1,111	4.1
1947	1,378	100.0	85	100.0	1,463	5.8
1948	1,529	111.0	123	144.7	1,652	7.4
1949	1,166	84.6	111	130.6	1,277	8.7
1950	1,291	93.7	174	204.7	1,465	11.9
1951	1,425	103.4	194	228.2	1,619	12.0
1952	1,256	91.1	178	209.4	1,434	12.4
1953	1,212	88.0	197	231.8	1,409	14.0
1954	922	66.9	170	200.0	1,092	15.6
1955	1,001	72.6	203	238.8	1,204	16.9
1956	1,152	83.6	221	260.0	1,373	16.1
1957	1,182	85.8	218	256.5	1,400	15.6
1958	942	68.4	183	215.3	1,125	16.3
1959	926	67.2	187	220.0	1,113	16.8
1960	887	64.4	189	222.4	1,076	17.5

Note: Data on wages and salaries cover total payrolls of establishments in the industry and cover all employees. Supplements to wages and salaries include payments covering total employer contributions for social insurance, employer contributions to private pension and welfare funds, and compensation for injuries, military reservist pay, and similar payments. Compensation of employees is the sum of wages and salaries and supplements.

Sources: Survey of Current Business, July 1961; and National Income Supplements, 1959 and 1954 editions, U.S. Department of Commerce.

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Table 29. Bituminous Coal Mining: Indexes of Hourly Compensation and Unit Employment Cost, 1939-60

Year	(1947=100)		Employment cost per ton as a percent of average mine value
	Employee compensation per man-hour	Employment cost per ton	
1939	46.7	52.6	66.3
1940	49.5	53.4	64.9
1941	56.0	59.9	63.5
1942	58.7	63.4	62.3
1943	62.5	69.8	60.2
1944	70.7	75.9	60.3
1945	75.4	78.9	59.8
1946	88.6	89.7	60.5
1947	100.0	100.0	55.3
1948	118.0	118.5	55.1
1949	126.7	125.9	59.8
1950	136.4	122.4	59.8
1951	145.8	130.6	61.6
1952	153.0	132.3	62.6
1953	165.7	132.8	62.6
1954	169.5	120.3	61.7
1955	171.8	111.2	57.3
1956	186.1	118.1	56.8
1957	193.9	122.4	55.9
1958	194.7	118.5	56.4
1959	208.5	116.7	56.6
1960	216.8	112.2	55.7

Note: Indexes of employee compensation per man-hour are derived from an index of compensation of employees as described in footnote, table 28 and an index of man-hours of all employees as described in footnote, table 11. Indexes of employment cost per ton are derived from data on compensation of employees and tons of coal produced as described in footnote, table 11. Employment cost per ton as a percent of average mine value represents the proportion that employment cost per ton is to the Bureau of Mines average value received or charged for a ton of coal f.o.b.

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Table 30. Bituminous Coal Mining: Trends in Unit Costs, 1929-58

Item	Percent change--					
	1929-39		1939-54		1954-58	
	Total	Average annual rate	Total	Average annual rate	Total	Average annual rate
Employment cost per ton	5.0	0.5	106.3	4.9	-2.3	-0.6
Material and other cost per ton	-3.3	- .3	230.5	8.3	26.2	6.0
Material cost per ton	7.1	1.0	273.3	8.9	10.7	2.6
Other cost per ton	-15.7	-1.7	196.4	7.5	47.0	10.1
Average value per ton shipped (Census of Minerals)	1.6	.2	147.0	6.2	9.8	2.4

Unit Costs as Percent of Unit Value

	1929	1939	1954	1958
Average value per ton shipped (Census of Minerals)	100.0	100.0	100.0	100.0
Employment cost per ton	66.5	68.6	57.3	51.0
Material and other cost per ton	33.5	31.4	42.7	49.0
Material cost per ton	15.4	16.2	24.5	24.7
Other cost per ton	18.2	15.1	18.2	24.3

Note: These estimates have been computed primarily from data shown in the Census of Mineral Industries, 1954 and 1958, U.S. Department of Commerce, Bureau of the Census. In deriving employment cost per ton, Census data on wages and salaries have been adjusted to include estimated supplementary payments. Data on "other costs per ton" have been computed as a residual, after deducting employment and material cost per ton from average value per ton shipped. Data on employment cost per ton and average value per ton shipped from the Census of Mineral Industries are not strictly comparable with other data on these subjects, based on National Income (U.S. Department of Commerce) and Bureau of Mines data, because of differences in coverage and definitions. Average value represents value received or charged for coal, f.o.b. mines.

Because of rounding, sums of percentages may not equal totals.

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Table 31A. Bituminous Coal Mining: Average Values of Selected Fuels at Production Sites, 1920-60

Year	Bituminous coal (ton)		Crude petroleum (bbl.)	Natural gas (M c.f.)	Year	Bituminous coal (ton)		Crude petroleum (bbl.)	Natural gas (M c.f.)
	Value	Indexes (1947=100)				Value	Indexes (1947=100)		
1920 ...	$3.75	90.1	159.1	150.5	1940 ...	$1.91	45.9	52.8	75.0
1921 ...	2.89	69.5	89.6	255.8	1941 ...	2.19	52.6	59.1	81.7
1922 ...	3.02	72.6	83.4	283.7	1942 ...	2.36	56.7	61.7	85.0
1923 ...	2.68	64.4	69.4	245.9	1943 ...	2.69	64.7	62.2	86.7
1924 ...	2.20	52.9	74.1	234.1	1944 ...	2.92	70.2	62.7	85.0
1925 ...	2.04	49.0	87.0	224.5	1945 ...	3.06	73.6	63.2	81.7
1926 ...	2.06	49.5	97.4	234.9	1946 ...	3.44	82.7	73.1	88.3
1927 ...	1.99	47.8	67.4	228.1	1947 ...	4.16	100.0	100.0	100.0
1928 ...	1.86	44.7	60.6	227.2	1948 ...	4.99	120.0	134.7	108.3
1929 ...	1.78	42.8	65.8	212.9	1949 ...	4.88	117.3	131.6	105.0
1930 ...	1.70	40.9	61.7	217.7	1950 ...	4.84	116.3	130.1	108.3
1931 ...	1.54	37.0	33.7	237.2	1951 ...	4.92	118.3	131.1	121.7
1932 ...	1.31	31.5	45.1	244.2	1952 ...	4.90	117.8	131.1	130.0
1933 ...	1.34	32.2	34.7	232.7	1953 ...	4.92	118.3	138.9	153.3
1934 ...	1.75	42.1	51.8	100.0	1954 ...	4.52	108.7	144.0	168.3
1935 ...	1.77	42.5	50.3	96.7	1955 ...	4.50	108.2	143.5	173.3
1936 ...	1.76	42.3	56.5	91.7	1956 ...	4.82	115.9	144.6	180.0
1937 ...	1.94	46.6	61.1	85.0	1957 ...	5.08	122.1	160.1	188.3
1938 ...	1.95	46.9	58.5	81.7	1958 ...	4.86	116.8	156.0	198.3
1939 ...	1.84	44.2	52.8	81.7	1959 ...	4.77	114.7	150.3	215.0
					1960 ...	4.73	113.7	149.2	226.6

Note: Average value per ton represents the value received or charged for coal, f.o.b. mines. Average value of crude petroleum per barrel and average value of natural gas per thousand cubic feet represent value received or charged, f.o.b., at wells.

Data for 1960 are preliminary.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 31B. Bituminous Coal Mining: Effect of Transportation Costs on Average Coal Value, 1948-60

Year	Average value of coal per ton f.o.b. mines	Average rail revenue per ton of coal		Average value plus average rail revenue per ton of coal	Indexes (1948=100)		
		Amount	Percent of average value of coal per ton f.o.b. mines		Average value of coal per ton f.o.b. mines	Average rail revenue per ton of coal	Average value plus average rail revenue per ton of coal
1948	$4.99	$2.74	54.9	$7.73	100.0	100.0	100.0
1949	4.88	3.00	61.5	7.88	97.8	109.5	101.9
1950	4.84	3.09	63.8	7.93	97.0	112.8	102.6
1951	4.92	3.16	64.2	8.08	98.6	115.3	104.5
1952	4.90	3.35	68.4	8.25	98.2	122.3	106.7
1953	4.92	3.33	67.7	8.25	98.6	121.5	106.7
1954	4.52	3.23	71.6	7.74	90.4	117.9	100.1
1955	4.50	3.24	72.0	7.74	90.2	118.2	100.1
1956	4.82	3.45	71.6	8.27	96.6	125.9	107.0
1957	5.08	3.57	70.3	8.65	101.8	130.3	111.9
1958	4.86	3.58	73.7	8.44	97.4	130.7	109.2
1959	4.77	3.57	73.5	8.43	97.4	130.3	109.1
1960	4.73	3.42	72.3	8.15	94.7	124.8	105.4

Note: Average rail revenue is based on gross freight revenues from transporting coal and tons of coal originating on railroads.

Source: U.S. Department of the Interior, Bureau of Mines.

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Table 31C. Bituminous Coal Mining: Average Fuel Price in Selected United States Industrial Markets, 1948-59

Year	Electric power utilities f.o.b. plant			Steel f.o.b. merchant ovens	Railroads f.o.b. mine
	Coal (ton)	Oil (bbl.)	Gas (m c.f.)	Coal (ton)	Coal (ton)
1948	$6.69	$2.79	$0.110	$8.74	$4.34
1949	6.50	2.15	.123	9.33	4.36
1950	6.38	2.00	.118	9.39	4.49
1951	6.42	2.11	.136	9.50	4.54
1952	6.54	2.14	.147	9.85	4.59
1953	6.52	2.05	.167	10.01	4.77
1954	6.25	2.11	.183	9.57	4.60
1955	6.01	2.12	.188	9.16	4.65
1956	6.29	2.42	.189	9.85	5.03
1957	6.62	2.79	.201	10.76	5.53
1958	6.55	2.47	.219	10.74	5.67
1959	6.28	2.22	.236	10.49	5.69

Sources: Data on prices of fuels for electric power utilities are from Annual Statistical Bulletin, Edison Electric Institute, New York. Data on prices of coal for steel and railroads, from U.S. Department of the Interior, Bureau of Mines.

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Table 31D. Bituminous Coal Mining: Indexes of Average Fuel Prices in Selected United States Industrial Markets, 1948-59

(1948=100)

Year	Electric power utilities f.o.b. plant			Steel f.o.b. merchant ovens	Railroads f.o.b. mine
	Coal (ton)	Oil (bbl.)	Gas (m c.f.)	Coal (ton)	Coal (ton)
1948	100.0	100.0	100.0	100.0	100.0
1949	97.2	77.1	111.8	106.8	100.5
1950	95.4	71.7	107.3	108.7	103.5
1951	96.0	75.6	123.6	108.7	104.6
1952	97.8	76.7	133.6	112.7	105.8
1953	97.5	73.5	151.8	114.5	109.9
1954	93.4	75.6	166.4	109.5	106.0
1955	89.8	76.0	170.9	104.8	107.1
1956	94.0	86.7	171.8	112.7	115.9
1957	99.0	100.0	182.7	123.1	127.4
1958	97.9	88.5	199.1	122.9	130.6
1959	93.8	79.6	214.5	120.0	131.1

Source: See table 31C for underlying data.

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Table 31E. Bituminous Coal Mining: Prices of Selected Fuels in the United States, 1959

Area	Bituminous coal	Fuel oil	Natural gas	Other fuel prices as percent of coal		Percent of total B.t.u.'s consumed		
	per million B.t.u.'s			Fuel oil	Gas	Coal	Oil	Gas
Electric utilities (wholesale)								
United States total	$0.27	$0.35	$0.22	129.6	81.5	66	8	26
New England	$0.38	$0.36	$0.35	94.7	92.1	56	39	5
Middle Atlantic	.31	.36	.33	116.1	106.4	76	14	10
East North Central	.26	.73	.24	280.8	92.3	95	--	5
West North Central	.28	.47	.22	167.8	78.6	48	--	52
South Atlantic	.27	.36	.30	133.3	111.1	77	10	13
East South Central	.19	.47	.23	247.4	121.1	91	--	9
West South Central	.16	.43	.15	268.8	93.7	--	--	100
Mountain	.21	.24	.26	114.3	123.8	27	9	64
Pacific	--	.35	.32	--	--	--	32	68
Space heating (retail)								
Baltimore	$1.18	$1.83	$1.59	155.1	134.7			
Chicago	1.61	2.07	1.28	128.5	79.5			
Seattle	2.17	2.26	1.46	104.1	67.3			

Note: Dashes indicate insignificant use.

Sources: Data for electric utilities are from Steam Electric Plant Factors, July 1960, National Coal Association. Data for space heating, from 1960 Gas Facts, American Gas Association.

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Table 31F. Bituminous Coal Mining: Retail Price Indexes of Energy Fuels, 1948-60

/1948=100/

Year	Bituminous coal	Fuel oil No. 2	Gas for space heating
1948	100.0	100.0	100.0
1949	103.6	94.8	101.3
1950	107.5	95.8	101.7
1951	109.9	101.3	102.7
1952	112.0	103.6	105.9
1953	114.3	109.0	111.6
1954	114.2	109.8	114.7
1955	115.4	113.4	120.1
1956	120.0	119.0	121.6
1957	124.4	125.1	122.9
1958	126.3	117.9	130.0
1959	128.5	119.5	134.6
1960	129.5	117.4	147.2

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Table 32A. Bituminous Coal Mining: Selected Data on Corporate Income, 1928-58

Fiscal year	Number of returns	Number with net income	Number with no net income	Net income or loss	
				Before taxes	After taxes
1928	2,705	863	1,842	-$24,508	-$27,950
1929	2,469	934	1,535	- 11,822	- 15,822
1930	2,239	781	1,458	- 42,071	- 44,708
1931	2,095	582	1,513	- 47,745	- 48,784
1932	1,864	289	1,575	- 51,167	- 51,944
1933	1,851	396	1,455	- 47,549	- 48,578
1934	2,017	660	1,357	- 7,584	- 10,892
1935	1,975	591	1,384	- 15,576	- 18,326
1936	1,945	590	1,355	- 3,310	- 6,524
1937	1,815	539	1,276	- 777	- 3,985
1938	1,887	363	1,524	- 26,667	- 29,328
1939	1,820	505	1,315	- 6,168	- 9,012
1940	1,756	676	1,080	14,396	7,803
1941	1,722	859	863	42,651	23,586
1942	1,737	906	831	67,915	34,125
1943	1,623	975	648	96,157	46,913
1944	1,584	932	652	92,737	43,811
1945	1,544	915	629	71,293	35,680
1946	1,640	1,013	627	80,537	50,562
1947	1,837	1,371	466	258,658	168,434
1948	2,163	1,434	729	309,626	196,588
1949	2,070	1,033	1,037	97,323	54,285
1950	1,988	1,104	884	163,188	93,765
1951	1,813	912	901	113,695	56,599
1952	1,665	789	876	69,194	33,481
1953	1,572	632	940	41,555	12,730
1954	1,424	462	962	15,247	- 701
1955	1,592	823	769	67,417	36,999
1956	1,800	900	900	119,275	70,473
1957	1,750	816	934	89,488	44,689
1958	1,481	761	720	46,792	21,190

Note: Data on number of returns are for all bituminous coal corporations. Data for 1958 are preliminary.

Source: National Coal Association, Statistics of Income, Corporations; based on data from U.S. Treasury Department, Internal Revenue Service.

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Table 32B. Bituminous Coal Mining: Net Income as a Percent of Net Worth and Business Receipts, 1939-58

Year	Before taxes				After taxes			
	Net income as percent of--				Net income as percent of--			
	Net worth		Business receipts		Net worth		Business receipts	
	Bituminous coal mining	Manufac-turing	Bituminous coal mining	Manufac-turing	Bituminous coal mining	Manufac-turing	Bituminous coal mining	Manufac-turing
1939	-0.4	8.4	-0.6	0.6	-0.7	6.9	-1.0	5.2
1940	1.5	12.0	1.7	8.2	.8	8.5	1.0	5.8
1941	4.2	21.3	3.8	1.2	2.4	11.2	2.2	6.3
1942	7.0	24.6	5.6	11.6	3.6	9.8	2.9	4.6
1943	9.7	27.1	6.9	11.5	4.8	9.9	3.4	4.2
1944	8.9	23.4	6.1	9.8	4.3	8.6	2.9	3.6
1945	7.2	15.9	4.9	7.4	3.7	6.4	2.5	3.0
1946	8.0	17.0	5.2	8.5	5.0	10.3	3.2	5.2
1947	19.6	21.5	11.5	9.4	12.8	13.3	7.5	5.8
1948	20.6	21.4	11.8	9.2	13.1	13.3	7.5	5.7
1949	7.1	15.9	5.3	7.8	4.0	9.8	3.0	4.8
1950	10.9	24.3	7.0	11.0	6.3	13.4	4.0	6.1
1951	7.6	23.6	4.6	9.9	3.8	10.2	2.3	4.3
1952	4.6	18.5	3.1	7.9	2.2	8.1	1.5	3.5
1953	3.1	18.7	2.3	7.8	1.1	8.1	.9	3.4
1954	1.2	15.3	1.0	7.0	.1	7.4	.1	3.4
1955	4.2	19.7	3.3	8.6	2.2	9.9	1.8	4.3
1956	9.5	19.1	6.9	8.7	6.1	10.0	4.4	4.5
1957	5.4	15.5	3.6	7.0	2.8	7.7	1.8	3.4
1958	3.0	11.9	2.4	5.7	1.4	5.7	1.1	2.8

Note: Net worth (sometimes called stockholder's equity, net assets, or net investment) is the sum of common and preferred stock, surplus reserves, paid in surplus, earned surplus, and undivided profits. Business receipts represent receipts from sales and services.

Data for 1958 are preliminary.

Source: Statistics of Income, Corporations, U.S. Treasury Department, Internal Revenue Service.

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Table 33. Bituminous Coal Mining: Distribution of Research Expenditures by Source and Purpose, 1955

Source	Expenditures (in thousands)	Percent of total	Purpose	Expenditures (in thousands)	Percent of total
Total	$17,382	100.0	Total	$17,382	100.0
Government	$5,443	31.4	Coal resources	$1,479	8.5
Commercial coal companies	2,452	14.1	Coal production	3,743	21.5
Captive coal companies	1,207	6.9	Coal utilization	11,154	64.2
Equipment manufacturers	3,221	18.5	Physical and chemical properties	1,006	5.8
Other industrial	4,955	28.5			
Universities and unidentified	104	0.6			

Notes: Coal production includes mining, preparation, storage, and transportation. Coal utilization includes combustion, chemicals, gasification, hydrogenation.

Sources: Outlook and Research Possibilities for Bituminous Coal, Information Circular No. 7754, May 1956, U.S. Department of the Interior, Bureau of Mines.

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Table 34A. Bituminous Coal Mining: Year of Major Changes in Wages and Related Benefits in Union Agreements

Benefit	Underground workers		Outside workers	Additions
	Day	Piece rate		
First Appalachian agreement	1933	1933	1933	Expanded into National Wage Agreement, the basic collective bargaining agreement in the industry.
7-hour day established	1934	1934	1934	
Premium pay provided for--				
Overtime	1937	1943	1937	Changed in 1943, 1945, 1946, 1947, and 1955.
Late shift	1945	1945	1945	
Holidays	1943	1943	1943	1943--time and a half; 1956--double time.
Payment for lunchtime	1945	1945	1945	1945--15 minutes; 1947--30 minutes.
Travel pay included (portal to portal) ..	1943	1943	--	1943--maximum of 45 minutes (paid at two-thirds time); 1945--considered as regular working time.
Allowance for reporting to work	1933	--	--	Minimum of 2 hours' pay for entering mine in morning.
Paid vacations	1941	1941	1941	Increased from $20 and 10 days in 1941, to $200 and 14 days in 1959 (changes in 1943, 1945, 1946, 1955, and 1956).
Geographic differentials eliminated	1941	--	1941	1941 agreement eliminated North-South differential; 1934 contract eliminated the northern West Virginia-northern Appalachian differential.
Tools and equipment provided	1943	1943	1943	
Health and welfare funds created	1946	1946	1946	

Welfare and Retirement Fund: Financed by contributions based on coal produced for use or sale: 1946--$0.05 per ton; 1947--$0.10 per ton; 1948--$0.20 per ton; 1950--$0.30 per ton; 1952--$0.40 per ton.
Medical and Hospital Fund: 1946--financed by wage deductions; 1947--combined with Welfare and Retirement Fund, financed by operators' contributions.

Note: Dashes indicate data not applicable.

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Table 34B. Bituminous Coal Mining: Work Stoppages, 1927-60

Year	Stoppages beginning in year		Man-days idle during year (all stoppages)	Year	Stoppages beginning in year		Man-days idle during year (all stoppages)
	Number	Workers involved			Number	Workers involved	
1927	22	176,000	23,000,000	1945	598	581,000	5,010,000
1928	30	63,300	5,940,000	1946	485	834,000	19,500,000
1929	58	18,100	182,000	1947	415	490,000	2,190,000
1930	52	26,800	883,000	1948	561	582,000	9,560,000
1931	57	52,400	1,540,000	1949	421	1,130,000	16,700,000
1932	43	63,600	5,910,000				
				1950	430	165,000	9,320,000
1933	102	142,000	2,210,000	1951	549	213,000	887,000
1934	78	110,000	1,560,000	1952	560	472,000	2,760,000
1935	42	421,000	2,970,000	1953	392	130,000	418,000
1936	38	19,600	533,000	1954	208	81,900	344,000
1937	54	99,300	1,920,000				
1938	27	9,510	133,000	1955	292	77,500	273,000
				1956	266	84,800	377,000
1939	25	355,000	7,300,000	1957	161	46,400	136,000
1940	34	24,400	153,000	1958	136	29,700	102,000
1941	75	593,000	6,750,000	1959	146	64,000	1,560,000
1942	96	43,800	264,000	1960	120	37,200	137,000
1943	400	487,000	7,510,000				
1944	792	230,000	1,060,000				

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