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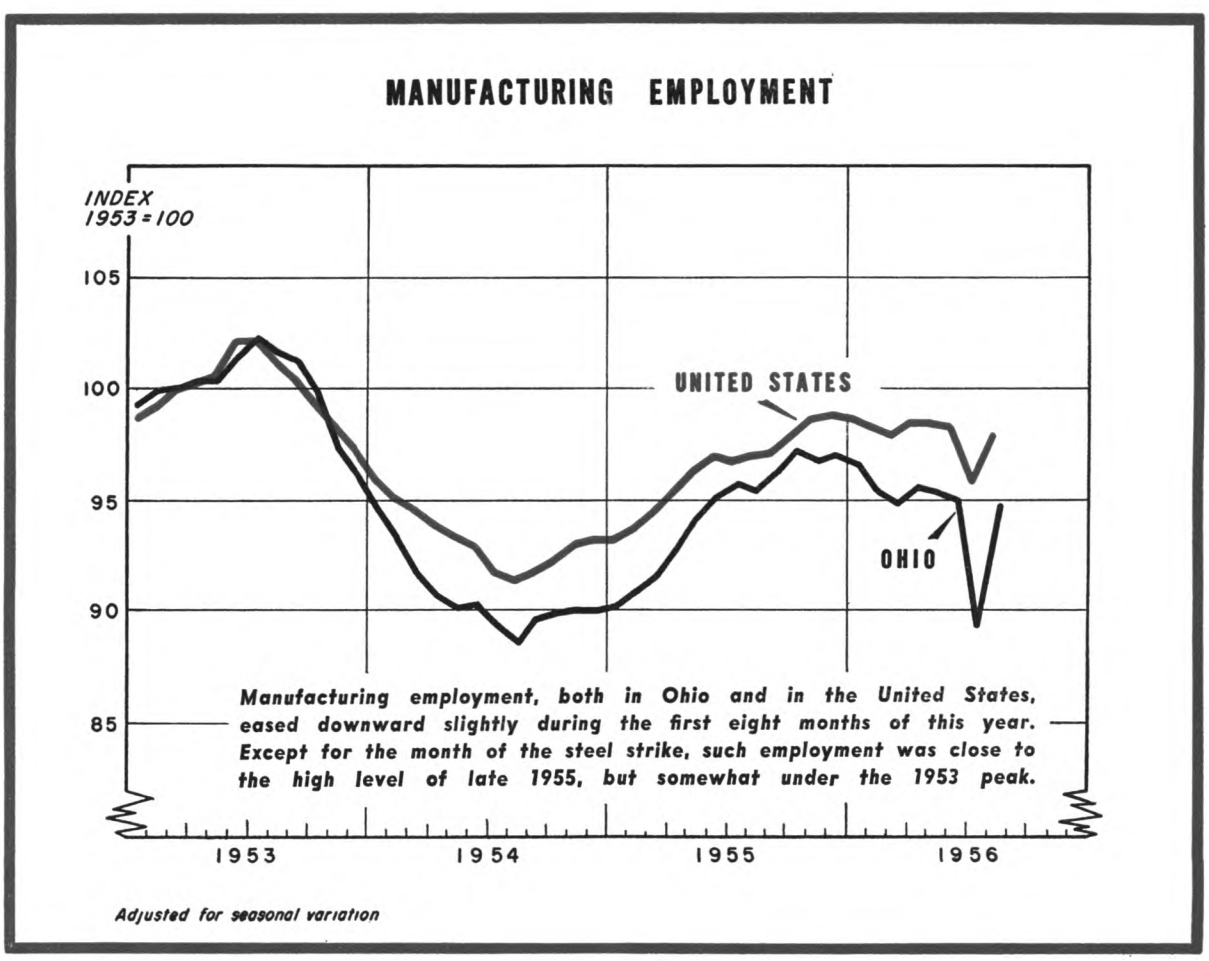


Manufacturing employment, both in Ohio and in the United States, eased downward slightly during the first eight months of this year. Except for the month of the steel strike, such employment was close to the high level of late 1955, but somewhat under the 1953 peak.

Changing Fortunes of Bituminous Coal

(4) Looking Toward the Future

EDITOR'S NOTE: This is the fourth and final article of a series about bituminous coal. The other three were as follows: "The Comeback of Coal," February 1956 issue; "New Techniques Aid the Industry's Recovery," April 1956 issue; "Impact on Employment and Community Development," July-August 1956 issue.

THE bituminous coal industry is confidently looking towards the future. All industry prognosticators foresee a growing demand for soft coal although individual opinions vary as to just how fast the demand will grow and how high it might be after 10, 15, or 25 years have elapsed.

Bituminous coal beds make up the bulk of the United States known reserves of mineral fuels. The extent to which these reserves will be drawn upon depends upon the coal industry's success in competing with other forms of energy. The country's energy requirements are expanding so rapidly that, on the surface, it looks as if coal's future is assured even if its share of the market continues to decrease slightly each year. A much brighter future may be envisioned, however, if new uses for coal can be found while the industry continues efforts to hold its position in its present markets by improving coal recovery and distribution techniques.

Soft Coal Reserves

Reserves of bituminous coal in the United States are estimated at around 1.9 trillion net tons. This huge total includes all categories of coal in the ground without regard to the costs involved in recovering them. Reserves that may be mined at or near 1954 costs are estimated to be about 237 billion short tons, or about 450 years' supply at the estimated 1956 production rate of around 525 million tons. An additional 285 billion tons of coal are recoverable at 1¼ to 1½ times 1954 prices and another 426 billion tons at 1½ to 4 times 1954 prices. Thus, at prices up to 4 times 1954 levels, some 948 billion short tons of soft coal can be mined according to current estimates. The latter tonnage figure comes to approximately 1,800 years' supply at the current production rate.

Ultimate economically recoverable reserves of petroleum and natural gas in the United States appear rather puny in contrast to the country's supply of soft coal. At present rates of use, remaining reserves of oil and gas are estimated at around 90 years' supply. Assuming a steady increase in the consumption of petroleum and natural gas, the Department of the Interior has estimated that, by the end of 1980, more than one-half of the country's original reserves of liquid hydrocarbons and natural gas will have been consumed. On the other hand, assuming a doubling of coal consumption over the next 25-year span, less than one-tenth of the United States' original recoverable reserves of coal will have been used up by the end of 1980.[1]

(1) Original recoverable reserves are here taken as past depletion (production and losses in mining) plus reserves estimated recoverable at up to 4 times 1954 prices. Losses in mining, both past and projected, are assumed to equal production.

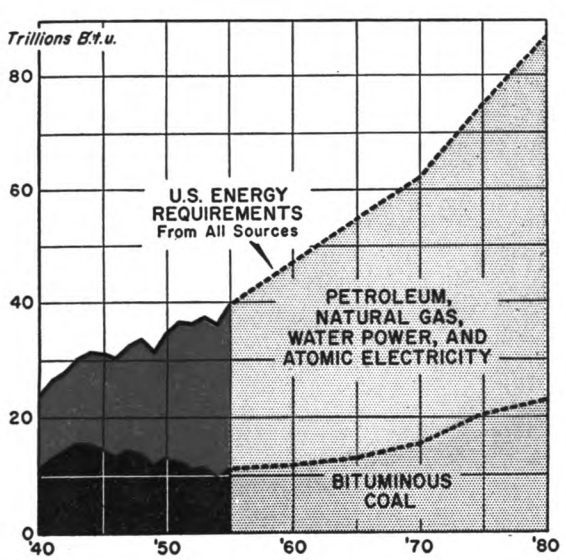
Coal's dominant position in the mineral fuel reserves of the U. S. has not, of course, guaranteed the industry sales in any market. Demand for oil and gas has risen rapidly during the last decade while, until 1955, coal was widely characterized as a "dying industry".

Coal's future is dependent upon the role it will play in supplying the rapidly rising energy needs of the country. This, in turn, depends upon its competitive position vis-a-vis oil and gas and the possibility that, within the next 20 or 25 years, electricity can be generated from atomic energy at a price competitive with the cost of generating electricity from coal.

Coal's Future Role as an Energy Source

The nation's total energy needs are expected to expand at an average annual rate of about 3.2 percent through 1980, as illustrated in the accompanying chart, according to projections made by the U. S. Department of the Interior early in 1956. At this rate of growth, energy requirements in 1980 would be nearly 2⅕ times the 1955 consumption. It is also interesting to note that this "informed guess" places 1975 energy needs nearly 9 percent higher than the Paley Commission estimates made only four years earlier, indicating how much the sights can be raised in a relatively short time.

Domestic soft coal needs are expected to rise at a slower rate than total energy requirements through 1980.



Adapted from an illustrative projection prepared by the U. S. Department of the Interior.

Demand for soft coal—domestic consumption plus exports—is not expected to rise as rapidly as total domestic energy needs. The Department of the Interior's high estimate of future coal requirements foresees demand growing at an increasing rate through 1975, with the rate of increase slowing down thereafter as electric generating plants using nuclear fuel are put into production. Total coal needs in 1980 are estimated at 938 million short tons, or nearly twice the 1955 tonnage consumed domestically and exported.

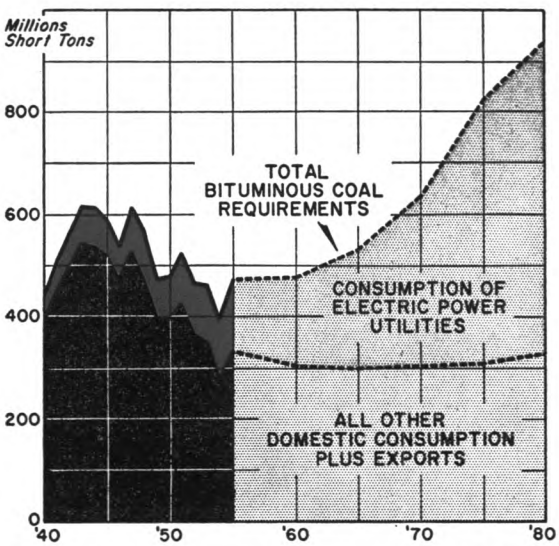
The relative importance of coal as an energy source is, therefore, expected to decline slightly over the next 2½ decades. The foregoing projection shows coal supplying about 26 percent of the country's energy needs in 1980 as compared with 28 percent in 1955, or 37 percent in 1950, and 47 percent in 1940.

The Department of the Interior's forecasts of future mineral fuel needs were prepared early in 1956 for a special joint committee study of the impact of the peaceful uses of atomic energy.[2] The Department made two projections on the basis of two estimates of future electric power generating capacity. Only the higher estimate is presented here for illustrative purposes.

The pattern of soft coal consumption has been projected into the future following the trends evident over the past 15 years. The tonnage used to generate electric power is expected to increase sharply over the next 25 years, even after making allowance for a substantial nuclear-generating capability by

(2) *Peaceful Uses of Atomic Energy;* Volume 2, "Background Material for the Report of the Panel on the Impact of the Peaceful Uses of Atomic Energy to the Joint Committee on Atomic Energy", (Washington, U. S. Government Printing Office, 1956), pp. 68-89.

Increasingly larger tonnages of coal will be required to supply the country's rapidly expanding electric power needs.



Adapted from an illustrative projection prepared by the U. S. Department of the Interior.

1980. This growth is illustrated in the accompanying chart using the Department of the Interior's high estimate of coal needs. Coal tonnage needed in 1980 by electric power utilities is predicated upon an estimated installed capacity of 600 million kilowatts, of which 137.8 million kilowatts are assumed to be nuclear plants. Under these assumptions, atomic energy will displace some 232 million tons of coal in 1980. That is, if no nuclear generating capacity were postulated, 1980 coal needs would be about 25 percent higher than shown in the chart.

The sharp upswing in electric utility coal consumption is projected on the assumption that there will be a steady improvement in the thermal efficiency of coal-fired boilers so that, by 1980, about 25 percent less coal will be required to generate each kilowatt-hour of electricity. At present, electric utilities consume about 1.0 pound of coal per kilowatt-hour. This is expected to be reduced by at least 0.01 pound per kilowatt-hour each year. By 1980, it is assumed that only 0.75 pounds of coal per kilowatt-hour will be needed. These are industry averages; modern plants today are already at the 0.75 pound level.

Projected coal demand, other than electric utility needs, is expected to remain fairly stable at current levels through 1980. It is anticipated that tonnage requirements of the steel industry's coke ovens will double between 1955 and 1980, offsetting declining demand by other industrial users, railroads and retail consumers. Coal exports are projected as rising over the forecast period, but the rise was projected from lower levels than indicated by the 1955 export tonnage. The Department of the Interior's high estimate of coal consumption in 1980 is compared with actual use by major consumer class in 1955 and 1940 in the following table.

BITUMINOUS COAL CONSUMPTION
(millions of short tons)

Consumer Class	1940	1955	1980
TOTAL	**447***	**470***	**938**
Electric power	49	140	613
Coke	81	108	170
Other industrial	126	104	75
Railroads	85	15	0
Retail	88	52	20
Export	16	50	60

* Includes fuel for ships engaged in foreign trade not shown separately.

Technological Advances

Any means of lowering coal's cost to the consumer, or of upgrading the value of coal to the consumer, enhances the industry's prospects for the future. The projection illustrating future coal demand is understated to the extent that anticipated technological developments in the industry could not be translated into tonnage requirements. Among such developments are the continuing battle against costs of coal recovery and transport as well as prospective new or expanded uses of coal.

One of coal's chief competitors in tomorrow's fuels market appears to be atomic energy—a virtually "freightless" fuel. Coal's

ability to compete with nuclear energy as a source of electric power will hinge largely on relative fuel costs—and transportation is an important factor in coal costs to the consumer. Several methods of reducing transport costs are being tried today in the Fourth Federal Reserve District. One public utility, with subsidiaries serving a number of communities throughout the District, is convinced that its needs can be most economically met by locating the power plant near the coal and transmitting the electricity over a growing network of high-voltage transmission lines. Transmission losses are more than offset by savings effected through reducing coal shipping charges.

On the other hand, a northeast Ohio utility is planning to effect savings by pumping a coal-water mixture through a pipeline running from south-eastern Ohio to Lake Erie. When the pipeline is pumping coal at capacity next March, the utility expects to obtain coal at a total cost which will be one-quarter to one-third below that of coal shipped in by rail.

The ultimate in such fuel cost saving plans is now under construction on the Upper Ohio River. An aluminum reduction plant is being built between Clarington and Hannibal, Ohio. A power plant with three 225,000 kw generating units is going up nearby at Cresap, West Virginia. A new low-temperature coal carbonization plant being built "next door" will treat the coal, removing the chemical by-products and leaving a residual "char" to be burned under the power plant boilers. A coal mine with an initial capacity of 3,000,000 tons per year and reserves of 120,000,000 tons will discharge coal on a slope adjacent to the plant. This integrated operation not only keeps the movement of coal and electricity to a minimum but also recovers the higher values from the coal while providing a lower-cost fuel for electric power generation. A similar experiment with lignite is being conducted in Texas.

Coal Chemicals

The coal-chemical industry could prove to be one of coal's major customers. Coal is not just a hunk of carbon but it is rather a huge complex of molecules, the structure of which is not yet fully understood. At present, the coal-chemical industry depends almost entirely upon the steel industry's by-product coke ovens for most of its raw materials. In the by-product coke oven, a ton of coal yields about 1,400 pounds of coke, some 10,000 cubic feet of fuel gas, over 8 gallons of tar, about 3 gallons of light oils and about 20 pounds of sulphate of ammonia. These "by-products" are, in turn, reduced to many other chemical compounds.

The steel industry's production of by-products is, of course, incidental to the production of coke. A growing interest is evident in the chemicals which can be derived from coal, however. This may be partly due to the expectation that the coke-iron ratio at blast furnaces will continue to improve, which means that coke-oven capacity will continue to grow at a slower rate than steel capacity. Such a long-term outlook puts an upper limit upon chemical industries using coal derivatives unless alternative sources are developed.

Interest in coal chemicals is also directed at the recovery of a great many compounds that have not yet been available in large quantity or at reasonable cost. A coal hydrogenation project, which has been in the pilot-plant stage for over three years, suggests that the optimum size of a commercial plant capable of producing a range of the more complex coal chemicals would use from 3,000 to 6,000 tons of coal per day. It is anticipated that a commercial hydrogenation plant will be built in the next few years—most likely next door to the coal it will need in such large quantity.

A range of petroleum products from gasoline to lubricating oils may also be extracted from bituminous coal using several different processes. However, while it is technically feasible to convert coal into synthetic liquid fuels,[3] pilot-plant studies in the United States indicate that petroleum products can

(3) Synthetic liquid fuels were produced from coal on a large scale in Germany during World War II. Also, a new plant turning 3,200 tons of coal per day into 4,300 barrels of gasoline, plus a wide range of refinery and chemical products, went into production within the last year in the Union of South Africa.

be recovered somewhat more economically from oil shale than from soft coal. Since there are reserves of some 535 billion barrels of shale oil estimated to be in the U. S. in shale having an oil content of 11 to 50 gallons per ton, commercial efforts will most likely be first made to utilize this alternative to supplement crude oil production. One expert estimates that there are 45 billion barrels of shale oil definitely recoverable with existing techniques at present market prices, or enough to meet 1955 crude oil requirements 16 times over.

The carbonization and hydrogenation processes of producing coal chemicals thus appear to offer the coal industry more promise as a source of potential demand in the next several decades than does the synthetic liquid fuels market. Intensified research programs to develop methods of recovery and utilization of coal chemical derivatives are a necessary prerequisite for growth in this direction.

The Coal-Fired Gas Turbine

The coal industry's efforts to recapture its railroad fuel market has brought a coal-burning gas turbine to the pilot-model stage. A full-scale locomotive is expected to be tested on the rails beginning in mid-1958. The 1955 test program suggests that a coal-fired gas turbine locomotive could save $49,000 in fuel and lubricating oil costs in comparison with a diesel locomotive during a 4,000 operating-hour-year. Potentially, there is an economic advantage of coal over diesel fuel, providing coal can be utilized more efficiently than it was in the old steam locomotives. Railroads cooperating in the locomotive development program pay about 20 cents per million B.t.u.'s for coal while diesel fuel costs approximately 83 cents per million B.t.u.'s.

The successful development of a commercially adaptable gas turbine locomotive, which is fired by coal with such great operating economies, could eclipse the diesel just as the diesel replaced steam. In any event, work in this direction holds some promise of recapturing an important coal market which would otherwise be permanently lost.

Coal for Europe

Another recent development in coal's continuing battle against shipping costs has been directed towards preserving the industry's gains in export demand. Coal exports jumped from 31 million tons in 1954 to 51 million tons in 1955. This year, foreign demand for U. S. coal appears to have leveled off. In an effort to hold and expand the foreign market, a $50-million corporation was formed this June by the larger coal producing and exporting companies, the United Mine Workers of America and three coal-carrying railroads.

The new corporation was formed to facilitate ocean shipment and to stabilize ocean rates. It proposes to accomplish this purpose by acquiring its own fleet of modern bulk-cargo ships and building modern facilities for unloading coal at European ports.

The Lag in Research

For all its visions of a rosy future and the positive steps taken by the forward-looking segment of the coal industry, the amount of money spent on research has remained relatively small. Industries based upon coal are currently spending only about 0.4 percent of their estimated gross income on research, as compared with the national industrial average of about 1.5 percent. Raising research outlays to the national average would mean expanding a $16-million program into a $60-million program.

The outlook for the next 2½ decades foresees a sizable net increase in the demand for coal as a solid fuel. The rise in demand could grow faster to the extent that research finds new uses for the complex of molecules in the "black diamond" and develops new or improved methods of recovering these synthetic compounds from coal.

In Conclusion

The brighter future envisioned for coal does not automatically cancel out all of the problems associated with the industry. The many and diverse facets of the soft coal industry

make it difficult to generalize, but several trends stand out as coal enters a new period of sustained increases in output.

Rapidly rising productivity at the mines holds several implications for the future. Under the assumption that productivity will rise 50 percent between 1955 and 1980, and using the higher estimate of coal requirements, the Department of the Interior has projected mine employment as continuing slightly downward through 1980. Under this assumption, productivity would rise rather slowly by recent standards, increasing from a little over 10 tons per man-day in 1955 to 15 tons per man-day in 1980, or only about 1½ percent each year. Some modern deep mines already have demonstrated productivity rates in excess of 15 tons per man-day while the strip mine average is much higher. Between 1950 and 1955 productivity increased 50 percent, for an average annual gain of more than 8 percent.

The trend towards intensified mechanization of the mining process will undoubtedly continue. New giant shovels are already planned for use in strip pits. Continuous mining equipment turns out less than one-twelfth of the coal taken from underground workings, leaving considerable room for the extension of this efficient method of coal recovery.

Increased utilization of the more efficient mining machinery augurs well for the manufacturers of coal mining equipment but holds little promise to the mining communities that their fortunes will change with those of coal. Even if productivity rises to only 15 tons per man per day in 1980 and coal demand follows the trend indicated by the Department of the Interior's high estimate, a slight downward trend in the number of men working in the mines is apparent. The reduction in employment, under these assumptions, will continue at a much slower rate than experienced during the past decade, but this will be small comfort to those communities where coal is the only industry. Past patterns of out-migration will undoubtedly continue unless other industry is attracted to the community.

NOTES

Among the articles recently published in *Monthly Business Reviews* of other Federal Reserve banks, the following may be of special interest to our readers:

"Business Inventories and Economic Fluctuations," Federal Reserve Bank of New York, October 1956.

"For Bank Investors . . . Past and Present Appeals of Municipals," Federal Reserve Bank of Richmond, October 1956.

"Reserves—Through the Window or From the Market," Federal Reserve Bank of Atlanta," September 30, 1956.

Copies may be obtained by writing to the Federal Reserve Bank named in each case.

Manufacturing Employment in Ohio

EMPLOYMENT in Ohio usually shows more than average sensitivity to business fluctuations because of the importance of manufacturing, especially durable goods production, in the state. About 44 percent of Ohio's non-farm workers are employed in manufacturing, and of that number, more than 70 percent work in factories producing durable goods. The comparable national percentages, in contrast, are 33 and 60 percent. The largest industries in the state, measured by numbers employed in 1955, are primary metals, fabricated metal products and machinery, transportation equipment (largely automobile parts) and rubber products.

The most recent dip in manufacturing output and employment, which began approximately in December of last year and lasted until early fall, was not matched by any corresponding decline in general business activity, as measured by the Gross National Product. A generally high level of business activity accompanied the development of "soft spots" in certain manufacturing lines, notably automobiles, farm machinery, and appliances. In such lines, reductions occurred early this year in respect to consumer demand or inventory requirements, or both. Industries selling producers' goods such as the machinery group, and some of the other metal fabricating lines, however, maintained or increased their output and employment, as business investment in new plant and equipment reached record levels. The non-manufacturing industries continued to expand, and in fact, have accounted for all the gains in employment since December of last year.

Such developments have been reflected in the statistics of manufacturing employment in Ohio, as illustrated by the accompanying charts. Latest data shown are for August, a month which in small part reflected the after-effects of the steel strike, but which in general continued the path marked out early in the year. Data on autumn trends in manufacturing employment were not available at press time.

The comparison made in the cover chart between manufacturing employment in Ohio and in the United States measures monthly changes from the average level of manufacturing employment during 1953. (For convenience in charting recent short-run changes, 1953 was selected as base year. It was not necessarily "normal," and it was, in fact, a year of unusual strength in manufacturing employment.) A similar comparison with 1947 as base year would show that Ohio has generally been keeping pace with the nationwide increase in manufacturing employment, at least until December 1955. During a considerable part of 1956, however, for reasons cited below, manufacturing employment was falling both in Ohio and in the nation, but somewhat more so in Ohio.

Thus, for all Ohio manufacturing industry combined, employment in the 1955 peak

month, December, was 5 percent below the previous high reached in July 1953. Nationally, employment in manufacturing establishments was down 3 percent over the same interval. Ohio's greater-than-average reduction in manufacturing employment during a considerable part of 1956 was due to its relatively larger proportion of durable goods industries, in which employment ran into some temporary reductions.

Employment in all Ohio manufacturing industry combined totaled 1,348,000 in August (after adjustment for seasonal variation) or 2.5 percent below the most recent high reached in December 1955, and 7 percent above the August 1954 recession low. The relative mildness of the decline since December is in sharp contrast to the 12 percent drop during the ten months following the July 1953 peak, and can be attributed to the recent situation of selective weakness in manufacturing activity as opposed to the general weakness during the 1953-54 downturn.

An arrangement of leading Ohio manufacturing industries by the behavior of their employment totals since December 1955 shows that the decline in total manufacturing employment was principally the result of weaknesses in the automobile and appliance lines and their supplying and related industries. In order to make this classification, it is necessary to separate the components of the primary and fabricated metals industries.[1]

Consumer Goods and Related Industries

The first group (see first set of charts) consists of industries in which employment dropped off in late 1955 or early 1956, and includes the following: rubber products; motor vehicles and parts; appliances[2]; iron and steel foundries (included in the "primary metals" group); and metal stamping, coating, and engraving (included under "fabricated metals"). Average 1955 employment in this group was about 21 percent of total manufacturing employment in Ohio.

Reduction in employment from December to August by this group accounted for 83 percent of the decline in total manufacturing employment in the same period. These industries are, except for appliances, largely dependent on the level of activity in the automobile industry, which declined sharply in the late autumn and winter of 1955-56.

The number of workers in the *motor vehicle and parts* industry reached a two-and-one-half year peak of 88,600[3] in December 1955, representing a gain of about one-third from the September 1954 low. By August this year it had dropped 17 percent to 73,800, as dealer sales fell off and successive reductions were made in automobile production. The fact that peak 1955 employment was about 2.5 percent below the 1953 high point indicates that the industry has apparently been able to improve its efficiency, in terms of labor requirements, in the intervening period.

A similar course of events seems to have occurred in Ohio's *rubber products* industry, supplier of tires and tubes to the automobile industry. Here, the total number of workers in December 1955, the latest peak, was 3 percent below the maximum number employed in 1953. Employment trends have resembled closely those in the motor vehicle industry; the labor force declined 9 percent from December 1955 to 80,200 in August 1956.

Employment in *iron and steel foundries,* whose largest single customer is the automobile industry, fell off by 8 percent from December to August, and the number of workers in metal stamping, coating, and engraving plants fell by 15 percent during that time. For both of these industries, however, peak 1955 employment was higher than at the 1953 top.

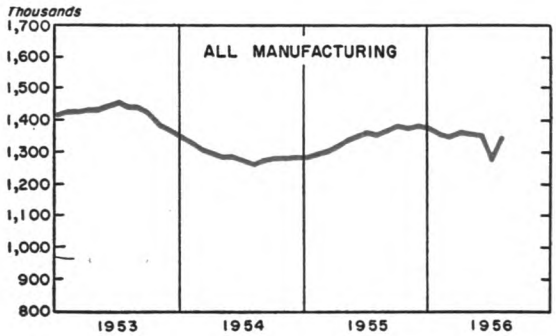
The number of workers in Ohio factories producing *appliances* dropped sharply in

(1) Standard Industrial Classification (SIC) Codes 33 and 34.

(2) Service industry and household machines.

(3) Not adjusted for seasonal variation. Seasonal adjustments have been made for employment in total manufacturing and in the following industries: appliances, machinery (except electrical and appliances), and electrical machinery. Such adjustments are reflected in figures cited in the text as well as in the chart showings.

Total employment in Ohio manufacturing industry slipped 2.5 percent from December of last year to August of this year.

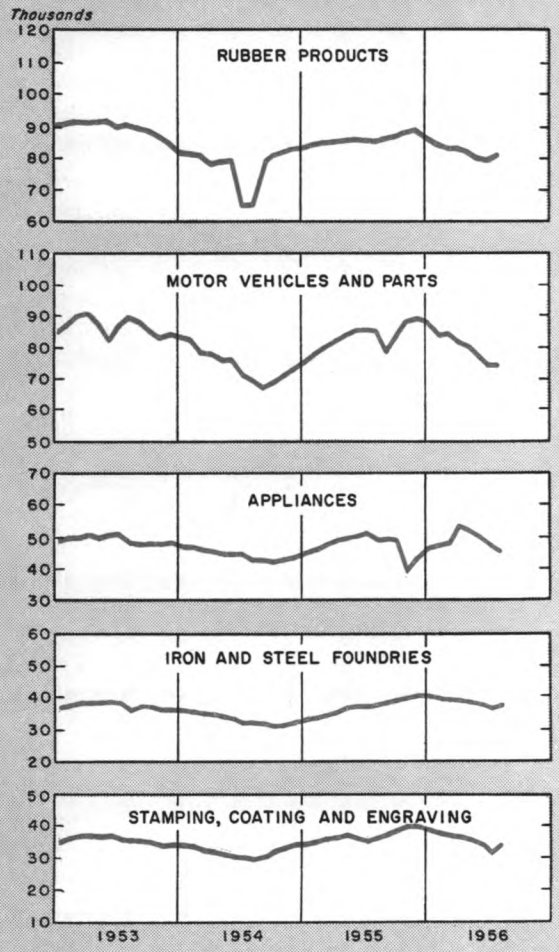


November 1955 when production was reduced by a strike against one major producer, and employment did not reach pre-strike levels until March this year. From April through August, the labor force in appliance manufacturing decreased 13 percent as production schedules were cut back sharply.

Producers' Goods Industries

Employment trends in the second group of industries are shown by the second set of charts. All but one of these industries, which can be described as entirely or predominantly manufacturers of producers' goods, have in-

Manufacturing Employment in Ohio
CONSUMER DURABLES AND RELATED INDUSTRIES



The number employed by the rubber products industry in August was 9 percent below the December 1955 total. In that month the work force had been 3 percent lower than during the 1953 peak.

Fluctuations in employment at plants producing motor vehicles and parts have been exceptionally severe since 1953. In August of this year, employment was 17 percent below the December 1955 total; that point, in turn, was one-third higher than in September 1954 and almost the same as the 1953 peak.

During the current year, the labor force in Ohio plants producing appliances declined 13 percent from April to August. The drop in November 1955 was caused by a strike against one major producer.

Iron and steel foundry employment slid 8 percent between December 1955 and August of this year. The labor force in the peak month of 1955 was 4.5 percent higher than during the 1953 high.

The number employed in Ohio metal stamping plants was 15 percent lower in August of this year than in December 1955; by that time the labor force had increased one-third over the low point of August 1954.

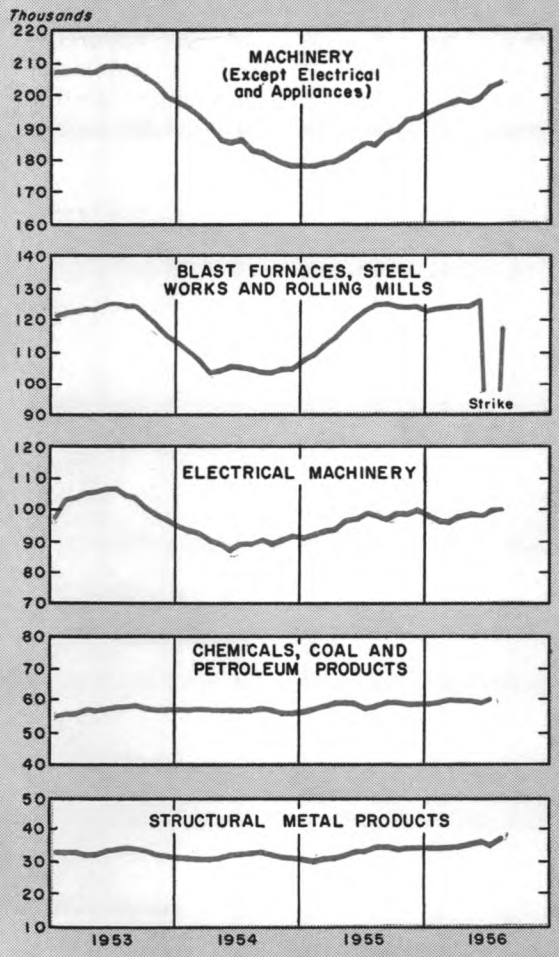
Source of data: Division of Research and Statistics, Ohio Bureau of Unemployment Compensation, Columbus, and U. S. Bureau of Labor Statistics. Some series seasonally adjusted. (See note 8 of text.)

creased employment from December 1955 to August; the one exception, primary steel[4], was due to a strike against most producers during July and part of August. In addition to steel mill products, the group includes the following industries: machinery, except electrical and appliances; electrical machinery; chemicals, petroleum and coke products; and structural metal products (part of the "fabricated metal products" group). Average employment in these industries in 1955 amounted to about 36 percent of total manufacturing employment.

(4) Blast furnaces, steel works, rolling mills.

The absence of a downturn in employment in these industries comparable to that in the first group was basically due to the buoyant demand for their products from industry, in contrast to weakened consumer demand or inventory adjustments for autos and appliances. Output of machinery and structural products rose because of industrial expansion and re-equipment programs. The chemical industry's expansion is supported by the demand for new products and new uses for existing products continually being developed by the industry and its customers. The slight leveling off in employment in two of these industries (electrical machinery and primary steel) that

Manufacturing Employment in Ohio
FIVE PRODUCERS' GOODS INDUSTRIES



Employment in Ohio's nonelectrical machinery industry was 14 percent higher in August than in December 1954, but still below the 1953 peak.

Except for the strike period, employment in the primary steel industry has held substantially steady since September 1955, after climbing 20 percent from the low point reached in April 1954.

The labor force in Ohio's electrical machinery industry was only fractionally higher in August than in December 1955, when employment had risen 14 percent over the June 1954 total.

Employment in the chemicals group was 3 percent higher in August than in the previous peak of September 1953. This industry had been least affected by the 1953-54 recession.

Employment in Ohio's structural metal products industry was 21 percent higher in August than at the recession low point of February 1955; the August total was also about 7 percent above the previous high of three years ago.

did occur after December seems to have resulted from the depressant influence of the automobile industry.

Employment in Ohio plants producing *nonelectrical machinery* has been rising without serious interruption since the end of 1954, and in August totaled 203,000, or 14 percent above the 1954 low. The *electrical machinery* industry has increased its work force by the same percentage, but most of the gain took place prior to December 1955; August employment of 99,500 was only 300 more than eight months previously. The recent relative stability of employment in this industry is principally due to the effect of the drop in the production of electrical components for autos, which offset rising production for industrial equipment and defense uses.

The *primary steel* industry, supplying all the metal-using industries, was apparently also affected by the slackening in automobile output in late 1955. Employment climbed 20 percent from the 1954 low to 124,800 in September 1955. By June of this year (the last month in which employment was unaffected by the steel strike) it had risen very slightly to 125,200, which was the same employment total as in the 1953 peak month of July.

The *structural metal products* industry, however, whose output goes largely into construction, has increased the number of its workers by 21 percent since early 1955. Employment of 36,100 in August surpassed the August 1953 peak by about 7 percent.

The *chemicals* group had been affected less by the 1953-54 recession than any other Ohio manufacturing industry, and the number of its employees reached a new record level of 59,500 in August, or 3 percent above the previous high reached in September 1953. The construction of new chemical plants along Lake Erie in Lake and Ashtabula counties and in the Ohio River area has been an important factor in the expansion of employment in this growing industry.