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Natural Gas in the Eighth District

NATURAL GAS CONSUMPTION has risen rapidly in recent years in the nation and in the Eighth Federal Reserve District. Industries use most of the gas marketed and petrochemical plants recently located in the district are based on this resource. Residential uses have also risen sharply.

The increased use of natural gas reflects several advantages, but chiefly the more favorable price of natural gas than competitive fuels. As a result of increasing demands and costs, gas prices have moved up. Prices in the district vary widely.

District production is small and in recent years has declined. Consequently, most of the natural gas consumed in the district comes from other areas. Expanding use has required increased pipeline capacity connecting the major supply areas of the Southwest with consuming areas. Underground storage facilities also help meet rising demands. Proved reserves have increased but at a lower rate than rising production.

Natural gas has become an important resource for district development.

Federal Reserve Bank
of St. Louis

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Natural gas consumption has risen rapidly in recent years in the nation and in the Eighth Federal Reserve District.

OUR AMERICAN ECONOMY requires tremendous amounts of energy to keep it going and growing. All production takes energy but ours is especially dependent on it as, each year, workers have more and more horsepower placed at their command and as consumers seek to improve their standards of convenience and living. Potential energy sources are, therefore, among the prime resources of the American economy.

Natural gas has developed over the past half-century into one of our major energy sources. The growth of the natural gas industry has been prodigious. At the start of the century, natural gas contributed only 3 per cent of the energy requirements of the nation furnished by mineral fuels and water power; by 1953, this share had risen to 23 per cent. And the shift toward natural gas has continued into 1954.

The economic significance of a resource lies in its availability. This fact is essential to understanding the importance of natural gas in the Eighth Federal Reserve District. Most of the natural gas produced in the nation comes from the Southwest. But the technological marvel of pipelines has made this source of energy and raw materials available to large areas of the Eighth District and in such quantities that natural gas has taken its place as a significant district "resource." The Eighth District is centered on a network of natural gas pipelines connecting the wells of Texas and Louisiana with the industries of the East. District industries can tap this network and obtain the useful material.

The extent to which the Eighth District has shared in the expanded use of natural gas and, thus, the extent to which industry and consumers here have taken advantage of the fuel's availability can be judged by figures on consumption in the seven states in which the district is located.¹ From 1947 to 1953, consumption in these states increased 136 per cent while for the United States as a whole the increase was 82 per cent (see Table I).

In addition to the growth comparison, which is made on the basis of physical units, cubic feet, it might also be of interest to note the dollar amount paid for natural gas in a recent year by businesses and consumers in district states and to measure that

¹The seven Eighth District states are: Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee. Official data on gas consumption are available by states, but not by Federal Reserve districts.

amount against the comparable total national expenditure. Data on value at the point of consumption (roughly equivalent to cost to users) show that the

TABLE I
CONSUMPTION OF NATURAL GAS, 1947 AND 1953
(Amounts in Billions of Cubic Feet)

| | Eighth District States | | | United States | | |
|------------------|------------------------|------|-------------------|---------------|------|-------------------|
| | 1947 | 1953 | Per cent Increase | 1947 | 1953 | Per cent Increase |
| Total..... | 480 | 1134 | 136 | 4426 | 8076 | 82 |
| Residential..... | 122 | 281 | 130 | 802 | 1686 | 110 |
| Commercial..... | 44 | 89 | 102 | 285 | 542 | 90 |
| Industrial..... | 314 | 763 | 143 | 3339 | 5849 | 75 |

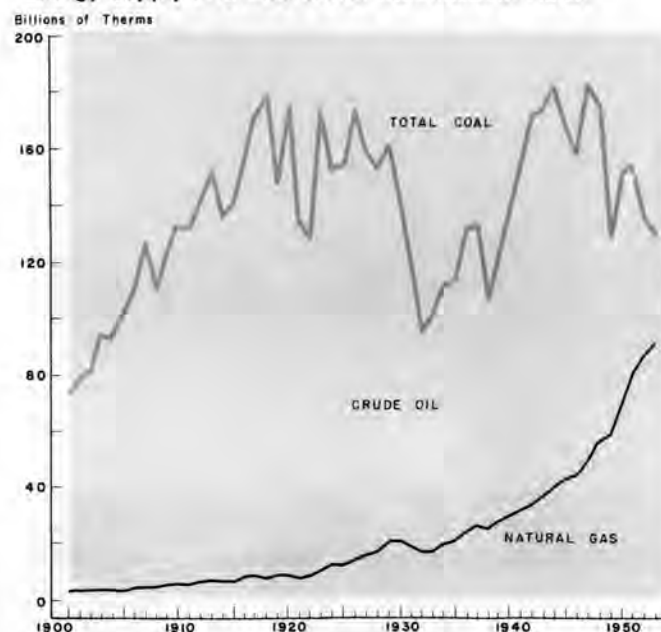
Detail may not add to totals due to rounding.
Source: Bureau of Mines.

total value of natural gas distributed in district states during 1953 was \$462 million. Gas for residential use was valued at \$233 million, just over half the dollar total; \$52 million was paid for commercial consumption and \$177 million for industrial uses. The nation's bill for natural gas in that same year came to \$2.9 billion.

Industries use most of the gas marketed...

Not only did total use of natural gas expand relatively faster in district states than in the nation, but industrial use here almost doubled the rate of national growth from 1947 to 1953. Turning to physical measures again, it is clear from the figures in Table I that, in both the district and the nation, industries consume most of the natural gas used. In district states industrial consumption accounted for about two-thirds of one trillion-plus cubic feet of natural gas used in 1953.

Energy Supply in United States from Mineral Fuels.



One of the chief industrial uses of natural gas is for fuel at electric utility plants. This particular market which consumed 17 per cent of the natural gas used in district states during 1952 (see Table II) has ex-

TABLE II
CONSUMPTION OF NATURAL GAS IN
DISTRICT STATES, 1952

| | Billion Cubic Feet | Per cent of Total |
|---|-----------------------|----------------------|
| Total | 1,082 | 100 |
| Residential | 264 | 24 |
| Commercial | 86 | 8 |
| Industrial | 732 | 68 |
| Field (drilling, pumping and operating gasoline recovery plants) | 60 | 6 |
| Petroleum refineries | 22 | 2 |
| Portland cement plants | 8 | 1 |
| Natural gas pipelines, primarily pumping | 55 | 5 |
| Fuel at electric utility plants | 188 | 17 |
| Other industrial | 400 | 37 |

Source: *Minerals Yearbook*, 1952 preprint.

panded sharply in the postwar period, reflecting both the larger proportion of electric power generated by gas and the growth in electric generating capacity which has taken place here at an even faster pace than in the nation. Based on Federal Power Commission figures, gas used by electric utilities in district states increased five fold from 1947 to 1953, about twice as fast as in the nation. Coal used in electric power generation rose 46 per cent but oil use fell 28 per cent in the same period. In the nation the proportion of electric power generated by gas increased from 9 per cent of the total in 1947 to 18 per cent in 1953.

Other large industrial users of gas are petroleum refineries, natural gas pipelines (for pumping), portland cement and other stone, clay or glass plants, primary metals and food products industries.

However, use according to industry tells only part of the story of natural gas consumption; the kind of use within the industry may be even more significant.

... and petrochemical plants recently located in the district are based on this resource.

Natural gas serves industry primarily as boiler fuel and in heat treatment or processing, but it is also used, along with petroleum, as a chemical raw material in the production of basic petrochemicals. Within the last 25 years the hydrocarbon components of petroleum and natural gas have become a source of raw materials for more than 2,500 different chemical products. About 25 per cent of total chemical production is based on natural gas and petroleum as raw materials. Although the volume of gas so used is not a large proportion of the total, it is an important one.

Nationally, the largest share of natural gas used by the petrochemical industries goes into production of carbon black; the second largest into production

of ammonia. Rising production of solvents, fertilizer and plastics, which are major end products of the chemical industry, has been an important factor in the increased demand for basic petrochemicals. Synthetic resins, fibers and rubber are dependent upon the use of organic raw materials, largely of petrochemical origin.

The attractiveness of natural gas as a raw material source for the chemical industry reflects the low cost with which the hydrocarbon components can be readily derived. Gas which is subjected to processing for petrochemical purposes can be subsequently utilized as a fuel since the desired components can be extracted from the natural gas without subtracting greatly from the heat content of the remaining gas for fuel purposes.

In recent years several petrochemical plants have been located in the Eighth Federal Reserve District. These locations reflect the availability of natural gas supplies and the existence of nearby markets. While most of the nation's petrochemical plants have been located in the Gulf Coast area close to the gas producing areas, the recent location of several plants in this district suggests that there are economies to be gained in moving the natural gas by pipeline from southwestern producing areas to plants set closer to the large consuming areas in the northeastern section of the nation.

The five chemical plants in operation or under construction in the Eighth District for production of synthetic ammonia and related compounds are excellent examples of the ability to locate petrochemical plants away from the gas fields and closer to the markets.

DISTRICT AMMONIA PLANTS

| Company | Location | Capacity per day |
|------------------------------|------------------------|------------------|
| Grace Chemical Company | Memphis, Tennessee | 250 tons |
| Hercules Powder Company | Louisiana, Missouri | 105 tons |
| Lion Oil Company | El Dorado, Arkansas | 570 tons |
| Mississippi River Fuel Corp. | Crystal City, Missouri | 200 tons |
| Spencer Chemical Company | Henderson, Kentucky | 200 tons |

The use of natural gas for production of chemicals is well illustrated by the \$25 million plant located at Brandenburg, Kentucky, by Mathieson Chemical Corporation. Raw materials for this operation come from a \$12 million plant at Greensburg, Kentucky, where 400,000 gallons of natural gas liquids (ethane) are extracted daily from 600 million cubic feet of natural gas. These natural gas liquids are used to produce organic chemical products such as ethylene glycol, used as an antifreeze and as a component in cellophane and other chemicals, and liquefied petroleum gases, such as propane, isobutane and natural gasoline.

Other district petrochemical plants which utilize natural gas include the duPont Company plant at Memphis which produces hydrogen and sodium cyanide; the B. F. Goodrich Chemical Company plants at Calvert City and Louisville, Kentucky, which produce acrylonitrile and hydrogen; Stauffer Chemical Company plant at Louisville which produces carbon tetrachloride, perchlorethylene and hydrogen chloride; and the Olin Mathieson Chemical Corporation plant at McKamie, Arkansas, where sulphur is recovered from sour natural gas. Columbia Carbon Company operates the only carbon black plant located in the district.

Finally, it might be pointed out, in connection with industrial uses of natural gas, that a small share is consumed by industry in field use which includes that for gas and oil well drilling and pumping, shrinkage loss and gas consumed in operating natural gasoline extraction plants, and the net gas lost in raising oil by injection of gas. Such field uses of natural gas consumed 6 per cent of the total in district states during 1952.

Residential uses have also risen sharply.

Analysis of residential use of gas should not be neglected because of the impressiveness of industrial consumption. As has been noted, in value terms, residential consumption constitutes a larger share of the total than industrial use. Further, as indicated in Table I, residential use of natural gas here, while not rising as much as industrial use, increased 130 per cent from 1947 to 1953, reflecting the growth in population and number of dwelling units, conversion from manufactured or mixed to straight natural gas, and greater average use per customer.

The Census of Housing in 1950 revealed that 19 per cent of the dwelling units in the Eighth District with heating equipment used gas supplied by a public utility (see Table III). In the seven metropolitan areas of the district, one-third of the dwelling units used utility gas in heating equipment, compared with 13 per cent outside metropolitan areas. The use of utility gas for space heating varied widely from one area to another in 1950. Generally, areas in Arkansas used utility gas for home space heating to a greater extent than other areas of the district, reflecting the availability of natural gas for many years in that state at relatively low rates.

In the nation the number of gas house heating customers rose by an average of 1.2 million per year from 1949 to 1953. Also, the proportion of residential customers of utilities using gas for space heating rose from 36 per cent in 1949 to 50 per cent in 1953.

Further increases in the use of gas for house heating are indicated by the backlogs of orders on hand for many utilities. The gas industry has forecast an increase of 40 per cent in national residential requirements from 1953 to 1957.

TABLE III
HEATING FUELS USED IN EIGHTH DISTRICT
DWELLING UNITS

| 1950 | | | | | |
|------------------------------|--|----------------|----------------|----------------|-------|
| | Total Dwellings with Heating Equipment | Per cent Using | | | |
| | | Coal | Utility Gas | Liquid Fuel | Other |
| Nonmetropolitan Areas | | | | | |
| Arkansas | 431,750 | 8.1 | 25.7 | 9.3 | 56.9 |
| Illinois | 282,860 | 71.3 | 5.3 | 12.0 | 11.4 |
| Indiana | 129,290 | 67.6 | 5.3 | 9.9 | 17.2 |
| Kentucky | 288,285 | 59.5 | 10.4 | 5.6 | 24.5 |
| Mississippi | 256,890 | 15.9 | 15.6 | 5.1 | 63.4 |
| Missouri | 459,810 | 37.3 | 8.9 | 15.0 | 38.8 |
| Tennessee | 131,520 | 34.4 | 7.9 | 12.0 | 45.7 |
| Metropolitan Areas | | | | | |
| St. Louis | 484,485 | 58.6 | 20.2 | 16.6 | 4.6 |
| Louisville | 164,115 | 53.8 | 32.0 | 9.4 | 4.8 |
| Memphis | 131,155 | 15.6 | 66.5 | 5.2 | 12.7 |
| Little Rock | 54,785 | 1.8 | 74.9 | 2.7 | 20.6 |
| Evansville | 47,055 | 72.1 | 13.5 | 10.3 | 4.1 |
| Springfield | 32,635 | 26.9 | 33.9 | 19.9 | 19.3 |
| Fort Smith | 19,285 | 10.3 | 83.5 | 0.6 | 5.6 |
| Metropolitan Areas | 933,515 | 46.9 | 33.4 | 12.4 | 7.3 |
| Other | 1,980,405 | 38.0 | 12.8 | 10.1 | 39.1 |
| Eighth Federal Reserve | | | | | |
| District | 2,913,920 | 40.9 | 19.4 | 10.9 | 28.8 |

Source: *Census of Housing, 1950.*

The increased use of natural gas reflects several advantages, but chiefly the more favorable price of natural gas than competitive fuels.

The tremendous growth of natural gas consumption in the postwar period reflects several advantages of gas as a fuel.

Gas is supplied as needed without requiring the consumer's investment in a supply on hand; it requires no handling or waste removal; it is clean, produces heat uniformly and can be easily controlled.

It is in terms of improved competitive cost position, however, that natural gas enjoys perhaps its greatest advantage. Despite a sharp rise in the general price level and a doubling in the price of coal and fuel oil, the price of natural gas rose only 22 per cent from 1940 to 1953.

The comparison is more meaningful when computed on a basis of equivalent energy content. On such a basis the competitive position of natural gas has improved. The price of gas was about twice that of soft coal in 1940 and only 4 per cent more in 1953 (see Table IV). While coal is still slightly cheaper ac-

According to these figures, it should be noted that they do not take into account any differences in burning efficiency, handling costs, or convenience of the fuels.

TABLE IV
AVERAGE EQUIVALENT RETAIL FUEL PRICES
PER MILLION B.T.U.

| | 1935 | 1940 | 1945 | 1950 | 1953 |
|-----------------------|---------|---------|---------|---------|---------|
| Natural gas | \$0.669 | \$0.635 | \$0.601 | \$0.638 | \$0.693 |
| Bituminous coal | .320 | .326 | .397 | .624 | .664 |
| Fuel oil | .422 | .498 | .616 | .884 | 1.006 |

Source: Federal Power Commission, *Natural Gas Investigation* (Docket No. G-580) and *Economics of Natural Gas in Texas* by Stockton, Henshaw & Graves.

1953 data computed by this bank.

As far as fuel oil is concerned, since 1945 the price of natural gas has been less on an equivalent heat content basis. Of course, in both cases these national averages obscure the price situation in many local areas where gas is actually much the cheaper fuel.

Prices of fuels for industrial use show much the same pattern of change as in the residential field. On a national basis, the average value at point of consumption of natural gas used for industrial fuel rose 36 per cent from 1940 to 1953. Over the same period, however, wholesale prices of bituminous coal and fuel oil more than doubled. The more rapid increase in the use of natural gas than coal by electric generating utilities indicates the relative price advantage of the former in many areas. Much of the gas used by electric utilities is obtained during summer months when other uses are at a minimum. For example, the amount used in August, 1953, was about twice the total consumed in January.

As a result of increasing demands and costs, gas prices have moved up.

Prior to World War II, large amounts of gas were found as a result of the rapid exploration for oil. Since sufficient pipeline capacity was not immediately available to take this supply, field prices of gas were depressed. Now that pipelines have been laid and demands are increasing, the price of gas at the well is also rising. In 1953, the national average was 9.2 cents per thousand cubic feet, compared with a low of 4.5 cents in 1940. The current average well price reflects much gas sold under existing long term contracts at lower prices than the average. Newer contracts generally supply gas at much higher figures than the expiring contracts. Thus, as contracts expire and are renewed, the increasing quantity of gas sold at higher prices raises the average price of gas in the field.

Reflecting both the increase in price of gas at wells and the rising cost of transmitting and distributing

gas, delivered prices have also risen in recent years. The average delivered price of natural gas in district states has not increased as rapidly as in the nation in the postwar years, largely because of the rapid growth of sales in the northeastern section of the country where prices are generally higher than the national average. Value at point of consumption for all natural gas used in district states rose from 36.7 cents per thousand cubic feet in 1947 to 40.7 cents in 1953, an increase of 11 per cent. For the nation as a whole, average value rose 53 per cent from 23.2 cents in 1947 to 35.5 cents in 1953.

TABLE V
AVERAGE VALUE OF NATURAL GAS AT
POINT OF CONSUMPTION

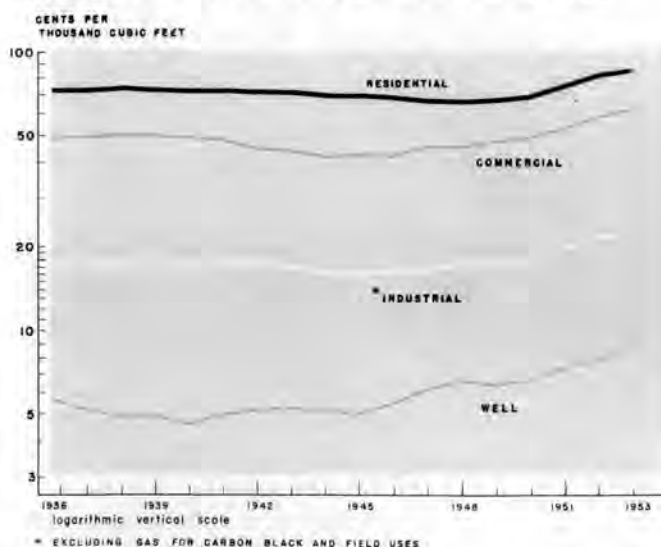
| | In cents per thousand cubic feet | | | | |
|------------------------------|----------------------------------|-------|-------------|------------|-------------|
| | 1947 | 1953 | | | |
| | Total | Total | Residential | Commercial | Industrial* |
| United States | 23.2 | 35.5 | 86.5 | 61.0 | 22.8 |
| Eighth District States | 36.7 | 40.7 | 82.8 | 58.5 | 24.3 |
| Arkansas | 14.2 | 19.0 | 53.6 | 39.1 | 14.3 |
| Illinois | 49.5 | 50.1 | 95.6 | 71.9 | 29.4 |
| Indiana | 57.9 | 64.2 | 105.9 | 91.0 | 37.3 |
| Kentucky | 41.0 | 38.7 | 61.4 | 52.5 | 27.4 |
| Mississippi | 23.0 | 23.6 | 73.4 | 42.3 | 15.0 |
| Missouri | 41.7 | 44.8 | 72.3 | 51.1 | 24.3 |
| Tennessee | 33.3 | 37.6 | 83.7 | 54.4 | 24.1 |

* Excludes gas for field use and carbon black production.

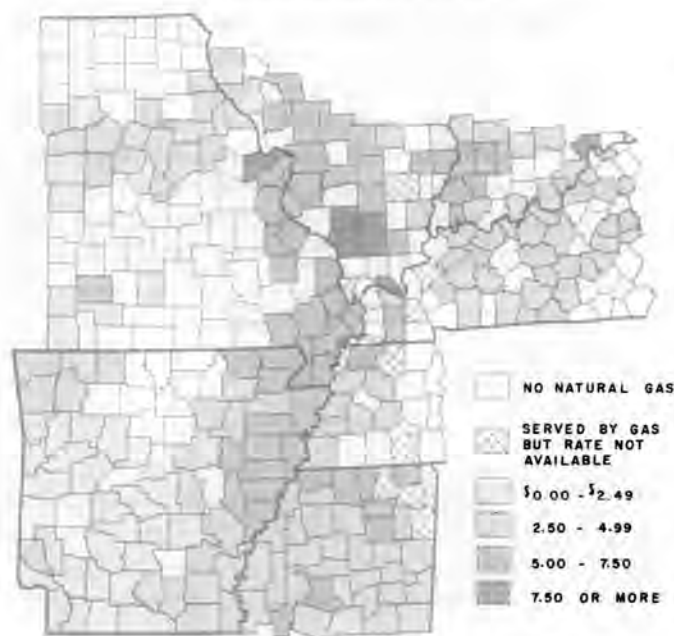
Source: Bureau of Mines.

The average value of natural gas in 1953 in district states for residential and commercial purposes was less than in the nation, but for industrial purposes it was higher. This reversed the pattern existing in 1947, when the average values in district states exceeded the national averages for all types of use.

Average Value at Point of Consumption and at Well.



Natural Gas Availability and Cost in Eighth District (for 40 therms of residential use)



Prices in the district vary widely.

As indicated by the chart, the price of gas for residential purposes other than house heating varies widely in the district. Since transportation and local distribution costs represent the major share of the delivered price of gas, areas closest to the gas fields generally have lower rates than those farther away.

District production is small and in recent years has declined.

As was noted at the outset of the article, the Eighth District can hardly boast of the amount of natural gas production within district boundaries. While there is more natural gas production in the district than in all of Europe west of the Iron Curtain, production here is only about 1 per cent of the national output. Net production in 1953 was 45.1 billion cubic feet in Arkansas, 33.5 billion cubic feet in Illinois, and 7.2 billion cubic feet in Indiana—in the aggregate 85.8 billion cubic feet.

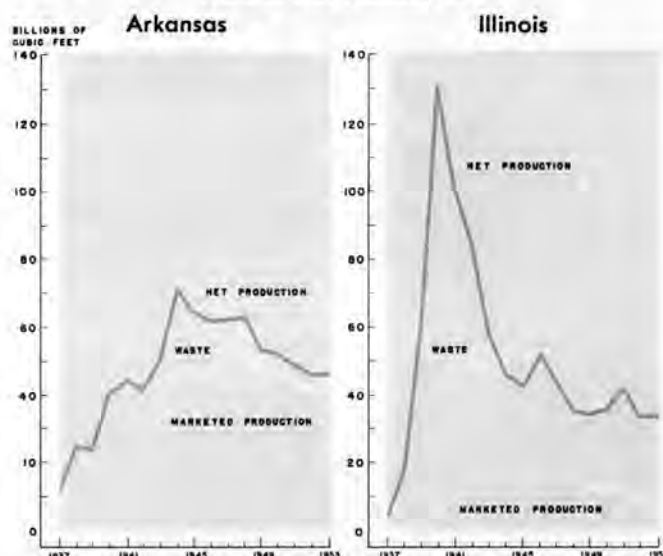
Gas is produced in other district states but primarily in fields which are outside the boundaries of the Eighth Federal Reserve District. None of the production in Tennessee and Missouri comes from fields within the Eighth District and the major part of the gas produced in both Kentucky and Mississippi is from fields outside the district. It is estimated that about 5 per cent of the Kentucky production is from fields within the district. Likewise in Mississippi most of the production is in fields in the southern half of

the state, although gas has been produced for some time from fields in northeastern Mississippi.²

The amount of natural gas flared or vented is a large percentage of total production in two district states. Although in Arkansas the amount lost during 1953 was only 3.6 billion cubic feet, 8 per cent of net production, in Illinois the figure for 1953 was estimated at 24.2 billion cubic feet, 72 per cent of net production, and in Indiana it amounted to 89 per cent of net production. Nationally, the amount of gas flared or vented was only 10 per cent in 1952.

Net production of natural gas from Arkansas and Illinois oil and gas fields has declined in recent years. In Arkansas, peak production was reached in 1944. In Illinois, the peak occurred in 1940. However, net production of gas from Indiana in 1952 was greater than in any other recent period.

Natural Gas Production.



Similarly, marketed production of district natural gas (net production less losses and waste by flaring and venting) has declined since 1948. Marketed production in 1953 was 41.5 billion cubic feet in Arkansas, 9.3 billion in Illinois, and 0.8 billion in Indiana. As was the case in terms of net production, these three states produced less than one per cent of the marketed production in the nation in 1953.

An estimated 35 billion cubic feet of solution gas was produced from Illinois oil wells during 1953, of which approximately 13.8 billion cubic feet was processed in natural gasoline plants. Something over

²Output in Arkansas, Illinois and Indiana may be used to approximate net production of natural gas in the Eighth Federal Reserve District. Some gas production in Indiana is outside district boundaries. Counting this non-district production as part of the district total tends to balance the omission of gas produced in district portions of Kentucky and Mississippi.

5 billion cubic feet, including residue gas from these plants, is believed to have been reinjected into the producing formations.

Natural gas is produced in two areas in Arkansas. Production in southern Arkansas is centered in Columbia, Lafayette, and Union counties and comes primarily from oil and condensate wells. Gross production in 1953 in southern Arkansas totaled 52.1 billion cubic feet. Most of this gas (47.8 billion cubic feet or 92 per cent) was used in natural gasoline extraction plants for the production of butane and propane and gasoline products. About 6 per cent of the gas produced from southern Arkansas fields was vented that year and a minor portion was used in the fields or put into pipelines. Gas produced in northwest Arkansas comes from dry-gas wells, that is, from a geological formation that does not contain crude oil or condensate. In 1953, 11.6 billion cubic feet of gas was produced in northwestern Arkansas fields, all of which was piped to consumers located in that general area.

Consequently, most of the natural gas consumed in the district comes from other areas.

With district production limited, about 90 per cent of the natural gas consumed in district states in 1952 was received from other states. The ratio of shipments received from other states to consumption ranged from 60 per cent in Mississippi to over 100 per cent in Indiana, Missouri and Tennessee.³ Most of the gas (92 per cent) came from the large producing areas of Oklahoma, Louisiana and Texas while Kansas

Major Interstate Shipments of Natural Gas to District States, 1952.



supplied about 8 per cent and other states supplied relatively small amounts to district states.

Gas piped from Texas, Louisiana, or Oklahoma constituted the largest portion of every district state's receipts. Shipments from Kansas supplied some areas in Missouri, Illinois and Indiana. In addition, there were minor shipments from Indiana, Arkansas and Mississippi to other district states and from West Virginia to Kentucky (see Table VI).

TABLE VI
INTERSTATE SHIPMENT OF NATURAL GAS, 1952
(Billions of Cubic Feet)

| Receiving State | Consumption | Total | Interstate Shipments Received From | | | |
|-----------------|-------------|-------|------------------------------------|-----------|----------|---------|
| | | | Arkansas | Louisiana | Oklahoma | Other |
| Arkansas | 165.6 | 128.4 | 128.3 | | | 0.1 |
| Illinois | 344.7 | 342.9 | 330.1 | 12.3 | | 0.5 |
| Indiana | 96.1 | 102.5 | 88.5 | 13.8 | | 0.2 |
| Kentucky | 87.0 | 68.6 | 67.5 | | | 0.5 |
| Mississippi | 119.6 | 71.9 | 71.9 | | | |
| Missouri | 169.0 | 172.4 | 126.0 | 46.3 | | |
| Tennessee | 99.8 | 102.7 | 102.4 | | | 0.3 (a) |
| TOTAL | 1,081.8 | 989.4 | 914.7 | 72.4 | 1.1 | 1.0 |

Note: Losses in transmission account for the excess of shipments received over consumption for states having no significant marketed production.

(a) Less than 50 million cubic feet.

Source: Minerals Yearbook, 1952 preprint.

Expanding use has required increased pipeline capacity connecting the major supply areas of the Southwest with consuming areas.

The rapid growth of demand for natural gas required the construction of pipelines to transmit the gas from major producing areas of Texas, Louisiana, Oklahoma, Kansas and New Mexico to major consuming areas in the midwest and northeastern parts of the country. Pipeline mileage for transmission of natural gas in the nation increased from 77,000 in 1945 to 125,000 in 1953, an increase of about 60 per cent. New construction of natural gas facilities authorized by the Federal Power Commission from 1947 to 1953 totaled 44,655 miles of pipelines at an estimated cost of \$3.6 billion. And the expansion of the natural gas transmission facilities is continuing—applications pending before the FPC on October 31, 1953, involved 8,000 miles of pipelines.

To some extent, expanding demand can be accommodated without new pipeline mileage. The delivery capacity of a pipeline may be enlarged by maintain-

³Total shipments received may exceed consumption because of losses in transmission.

ing a uniform and higher pressure throughout its length. This can be done by adding compressing stations to restore the pressure as the gas moves along towards its market. This means of increasing pipeline capacity is limited, however, by the strength of the steel pipe. Additional compressor stations have been added to the transmission pipelines serving some of the major areas of the district.

No additional pipelines are currently under construction to increase the capacity for serving the major cities of the district. Most of the new pipeline construction is devoted to serving the New York and New England areas, where little natural gas has been available heretofore. Three of the natural gas lines planned for construction during 1954 originate in Louisiana, and traverse parts of the Eighth Federal Reserve District on their way to their destinations north or east of the district. In addition, several pipelines cutting across the district will be built parallel to existing systems.

Underground storage facilities also help meet rising demands.

The use of natural gas for house heating imposes a highly seasonal demand pattern upon the industry. To meet the firm requirements of residential customers during peak demand periods, large customers, supplied gas on an interruptible basis, can be cut off. Some utilities have facilities for producing high BTU gas to help meet house heating peaks. Another solution to the problem is the storage of gas in geological formations, usually depleted oil or gas fields, located near the consuming areas. The distribution utility can pump gas into the underground formations in the summer when demands fall below the capacity of the transmission system and withdraw the stored gas in winter months when demands exceed the supply from the transmission pipeline. The use of underground storage facilities enables pipelines to operate at a higher average rate of capacity, and eliminates the need for additional pipeline capacity that would be utilized only in the winter. Thus, use of storage facilities makes for more efficient operation.

Underground storage has increased rapidly in recent years as the industry has attempted to meet the rising demands for service that exceed the capacity of the transmission system. The estimated ultimate capacity of underground storage facilities in the nation in 1947 was 250 billion cubic feet and had risen to 1,735 billion cubic feet in 1953. Underground storage facilities exist in the district, and more are being developed. An underground storage project be-

ing developed near St. Louis would enable Laclede Gas Company to supply house heating gas to approximately 50,000 additional customers. Construction costs of facilities for this storage project have been estimated at about \$5 million.

Southern Indiana Gas and Electric Company, which serves Evansville, Indiana, undertook drilling and other testing operations in 1953 to determine if a field, about 13 miles west of Evansville, would prove suitable for underground storage purposes. So far tests have been satisfactory and some gas has been pumped into storage.

Gas is stored in two pools in Arkansas with maximum storage of 2.4 billion cubic feet. Another underground storage facility in the district is located near Amory, in northeastern Mississippi, where an abandoned dry-gas field capable of holding 900 million cubic feet of natural gas is utilized. Louisville Gas and Electric Company owns a nearby underground storage facility with a capacity of over 3 billion cubic feet.

Proved reserves have increased but at a lower rate than rising production.

Since the district is largely dependent upon the resources of other areas for its natural gas, adequacy of the supply in other areas is relevant. Despite the rapid increase of gas production in the nation in recent years, estimated proved recoverable reserves have been increased by discoveries of new fields and new pools, extensions of known fields and revisions of prior estimates. At the end of 1953 reserves of natural gas in the nation were 211 trillion cubic feet, 28 per cent greater than at the end of 1947. About 70 per cent of total reserves is non-associated gas, that is, free natural gas not in contact with, nor dissolved in, crude oil in the reservoir. The remaining reserves are almost equally composed of gas dissolved in oil or free gas in immediate contact, but not in solution, with crude oil in the formation.

Net production last year totaled 9.2 trillion cubic feet compared with 5.6 trillion cubic feet in 1947, an increase of 64 per cent. As a result of the more rapid rise in net production of natural gas than of proved reserves, these reserves at the end of 1953 were about 23 times annual output, compared with 30 times in 1947.

With the rapid increase in gas transmission capacity, the amount of gas uncommitted to pipelines has decreased. Consequently, the decline in the ratio

of reserves to production suggests that the rate of increase in future gas consumption will be more closely related to forthcoming increases in reserves than in recent years.

Proved reserves are estimates of the known gas supplies and do not include natural gas which may be subsequently discovered or lie in unproved portions of partly developed fields. Opinions as to the total ultimate reserves in the United States currently range from about 400 to 600 trillion cubic feet, or about two or three times the current proved recoverable reserves.

Proved reserves of natural gas in the district are limited, and represent an insignificant portion of the total reserves of the United States. At the end of 1953 proved reserves in Arkansas totaled 1.2 trillion cubic feet; those in Illinois totaled 231 billion cubic feet, while those in Indiana were estimated at 36 billion cubic feet. These reserves on December 31, 1953, were 31 times annual output in Arkansas, but only eight times output in Illinois and only five times that in Indiana.

Natural gas has become an important resource for district development.

In the economy of the Eighth Federal Reserve District, natural gas—as a fuel and as a raw material—has taken its place as an important district resource. Its availability in expanding volume and at low cost has become a significant element in the growth of job opportunities in many district areas and in improving the standard of living of many district residents. Further, any appraisal of future industrial development in the district must take account of this expanding source of energy and raw materials.

It should not be overlooked, however, that continued expansion in district use of natural gas is dependent upon the national supply. Assurance of this supply requires continued discovery of new gas reserves, a problem closely allied to the exploration for oil, and increased production from proved reserves. Improved conservation of gas would also increase the supply and reduce the drain on the nation's ultimate reserves.

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Survey

OF CURRENT CONDITIONS

THERE WERE SIGNS in October that the "side-wise" movement of business activity in recent months may be turning into a gradual rise. Unemployment in the nation fell more than seasonally in early October to below 3,000,000. Production increased in a number of manufacturing industries. Judging from September contract awards and housing starts, construction also continued at high levels. On the other hand, bank loan demand was weak and farm commodity prices declined.

Likewise, more signs of improvement than weakness could be seen in the Eighth Federal Reserve District. Employment in the district's major cities showed some increase in the month, reflecting both seasonal gains in trade and manufacturing, and the impetus given by developments in Louisville and Little Rock. Construction activity, which has been one of the strengthening factors in the business situation this year, continued its rapid pace during October. Department store activity, according to preliminary estimates, increased more than the seasonal amount during October and was at an adjusted rate close to the average for the first nine months of the year. However, bank loans in the district rose less than seasonally. And prices of farm products continued downward moderately during October, further depressing income prospects in the farm sector of the district economy.

Employment

Unemployment in the nation declined by 360,000 from September to early October to 2.7 million. Total farm and nonfarm employment was estimated by the Bureau of the Census at 62.1 million, virtually unchanged from the September level.

Improvement in district labor markets in October reflected both seasonal influences and the expansion of district facilities. In most areas insured unemployment continued a gradual decline in October. Most auto plants completed re-tooling for model changeovers and called back workers temporarily laid off. Automobile manufacturing employment in Evansville is expected soon to exceed its previous peak level. Seasonal slack in shoe and apparel production and

strikes at two major electrical equipment manufacturers partly offset some pickups in St. Louis area manufacturing employment. By the end of the month, however, one of the electrical plants had resumed production.

Additions to the district's plant capacity and defense facilities aided the labor market in several areas. In Louisville, General Electric Company began hiring 2,000 more workers to staff its newly completed refrigerator plant at Appliance Park. Construction employment in the Little Rock area is growing as work on the Little Rock Air Base progresses from the clearance and grading stage to paving and the construction of base buildings. Further increases are expected in the next several months. Hiring of workers for a new automobile frame plant provided some relief in the St. Louis area where employment has been substantially below year-earlier levels.

Industry

The output of factories and mines in the Eighth District and lumber production in the South continued to edge upward in October, according to early reports. Steel ingot production in the St. Louis area advanced 12 percentage points from September to 75 per cent of capacity. Coal output, judging from the trend of the past two months and October trade reports, has picked up. Crude oil output remained high.

In the southern forest region, production of pine increased 3 per cent in early October while hardwood mills operated at 95 per cent of capacity, compared with 90 per cent in September. In Kentucky, 25 whiskey distilleries were in operation at the end of September compared with 14 operating a month earlier.

Industrial electric power consumption figures for September indicate that the gap between this year's and last year's industrial activity in the district is narrowing. Electric power used by selected industrial firms in major district cities was only 4 per cent below a year ago, whereas in August it was 12 per cent below that of 1953. From August to September this year, consumption increased 9 per cent, compared with no change in the same months last year.

Construction

The construction industry continued to be a strengthening factor in the economy. Total contract awards and residential awards in the district in September were higher than in any other month of this year and awards in the nation were above the high average of recent months. The cumulative total of district awards for the first nine months was 12 per cent higher than the value in the same period of last year. In the nation total contracts awarded in the first three quarters were also about 12 per cent higher than in 1953. Earlier this year the district gain in contracts over a year ago had been substantially smaller than the national increase.

Trade

Department store sales increased more than the seasonal amount during the first three full weeks of October and were at an adjusted rate close to the average for the first nine months of the year. Inventories at department stores were lower than a year earlier. However, commitments to buy were larger than a year earlier.

Furniture store volume at reporting district stores in September was somewhat less than in August, but was 6 per cent larger than in September, 1953.

The retail value of inventories held by reporting district department stores and furniture stores on September 30 increased over that at the end of August. In comparison to a year earlier, department store inventories were 7 per cent lower while at furniture stores they were at about the same level. The volume of outstanding orders at district department stores on September 30 was 6 per cent below that a month ago, but was substantially larger than a year ago.

Banking

From mid-September to mid-October business loans at district weekly reporting banks expanded less than seasonally. Net additions in loans to commodity dealers were less than usual, reflecting the reduced volume of cotton moving to market. Outstanding indebtedness by metal manufacturers continued to decline. And contractors made net repayments in contrast to net borrowings earlier in the year. On the other hand, manufacturers of textile, apparel and leather goods added to their indebtedness although a reduction usually occurs at this season. Loans on securities and real estate and "other", largely consumer, loans were up moderately.

Over the period, reserve positions of these banks were relatively easy, as a net inflow of funds from other areas more than offset seasonal currency drains.

These banks purchased a substantial amount (\$80 million) of securities, primarily Treasury bills and the new Treasury notes, and built up their cash assets. As a result of both bank credit expansion and net inflow of funds, the money supply in the district rose during the four weeks.

Reflecting the acceleration in the rate of saving this year, there has been a more rapid growth in time deposits at commercial banks, in both the district and the rest of the country. For the first three quarters of 1954, time deposits at district member banks rose 7 per cent, compared with 4 per cent in the corresponding period a year ago and a 3 per cent average for the like periods of the other postwar years. Most banks shared in the gain. As a group, time deposits in reserve city banks increased at a faster rate than in country banks, whereas in the previous four years the greater expansion was at country banks. Within the country bank group, banks in towns of less than 15,000 population had a smaller rate of increase in savings accounts. Time deposits in the district portions of Indiana and Illinois showed the smallest growth of any district areas.

Agriculture

The farm sector of the district economy was depressed further during October by lower prices for farm products. Reduced prices of hogs and broilers contributed most of the decline; crop prices increased slightly.

Rainfall during October was near or above normal in many parts of the district and more than last year in most areas. The moisture materially improved extremely poor pasture conditions and encouraged heavy seedings of winter and early spring pastures which may partially alleviate feed shortages existing on some farms. Both rainfall and temperature have been excellent for harvesting, rapid curing and stripping of the district tobacco crop which this year promises to be high in quality and per acre yield.

However, fall rains delayed the soybean harvest and caused moderate declines in yield and quality. Reflecting a level of marketings below expectations, soybean prices increased moderately during the four-week period ending at mid-October. In addition, the rains had an adverse effect on the quality of cotton harvested and delayed the corn harvest, but did little or no damage to the latter crop.

A record rice crop of 17 million bags was harvested in district states. However, inadequate storage facilities had a depressing effect on prices and increased the handling cost of the crop.

Cash farm receipts for August were unchanged from a year ago but, for the first eight months of 1954, were 6 per cent below the same period last year.

The DISTRICT RECORD

VARIOUS INDICATORS OF INDUSTRIAL ACTIVITY

| | | | |
|---|--------|------------|--------------------|
| Industrial Use of Electric Power (thousands of KWH per working day, selected industrial firms in 6 district cities) | 12,547 | Sept. 1954 | Percentage Change* |
| Steel Ingot Rate, St. Louis area (operating rate, per cent of capacity) | 63 | | + 9% |
| Coal Production Index—8th Dist. (Seasonally adjusted, 1935-1939=100) | 125 p | | + 26 |
| Crude Oil Production—8th Dist. (Daily average in thousands of bbls.) | 323.8 | | + 9 |
| Freight Interchanges at RR—St. Louis (Thousands of cars—25 railroads—Terminal R. R. Assn.) | 89.6 | | + 1 |
| Livestock Slaughter—St. Louis area. (Thousands of head—weekly average) | 113.4 | | + 4 |
| Lumber Production—S. Pine (Average weekly production—thousands of bd. ft.) | 182.4 | | + 2 |
| Lumber Production—S. Hardwoods. (Operating rate, per cent of capacity) | 92 | | + 1 |

* Percentage change figures for the steel ingot rate, Southern hardwood rate, and the coal production index, show the relative per cent change in production, not the drop in index points or in percents of capacity.
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Banking

BANK DEBITS¹

| | Sept. 1954 (In millions) | Percentage Change from Aug. 1954 | Sept. 1953 |
|---|-----------------------------|-------------------------------------|------------|
| Six Largest Centers: | | | |
| East St. Louis-National Stock Yards, Ill. | \$ 130.0 | + 4 % | - 2 % |
| Evansville, Ind. | 135.6 | - 10 | - 14 |
| Little Rock, Ark. | 162.8 | + 3 | + 7 |
| Louisville, Ky. | 708.7 | + 6 | + 3 |
| Memphis, Tenn. | 752.3 | + 28 | + 14 |
| St. Louis, Mo. | 1,938.4 | + 4 | - 3 |
| Total—Six Largest Centers | \$3,827.8 | + 5 % | + 1 % |
| Other Reporting Centers: | | | |
| Alton, Ill. | \$ 33.7 | - 0 % | - 5 % |
| Cape Girardeau, Mo. | 14.1 | + 6 | - 1 |
| El Dorado, Ark. | 27.9 | + 8 | + 8 |
| Fort Smith, Ark. | 49.1 | - 9 | + 12 |
| Greenville, Miss. | 29.0 | + 37 | + 23 |
| Hannibal, Mo. | 8.9 | + 2 | - 7 |
| Helena, Ark. | 12.8 | + 87 | + 33 |
| Jackson, Tenn. | 26.1 | + 23 | + 11 |
| Jefferson City, Mo. | 69.9 | + 24 | - 9 |
| Owensboro, Ky. | 38.5 | + 3 | - 8 |
| Paducah, Ky. | 31.1 | - 3 | - 15 |
| Pine Bluff, Ark. | 39.2 | + 37 | - 4 |
| Quincy, Ill. | 35.4 | + 2 | + 1 |
| Sedalia, Mo. | 12.7 | + 2 | + 1 |
| Springfield, Mo. | 71.8 | - 2 | + 5 |
| Texarkana, Ark. | 17.4 | + 3 | - 19 |
| Total—Other Centers | \$ 517.6 | + 9 % | - 0 % |
| Total—22 Centers | \$4,345.4 | + 6 % | + 1 % |

INDEX OF BANK DEBITS—22 Centers Seasonally Adjusted (1947-1949=100)

| | 1954 | 1953 |
|-------|-------|-------|
| Sept. | 139.4 | 137.6 |
| Aug. | 137.6 | 138.4 |

¹ Debits to demand deposit accounts of individuals, partnerships and corporations and states and political subdivisions.

Agriculture

CASH FARM INCOME

| (In thousands of dollars) | Percentage Change |
|---------------------------|-----------------------------|
| | Jan. thru Aug. |
| | Aug. '54 compared with 1954 |
| | Aug. '53 1954 |
| | 1953 1952 |
| Arkansas | \$ 20,805 + 6% - 4% - 13% |
| Illinois | 137,304 - 4 + 1 - 3 |
| Indiana | 93,892 - 5 - 0 - 0 |
| Kentucky | 30,935 - 1 - 8 - 5 |
| Mississippi | 22,600 + 10 - 21 - 7 |
| Missouri | 78,544 - 3 - 3 - 1 |
| Tennessee | 25,657 - 10 - 9 - 15 |
| 7 States | \$409,737 - 3% - 3% - 4% |
| 8th Dist. | \$167,817 - 1% - 6% - 5% |

Source: State data from USDA preliminary estimates, unless otherwise indicated.

Construction

INDEX OF CONSTRUCTION CONTRACTS AWARDED EIGHTH FEDERAL RESERVE DISTRICT* (1947-1949=100)

| Unadjusted | Aug. 1954 | July 1954 | Aug. 1953 |
|---------------------|-----------|-----------|-----------|
| Total | 211.2 p | 193.8 | 188.0 |
| Residential | 282.2 p | 249.1 | 176.9 |
| All Other | 178.3 p | 168.1 | 193.2 |
| Seasonally adjusted | | | |
| Total | 173.6 p | 152.5 | 154.0 |
| Residential | 235.2 p | 212.9 | 147.4 |
| All Other | 145.0 p | 124.5 | 157.1 |

* Based on three-month moving average (centered on mid-month) of value of awards, as reported by F. W. Dodge Corporation.

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ASSETS AND LIABILITIES OF EIGHTH DISTRICT MEMBER BANKS

(In Millions of Dollars)

| | Weekly Reporting Banks | All Member Banks |
|----------------------------------|------------------------|------------------|
| | Change from | Change from |
| | Oct. 13, 1954 | Sept. 29, 1954 |
| Assets | Sept. 15, 1954 | Aug. 25, 1954 |
| Loans (Net) ¹ | \$1,377 | \$2,101 |
| Business and Agricultural | 681 | 52 |
| Security | 38 | 29 |
| Real Estate | 268 | 3 |
| Banks | 36 | - 0 |
| Other (largely consumer) | 372 | + 14 |
| U. S. Government Securities | 1,198 | + 5 |
| Other Securities | 222 | + 74 |
| Cash Assets | 964 | 2,130 |
| Other Assets | 39 | 448 |
| Total Assets | \$3,800 | \$6,169 |
| Liabilities and Capital | \$+ 163 | \$+ 96 |
| Demand Deposits of Banks | \$ 806 | \$ 782 |
| Other Demand Deposits | 2,143 | 3,712 |
| Time Deposits | 542 | 1,171 |
| Borrowings and Other Liabilities | 65 | 75 |
| Total Capital Accounts | 244 | 429 |
| Total Liabilities and Capital | \$3,800 | \$6,169 |

¹ Loan breakdowns reported gross for weekly reporting banks, not available for all member banks.

Trade

RETAIL FURNITURE STORES

| | Net Sales | Inventories |
|------------------------------|-------------------------------------|-------------------------------------|
| | Sept., 1954 compared with Aug., '54 | Sept., 1954 compared with Aug., '54 |
| | Sept., '53 | Sept., '53 |
| 8th Dist. Total ¹ | - 2% | + 6% |
| St. Louis | + 2 | + 6 |
| Louisville Area ² | - 14 | + 10 |
| Louisville | - 15 | + 10 |
| Memphis | - 18 | + 4 |
| Little Rock | - 17 | + 5 |
| Springfield | + 7 | + 1 |

* Not shown separately due to insufficient coverage, but included in Eighth District totals.

¹ In addition to following cities, includes stores in Blytheville, Fort Smith and Pine Bluff, Arkansas; Hopkinsville, Owensboro, Kentucky; Greenwood, Mississippi; and Evansville, Indiana.

² Includes Louisville, Kentucky; and New Albany, Indiana.

PERCENTAGE DISTRIBUTION OF FURNITURE SALES

| | Sept., '54 | Aug., '54 | Sept., '53 |
|--------------|------------|-----------|------------|
| Cash Sales | 14% | 14% | 14% |
| Credit Sales | 86 | 86 | 86 |
| Total Sales | 100% | 100% | 100% |

DEPARTMENT STORES

| | Net Sales | Stocks on Hand | Stock Turnover | Percentage of Accts. and Notes Receivable, Outstanding Sept. 1, 1954, collected during Sept. |
|-------------------------------|-------------------------------------|----------------|--------------------------|--|
| | Sept., 1954 compared with Aug., '54 | Sept. 30, '54 | Jan. 1 to Sept. 30, 1954 | Excl. Instalment Accounts |
| | Sept., '53 | Sept. 30, '53 | 1954 | 1953 |
| 8th F.R. District Total | + 6% | - 0% | - 2% | 17% |
| Fort Smith Area, Ark. | + 10 | - 8 | - 2 | 47% |
| Little Rock Area, Ark. | + 14 | - 1 | - 5 | 42 |
| Quincy, Ill. | - 1 | + 4 | - 3 | 45 |
| Evansville Area, Ind. | + 3 | - 14 | - 13 | |
| Louisville Area, Ky., Ind. | + 7 | - 1 | - 3 | |
| Paducah, Ky. | + 6 | - 18 | - 18 | |
| St. Louis Area, Mo., Ill. | + 7 | + 4 | - 9 | |
| Springfield Area, Mo. | + 7 | + 4 | - 3 | |
| Memphis Area, Tenn. | + 1 | - 0 | + 1 | |
| All Other Cities ² | + 7 | - 10 | - 14 | |

INDEXES OF SALES AND STOCKS—8TH DISTRICT

| | Sept. 1954 | Aug. 1954 | July 1954 | Sept. 1953 |
|---|------------|-----------|-----------|------------|
| Sales (daily average), unadjusted ³ | 111 | 100 | 89 | 110 |
| Sales (daily average), seasonally adjusted ³ | 104 | 110 | 112 | 103 |
| Stocks, unadjusted ⁴ | 111 | 116 | 119 | 138 |
| Stocks, seasonally adjusted ⁴ | 104 | 119 | 128 | 129 |

³ Daily average 1947-49=100

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⁴ End of Month average 1947-49=100

Trading days: Sept., 1954—25; Aug., 1954—26; Sept., 1953—25.

² Fayetteville, Pine Bluff, Arkansas; Harrisburg, Mt. Vernon, Illinois; Vincennes, Indiana; Danville, Hopkinsville, Mayfield, Owensboro, Kentucky; Chillicothe, Missouri; Greenville, Mississippi; and Jackson, Tennessee. Outstanding orders of reporting stores at the end of September, 1954, were 15 per cent larger than on the corresponding date a year ago.