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Chapter 6

Pipelines[1]

The first considerable pipeline was laid in 1875. Some 60 miles long, it connected Pennsylvanian oil wells with Pittsburgh. Growth during the 1880's was rapid and by 1892 about 3,000 miles of trunk lines had been built.[2] Their construction resulted in a general removal of refinery capacity from oilfields to consuming centers. Under the Hepburn Act of 1906 pipelines were not finally declared to be common carriers subject to the Interstate Commerce Commission until 1914.[3] The Commission did not begin to collect statistics systematically until 1920, at which time about 25,000 miles of trunk lines were subject to its jurisdiction. Since 1920 ICC trunk lines have increased, through additional construction, to about 70,000 miles.[4]

The industry was therefore already well developed at the earliest date for which we have traffic and employment figures. The traffic figures in Table 29 and Chart 19 are for interstate trunk lines only and therefore cover less than half the industry's total pipeline mileage, but four-fifths of all trunk-line mileage. Traffic per mile of trunk is much greater than per mile of gathering line, and we may say confidently that the traffic figures (Appendix Table G-1) upon which our indexes are based account for much more than half of the entire industry. Whatever the

[1] For a description of how pipelines are constructed and operated, see David D. Leven, *Done in Oil* (Ranger, 1941), Chapter XXII; technological changes in pipeline transportation are reviewed in O. E. Kiessling and others, *Technology, Employment, and Output per Man in Petroleum and Natural-Gas Production* (National Research Project, Philadelphia, 1939), Chapter IX.

[2] Federal Trade Commission, *Report on Pipe-Line Transportation of Petroleum* (1916), p. 47.

[3] U. S. *v.* Ohio Co. et al. (234 U. S. 548).

[4] The inclusion of intrastate and gathering line mileage would roughly double each of the totals mentioned.

Table 29

OIL PIPELINES: OUTPUT, EMPLOYMENT, AND PRODUCTIVITY, 1921-1946[a]
1939 : 100

	Output[b] (ton-miles)	*Employment* (no. of workers)	*Output per Worker*
1921	18	62.6	29
1922	25	83.9	29
1923	27	116.0	23
1924	34	108.3	31
1925	40	99.8	40
1926	43	131.8	33
1927	54	137.0	40
1928	62	121.8	51
1929	72	113.1	63
1930	77	105.8	73
1931	77	95.7	80
1932	80	78.5	102
1933	89	91.0	98
1934	95	100.5	94
1935	86	103.7	83
1936	93.6	112.0	84
1937	104.8	116.7	90
1938	99.0	105.0	94
1939	100.0	100.0	100
1940	105.7	104.0	102
1941	121.3	107.8	113
1942	132.5	111.6	119
1943	155.7	113.0	138
1944	174.3	113.3	154
1945	169.9	114.5	148
1946	167.5	124.4	135

[a] Covers only lines reporting to the ICC. Throughout the period ICC trunk lines represented between 80 and 83 percent of all trunk line mileage. Based on Appendix Table G-1.

[b] Trunk line movement only. Same series is given for 1920-1946 in Table 8.

exact fraction is, it probably remained fairly steady during the period covered, for we know that ICC as a proportion of total mileage did not vary much;[5] and that substantially all oil gathered has to move over trunk lines.

The employment figures are not exactly comparable with output. That is to say, they cover interstate lines only, but include

[5] ICC trunk line mileage was 82.2 percent of total trunk line mileage in 1924, and 81.8 percent in 1945.

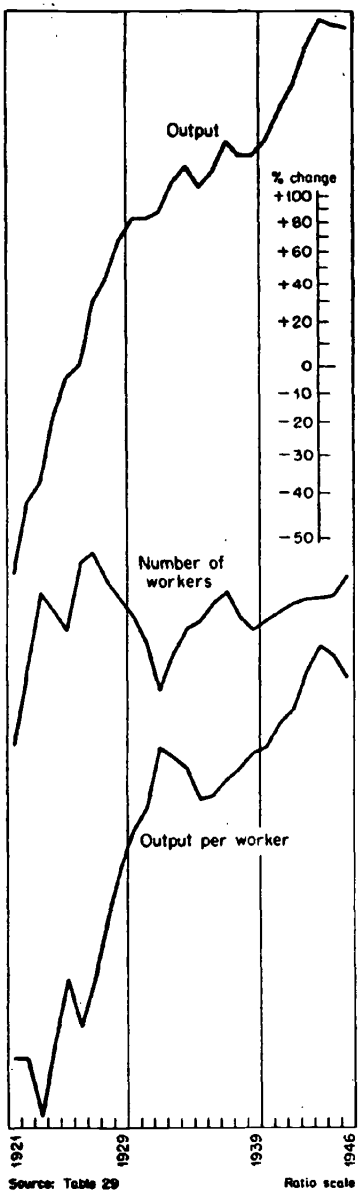
work on gathering as well as trunk lines. The preponderance of trunk line movement suggests that this is not a serious qualification.[6]

During the 25 years ending in 1946 output (ton-miles of transportation) grew very nearly tenfold, and output per worker about fivefold. The employment figures include an unknown proportion of construction workers, in addition to the regular operating and maintenance forces. The rather sharp fluctuations in employment and output per worker are consequently to be explained by variations in the amount of new construction or major replacement.

Yet the upward trend in output per worker during the period observed is striking, and must be assumed to reflect mainly an improvement in ton-miles per operating employee. Among factors

[6] ICC trunk line mileage rose from 50.0 percent of total ICC mileage in 1924 to 61.5 percent in 1946. These figures suggest that our indexes of output and productivity may have a slight upward bias; however, traffic per mile of gathering is so much less than traffic per mile of trunk-line that the bias can hardly be important.

Chart 19
OIL PIPELINES: OUTPUT, EMPLOYMENT, AND PRODUCTIVITY



responsible may be mentioned more efficient pumping machinery, pipe of larger diameter, and perhaps longer hauls. In recent years Diesel engines have received wide application for pumping. Still more recently electric pumps operating on the centrifugal principle have been introduced. The diameter of trunk lines has increased over the years from 4 or 6 inches to as much as 16 inches at the present time: average diameter now exceeds 8 inches. Average haul has lengthened from about 200 miles at the beginning of the 1920's to about 350 miles today.

Other changes have also occurred. Maintenance work has been greatly simplified through the introduction of more reliable and durable lines, and through newer methods of finding and dealing with failures. From about 1925 oxyacetylene welding in the original construction of lines began greatly to reduce subsequent failures at joints. Further, the control of electrolysis reduced corrosion. Meanwhile the use of aircraft for locating failures was developed. In 1928 an ingenious application of electric welding enabled lines to be patched without the necessity of emptying them beforehand.