NOTES ON THE PRESENT STATUS OF WATERWAY DEVELOPMENT IN THE UNITED STATES.

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From the time the first Virginia Colony dropped anchor in the James River in 1607 to the present day, the use of the waterways of America has been a problem of greater or less prominence. Oddly enough, in the early history of our country, the advisability of attempted improvements of the inland waterways was much doubted. Benjamin Franklin, writing from Europe in 1772 concerning the experiences of the engineers in the Old World in their attempts to harness the streams, said, "Rivers are ungovernable things" and further stated that "the English engineers seldom use a river if it can be avoided."[1] This may have been the echo to an ancient Spanish decree to the effect that "since God has not made the rivers of Spain navigable, it is sacrilegious for man to attempt to do so."

All along the Atlantic seaboard a storm of ridicule and criticism was hurled at the men who advanced ideas and plans for the improvement of the waterways. It formed the topics for the cartoonist and "funny page" writers of the time. However, in the face of the ridicule a number of companies were formed and proceeded to carry out various plans of waterway improvement. Among these were, "The Potomac Company", 1785; "The Society for the Promotion of Navigation", 1791; and "The Western Inland Lock and Navigation Company", 1792.

The success of the Erie Canal in 1825 turned the tide in favor of waterway improvement and ushered in the period of great extension of inland waterway utilization, especially the construction of canals. Since 1825 waterway improvement has been accepted as an avowed policy of our government, and has been given almost universal approval by the American people. President Coolidge in his first two messages to congress advocated "The fullest possible development of our waterways." As it was unpopular in the early days to advocate stream improvement, so has it now become unpopular to even question the advisability of such work. Vast sums are appropriated by congress at each session for river and harbor improvements, for example, the amount expended in 1924 for such improvements amounted to over $62,000,000.00.[2]

Of the estimated 25,000 miles of navigable waters in the United States, exclusive of the Great Lakes, the Mississippi proper contains 1,944 miles, the Missouri 2,285 miles, and the Ohio 968 miles. These streams with their tributaries have received the greater attention and large sums have been appropriated for their improvement.

[1] The Paths of Inland Commerce, A. B. Hulbert, pp. 30-31. Yale University Press, 1920.

[2] Ann. Rept. Chief of Eng. U. S. Army, 1924, pp. 3-5. Government Printing Office, Washington, D. C.

"Proc. Ind. Acad. Sci., vol. 36, 1926 (1927)."

The Ohio River Project. The Ohio River has an unusually favorable location. Its source is in the center of a great industrial district, some of its tributaries feed from the largest coal-producing fields of the United States, its east-west extension is in the direction of the movement of the great mass of American trade, and its mouth, nearly a thousand miles from its source, is in the heart of a wealthy agricultural region. These seem to be sufficient reasons for the undertaking of a gigantic project of improvement. The project is designed to furnish a continuous channel of nine feet depth at low water from Cairo, Illinois, to Pittsburgh, by the construction of 50 movable dams with locks. The original project called for 54 dams, but by adjustments of height and slightly shifting of positions of some of them it seems now that 50 or 51 will be adequate.

The status of the project on October 1, 1926, as reported by the Chief Engineer of the Central Division, Cincinnati, was as follows: 42 dams were completed,[3] and dam No. 45 was 95 per cent complete. Numbers 46, 47, and 49 were between 60 and 70 per cent complete; numbers 50 and 52 were 45 per cent, number 51 was 37 per cent, and number 53 was 35 per cent complete. The slogan is "On to Cairo by 1929."

Cost of the Project. The amount expended on new work to the end of the fiscal year 1924 was $76,631,576.[4] The estimated cost of the project when finished is $103,059,130. This does not include the cost of improving the channel, operating dredge and snag boats, nor the cost of annual maintenance. The latter estimate made in 1906 was $810,000 annually, which in 1926 would probably be three times that amount. The cost of operating snag and dredge boats annually for the past 100 years (1827-1924) has been $110,000. To this should be added interest on the sums invested and a sinking fund to provide for the return to the government of the principal sum. Computing this on the basis of the estimates of the cost of the completed improvements, together with 4 per cent interest on the investment as it accumulates during the 25-year period of construction, and providing for the retirement of the principal sum in 50 equal annual installments, together with the annual cost of upkeep would require an annual payment of about $7,500,000 for 50 years, or after completion, to 1980 A. D.

Traffic on the Ohio River. The tonnage hauled on the Ohio River as given in the annual reports of the Chief of Engineers of the U. S. Army 1919-1924, show a general increase, but with a larger tonnage for 1920 than for any other year previous to 1924, when the tonnage hauled was 10,866,683 short tons. This was double the tonnage hauled in 1919. The traffic for 1925 was reported to the writer by the Division Chief of Engineers of the Central Division as 15,737,015 tons and for the first nine months of 1926 as 13,604,353 tons, estimating the total tonnage for this year at about 18,000,000 tons. All of these data seem

[3] Dams 1 and 2 have been replaced by the Emsworth Dam, No. 42 has been abandoned, No. 41 at Louisville is being rebuilt and no work has been started on No. 54.

[4] Ann. Rept. Chief of Eng. U. S. Army, 1924, pp. 1210-1229.

to indicate a marked increase in traffic with the extension of the improved sections of the river. The data, however, should be closely scrutinized before drawing conclusions as to the value of the project.

Of the 8,000,000 tons of freight in 1923, only a little over 6,000,000 tons passed through the locks. The rest used the open channel, and at least that amount would have used the river if no improvements had been made. Three classes of traffic, i. e., coal, sand and gravel, and iron and steel goods make up 90.3 per cent of the upstream traffic, and 95.8 per cent of the downstream traffic. Of the downstream traffic, coal alone made up 88 per cent with an average haul of 59.8 miles. In the up-stream traffic, on the other hand, sand and gravel composed 54 per cent with an average haul of 9.8 miles.[5]

Much of the apparent increase of traffic of 1925 over that of 1924 is due to a change in the method of collecting data. Three of the five million tons increase included sand and gravel taken from the bottom of the river in the dredging operations and was not hauled out of the pool in which it was dredged. This item, not included in previous reports, can hardly be included in the statistics of commercial benefits of the improvements. An increase of shipment of over a million tons of coal and coke is, however, worthy of note.[6]

The average tonnage hauled on the river 1919-1923 was about 12,000,000 tons. As has been noted, nearly all of it has been coal and sand and gravel, and the average haul through the locks was about 50 miles. About one-fourth of the total traffic was through channel and open river, not using the locks, and presumably not dependent on the improvements made. The total cost as previously calculated (the payment of $7,500,000 per year for 50 years) would pay the freight by rail on 9,000,000 tons of coal for a distance of 52 miles. In other words, the actual cost to the government of the improvements of the Ohio River is sufficient to pay the freight on the average amount of traffic through the locks for the five-year period, and would continue to pay the railway freight rate on that amount for 50 years. Yet the government furnishes the improvements for the transportation companies and does not receive one cent in return for the use of the stream, nor for the use of the locks. What business institution could survive by such methods? If the government is recompensed, it must be by indirect results.

While waterway improvements may have many other beneficial results, as the storage of storm waters to reduce floods or to furnish water power, it should be noted that the improvements of the Ohio River are in the form of movable dams for aid to navigation. The dams are lowered during high water and during the winter time, and are used only during low water conditions of the summer, and are of no aid to either flood prevention nor to water power development. If the project has justification, it must be found in its benefits to navigation.

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[5] Com. Statistics of Rept. of Chief of Eng. U. S. Army 1924, pp. 1016-1020.

[6] Blue print data furnished by Division Chief of Eng. Central Division, not yet published.

Improvement of the Tributaries of the Ohio River. During the period of improvement of the Ohio River, most of its tributaries were undergoing improvement also. The chief tributaries on which a series of dams have been built, the number of dams, the miles of navigable waters provided, the cost of the construction of dams and locks, and the tonnage for the year 1923 is given in table I. While the dams on the Monongahela River are all in operation, it will be necessary to rebuild a number of them which were originally built by the Monongahela Navigation Company and will involve an additional expenditure of $5,875,000. The average tonnage 1916-1923 was about 18,400,000 tons, three-fourths of which was coal.

The Allegheny River project involves the construction of eight dams and the removal or elevation of seven bridges in Pittsburgh. The latter is being rapidly pushed forward. This project when completed will give a navigable depth for 61 miles. More than one-half the tonnage moved during 1923 was sand and gravel.

TABLE I. The improved tributaries of the Ohio River showing for each stream the number of dams constructed, the number of miles navigable above the mouth of the stream, the cost of the improvements to June 30, 1924, and the tonnage hauled during the year 1923. (Annual Report of the Chief of the Engineers, U. S. Army, to the Secretary of War, 1924, Government Printing Office, Washington, D. C., 1924.)

River	Number Dams	Miles Navigable	Cost	Tonnage 1923
Monongahela	14	130	$8,940,000	23,560,000
Allegheny	5	29	3,500,000	4,612,640
Muskingum	11	91	2,988,000	214,261
Little Kanawha	5	48	631,918	98,088
Kanawha	10	90	7,063,300	1,572,821
Big Sandy	7	50	1,649,000	22,000
Kentucky	14	248	4,175,000	167,000
Green	7	196	3,478,500	338,000
Rough-Green	2	71	145,141	531
Wabash	1	91	260,000	87
Cumberland	15	318	13,737,000	413,000

Effects of Improvements on Freight Rates. One of the strong arguments for the investment of large sums on waterway improvement is that it is more than compensated for in reduced freight rates. The freight rates on five of the tributaries of the Ohio (Chief of Engineer's Report for 1924) is given in table II, and a comparison is made with the freight rates by rail for the same commodities. A study of the table shows that for these rivers, the average per ton mile rate for eight commodities on the five rivers was 74 per cent higher than the rate by rail between Bloomington, Indiana, and Indianapolis. The government has spent $28,500,000.00 to make these streams usable, but with the result that the shippers must pay even higher rates than those who have no waterways. It appears that the investment, at least on small streams, is an unadvisable expenditure of the Nation's money.

The decrease in river transportation from the hey-day of steamboat traffic on the Mississippi and Ohio to almost nothing, is explained by many as being due to the winding course of the streams, the silting of their channel, unfair competition of the railroads, and other causes. While the removal of the forests, continued cultivation of the land, and other causes may have resulted in a slightly increased silting of the

TABLE II.—Showing the freight rates per ton mile of nine commodities on five of the tributaries of the Ohio River, with averages for each river and for each commodity; also the railway rates for the same commodities between Indianapolis and Bloomington, Indiana. (Annual Report of the Chief of Engineers of the U. S. Army—Commercial Statistics compiled by the Statistical Division, 1924. U. S. Government Printing Office, Washington, D. C.) Railway rates quoted by Illinois Central Freight Agent, Bloomington, Ind.

Commodity	Muskingum	L. Kanawha	Kanawha	Kentucky	Cumberland	Average of Rivers	Railway
Cattle	$.15	$.15	$.20	$.0615	$.049	$.1165	$.057
Hogs	.15	.12	.25	.0615	.038	.1239	.066
Sheep	.15	.12	.16	.0165	.055	.1093	.071
Fzrm produce	.06	.12	.072	.034	.053	.069	.....
Grain	.11	.12	.09	.0265	.034	.0961	.048
Furniture	.16	.17	.145	.03	.125	.126	.086
Sawed lumber	.10	.06	.10	.0153	.033	.061	.046
Coal	.09	.12	.....	.004	.....	.071	.016
Sand—gravel	.04	.06	.055	.0034	.....	.0396	.0166
Averages	.112	.112	.134	.0328	.057	.0902	.0518

channels, the truth is that streams have essentially the same characteristics today they had when steamboat traffic was at its height. The steamboat supplanted other means of travel because it was the fastest, most commodious, and cheapest means of transportation then available. When other means of travel with similar advantages over the steamboat were introduced, the importance of the steamboat correspondingly declined. Today, with steam and electric railways, and excellent highways for automotive traffic competing with the river transportation, it is difficult to see how the investment of any sum, however large, can greatly increase river shipments. River traffic must be confined to commodities of large bulk, great weight, and small value per bulk, in which time is a minor element in their movement. Even the shipment of these must be sought through the inducement of cheaper freight rates. Can these rates be made cheap enough, and the traffic great enough to justify the expenditure of so many millions of dollars?