

**REPORT ON THE
WATER-POWER OF
THE ST. LOUIS RIVER**

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Report on the water-power of the St. Louis River by John Birkinbine

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JOHN BIRKINBINE

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1888

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25 N. E. City Hall Square,

PHILADELPHIA, February 10th, 1888.

J. M. BUTLER, Esq.

Secretary and Treasurer, St. Louis River Water-power Co.
Room 21, 119 S. Fourth St., Philadelphia.

DEAR SIR: With this, please find my report upon the water-power of the St. Louis River in the States of Minnesota and Wisconsin.

This report is based upon data collected in four visits to the property of your company, supplemented by examinations of the reports of others, to which reference will be made in the text.

Yours respectfully,

JOHN BIRKINBINE.



REPORT

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A section of the State of Minnesota, 100 miles north of the city of Duluth, is notable on account of its mineral wealth, and also by reason of being the headwaters for three great drainage-basins. Here, within twelve miles, are sources which form streams flowing

[a] Into the Mississippi River, and thence into the Gulf of Mexico.

[b] Into Vermilion Lake, and thence to the Atlantic Ocean via Hudson's Bay.

[c] Into the St. Louis River, and thence by the chain of great lakes, the St. Lawrence River and Bay, into the Atlantic Ocean.

This water-divide is, however, of moderate elevation, being from 1,600 to 2,000 feet above tide, or 1,000 to 1,400 feet above Lake Superior. Where the Duluth and Iron Range Railroad crosses from the drainage-basin of Lake Superior to that of Hudson's Bay, the maximum elevation is 1,597 feet above tide. This section of St. Louis County, Minnesota, consists of a series of alternating and interlacing swamps and ridges, covered with timber, forming excellent gathering-ground for water. With the exception of the territory opened up by the development of the iron-ore mines in the vicinity of Vermilion Lake and the construction of the Duluth and Iron Range Railroad connecting these mines with Lake Superior, or of that explored by the United States engineers in the construction of storage-reservoirs to maintain the flow of the Mississippi River, this section has been until very lately an unbroken wilderness.

In 1883, when my first report upon the water-power of the St. Louis River was prepared, the vicinity described was inaccessible except by tedious overland journey or by following the streams in birch-bark canoes to portages. Now, however, the exploitation of the deposits from which in four years one million tons of excellent iron-ores have been taken, and carried seventy miles to Lake Superior for shipment eastward, has brought a population of 8,000 to 10,000 to this vicinity, and exploration-work to the east is rapidly developing new territory and populating the district. Most of this development, however, is on the drainage-area which ultimately leads into Hudson's Bay, and does not materially influence that which now commands attention, viz.: the St. Louis River basin. The same may be said concerning the dams constructed by the Government engineers at the headwaters of the Mississippi; but the data collected in the surveys, gaugings, etc., offer valuable assistance in determining the quantity of rain falling on the watershed of the St. Louis River, and consequently of estimating the minimum and average flow of the stream and the power which can be developed by utilizing the water.

The settlement of the territory adjacent to the St. Louis River drainage-area will naturally affect its utilization for agricultural purposes; but so much of the swamp-land is covered with timber of comparatively little commercial value, that the denudation of the forests does not promise to be as rapid as the neighboring development might indicate.

REPORTS AND ESTIMATES.

The possibilities of utilizing the water-power of the St. Louis River attracted attention in the early settlement of the head of Lake Superior, and the opportunities offered for transforming the picturesque "dalles" into sources of power for manufacturing-purposes have been examined by numerous persons skilled in the various industries or in the specialty of hydraulics.

In 1870, Mr. James B. Francis, C. E., of Lowell, Mass., reported upon the method of developing a portion of the water-power of the St. Louis River at Thomson, Minnesota.

In 1871, Mr. C. S. Hollingsworth, C. E., made an estimate of the power which could be supplied by the St. Louis River.

In 1872, Mr. J. F. Stevens, C. E., of Minneapolis, prepared estimates of the cost of improving this water-power.

Messrs. P. S. Harris, L. S. Bayles, Geo. R. Stantz, and Jos. McIntyre, C. E., have also surveyed the river or estimated for its improvement.

In 1883, Mr. John Birkinbine, C. E., of Philadelphia, made an examination of the water-power of the St. Louis River, and prepared a full report upon it, using in connection with his data such of the information previously collected as had been preserved.

In 1884, Mr. R. C. Reid, C. E., of Edinburgh, Scotland, prepared a report for British interests, in which he endorses and uses many of the figures presented by the writer in the preceding year.

In 1887, Mr. E. C. Burns, C. E., of Jamestown, New York, prepared a report upon data collected in a visit to the "dalles" and to the drainage-area of the St. Louis River, in company with the writer.

In the same year, Mr. A. E. Lehman, C. E., of Philadelphia, spent several weeks making the necessary surveys of the "dalles" of the St. Louis River, from which the accompanying excellent topographical map and profile have been prepared.

The present report will therefore refer to the work of all of these gentlemen, and, while it will in some features repeat from the writer's report of 1883, it will also quote from other reports and embody data collected in each of the four visits to this interesting section of the country.

SKETCH OF THE ST. LOUIS RIVER.

The St. Louis River has a length of over 100 miles, and is formed by several important branches flowing south to southwest with but slight declivity, until they unite in a common stream which cuts its way through slate and sandstone barriers, and, bending abruptly to the east, dashes by picturesque cascades, rapids, and cataracts of impressive size, to the level of Lake Superior. Of the total fall (approximately 1,000 feet) of the

river, 540 feet are between Knife Falls and Fond du Lac, a distance of 16 miles; the latter place was for many years the head of lake-navigation, and is fifteen miles distant from Duluth. The river may therefore be considered as consisting of:

1st. The tributaries draining timbered areas, and falling, say 460 feet in seventy miles.

2d. The "dalles" or rapids where the river cuts through the rocky barrier, falling 540 feet in sixteen miles.

3d. The navigable stream (without fall), extending fifteen miles from the foot of the "dalles," near Fond du Lac, to Duluth harbor, at the head of Lake Superior.

The St. Louis River, considered as the most important tributary of Lake Superior, would seem destined to achieve a reputation for the wealth produced by utilizing its water-power, much greater than now accredited to it on account of the natural beauties of the "dalles." "It is itself the ultimate terminus of, all things considered, the most remarkable system of waterways on the surface of the globe, stretching from the Atlantic Ocean on the east to the heart of the North American continent on the west," through territory which embraces our great grain, lumber, iron-ore, and copper resources, and past much of the nation's industrial and commercial development.

"What more picturesque journey can be described than one which would be made by a log starting near the low continental divide at the headwaters of the St. Louis River, at an elevation of 1,600 feet above the sea, down this river and through the "dalles" into the calm waters of St. Louis Bay, and then, with an average volume of not less than 2,400 cubic feet per second, through Superior Bay, out into Lake Superior, whose elevation is 601.78 feet, which it traverses for 375 miles, leaving it with a volume of 90,783 cubic feet of water per second pouring over the Sault Ste. Marie, and then through the St. Mary River into Lake Huron (elevation 581.28 feet), thence through St. Clair Lake and river with a volume of 234,000 cubic feet per second to the Detroit River and Lake Erie (elevation 572.86), from which it emerges through the Niagara River with a volume of 243,000 cubic feet per second, and dashes over the rapids and cataract to Lake Ontario (elevation 246.61 feet)? Traversing this, the last lake of the great chain, it completes the journey of 1,500 miles through