

The only facts which militate against the validity of the limit assigned are that a survey of the two strata up and down the river for several miles shows them to be conformable; but as stated above, in Ripley county the fifty feet of non-fossiliferous rock is absent, proving non-conformability, and that the fossils, with few exceptions, are unlike others found in the Hudson river group.

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THE KANKAKEE RIVER AND PURE WATER FOR NORTHWESTERN INDIANA AND CHICAGO—By J. L. CAMPBELL.

The Kankakee river is the unsolved engineering problem of Indiana.

How to secure the proper drainage of the vast basin known as the Kankakee marshes is a question which has not had a practical answer—chiefly on account of the expense necessary to carry out any of the proposed plans. A new interest in this question may be developed in connection with the problem of an adequate supply of pure water for the new cities in northwestern Indiana and of Chicago, beyond our borders.

The fact exists, although vigorously denied by citizens of Chicago, that pure water has not been obtained by the tunnel system into Lake Michigan, and it is more than probable that further extension of the system will fail to furnish pure water, and after the most costly experiments or repeated disappointments the city will seek its water supply from other sources.

The effort to keep the lake water pure by artificial drainage of the city into the Illinois river may be partially successful—but even this is doubtful—and at best changes will be enormously expensive,—literally an up-hill business.

It will not be denied that a vast territory around Chicago cannot be included in the artificial drainage system, and this territory will continue to be drained into Lake Michigan.

The mouth of the tunnel, whether located two or ten miles from the shore, is the source of an artificial stream toward which currents must tend from all directions. Into these currents the impure drainage of the city will be carried, and the water supply will be contaminated.

The extension of the tunnels doubtless will furnish less impure water, but certainly not the pure supply necessary for the health of a great city.

The practical questions connected with the question of the water supply of a great city are:—

- (1) Purity of water.
- (2) Adequacy of supply.
- (3) Elevation.
- (4) Cost of construction.

The purpose of this paper is to show that the Kankakee river furnishes a satisfactory answer to these questions.

The river takes its rise in the marsh land near South Bend, in St. Joseph county, Indiana, at an elevation of seven hundred and twenty feet above sea level, and by an extremely crooked course through Indiana, enters Illinois a few miles east of Momence. The length of the river in Indiana is nearly two hundred and fifty miles.

According to a survey made by the author of this paper for the State of Indiana in 1882 this channel could be reduced for better drainage to less than one hundred miles.

The chief tributary of the Kankakee is Yellow river, which rises in the eastern part of Marshall county.

The country adjacent to the river is a broad plain, varying in width from one to twenty miles, along the borders of which are sand ridges which give to the region the designation of the Kankakee Valley, and which have produced the erroneous impression that the marsh is a low irreclaimable swamp, whereas the fact is that it is an elevated plateau with a mean level of ninety feet above Lake Michigan and six hundred and seventy feet above the ocean.

The plateau has a slope westward of one foot per mile.

The water of the Kankakee is remarkably pure and clear, and is regarded by all who have used it as exceptionally healthful.

Iron is found in solution, which doubtless adds value to the water for general purposes.

The bed of the Kankakee and of its tributaries generally is fine sand and gravel, and the underlying strata throughout the valley are fine sand increasing to coarse gravel. Clay beds are rare and there is no stone along the stream throughout Indiana. The overlying loam varies in thickness from a few inches to several feet, and the surface generally is an unreclaimed marsh in which coarse grass, wild rice and weeds grow in the greatest luxuriance.

The crookedness of the stream is readily explained by the instability of the sandy strata through which it flows—the twelve inches of surface slope being reduced to four inches, measured in the channel of the stream.

The sandy substratum makes the entire valley a vast filtering basin—a great lake filled with sand and gravel, whence issues the pure and limpid water of the Kankakee river.

This is a satisfactory answer to the first and most important question concerning a city water supply.

The second question is the adequacy of supply.

The most convenient point on the Kankakee for starting a pipe line to Chicago or any of the new cities in the northwestern part of Indiana is in township 33 north, range 6 west, not far from the boundary line between Porter and Lake counties.

The drainage area of the basin above this point is about twelve hundred square miles, which is four times the area of the Croton basin whence is derived the water supply of New York.

The sluggish flow of the river, due to the fall of only four inches to the mile, substantially makes this basin of over a thousand square miles a reservoir more than sufficient for the greatest demands, and satisfactorily answers the second general question concerning a city supply.

In answer to the third and fourth general questions, the state survey of 1882 shows that the elevation of the initial point already designated as the proper beginning place for a pipe line is seventy-three (73) feet above lake Michigan, or sixty-nine feet above the Illinois Central depot on the lake front of Chicago, or fifty-one feet above the railway station at Toleston.

The distance from the initial point to Chicago is less than fifty miles and to Toleston twenty-five miles.

The sand ridge on the north side of the Kankakee has a probable altitude of fifty feet, and in the absence of a survey it cannot be stated whether it would be better to excavate through this ridge for the pipe line or to pump the water to the summit. If it is found feasible to excavate for the line a flow of water by gravity alone can be secured from the Kankakee to the lake front in Chicago, with a fall of one foot per mile, into the receiving reservoir twenty-three feet above the level of the street. The first Croton aqueduct has a fall of forty-seven feet in thirty-eight miles.

If it is found more expedient to pump the water to the summit it is possible that an open channel along the surface of the ridge could be constructed so as to reduce the closed pipe line to twenty-five miles and to deliver the water in Chicago with a standpipe pressure of from fifty to seventy-five feet.

These questions cannot be satisfactorily answered until after a careful survey has been made.

The importance of this enterprise cannot easily be overestimated, and the cost of the work, even if it should reach millions, will be insignificant in comparison with the results to be obtained.

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