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IRRIGATION IN NEBRASKA.

The greatest single problem that concerns the development of Nebraska is the problem of irrigation. It is absolutely essential to the existence of agriculture in a part of the state; it is necessary to anything approaching an even prosperity in any part; and, in the opinion of daring thinkers, the time will co me when the changing conditions of agriculture and the enlarged home market for western farm products will make it desirable, if not necessary, in every part of our 76,0 00 square miles that is under cultivation.

The BEE purposes, in a series of articles to consider the subject in all its bearings—the existing need of it:the benefits it promises; the progress already made; the sources of water supply; the various methods of distribution; the aid needed from state and national governments; the cost of constructing systems; how they are to be paid for, and the expense to the consumer. The intention is to first furnish a complete exposition of this subject, then to arouse and center the attention of the state and, finally, by these means to interest capital and carry the grand undertaking to success. Something of good will result if it awakens the interest that its commanding importance deserves.

OUR ARID AND SEMI-ARID REGIONS.

It is no easy matter to exactly define the arid and semi-arid regions of Nebraska, but it cannot be successfully disputed that without irrigation no crop is certain, year in and year out, west of 100th parallel. Governor Furnas—who had a reputation as an irrigation crank before the theory had a dozen followers in the state—says this is the best arbitrary line that can be drawn from north to south to mark the invisible point where the reliable rain belt blends into the hopelessly arid country.

The 100th parallel divides the state almost exactly in the middle, passing through Keya Paha, Brown,Blaine, Custer, Dawes, Gosper, and Furnas counties. Not all the counties west of this division are equally destitute of natural moisture. Those along the Kansas border have frequently raised good crops of all kinds, and all the others have had unusually favorable seasns when they have fairly repaid the toil of the farmer. It is here, however, that the arid and semi-arid region exists, and that the aid of irrigation must be invoked if it is ever to become anything better than it is today.

Twenty-five counties and a portion of several others lie west of the 100th parallel. Of these, ten may be left out of the present consideration, to be taken up later, partly because they are very sparsely settled, and partly because they are largely sandy, and partly because practical investigation has yet determined little as to the nature and extent of their available water supply. They are also so well adapted for grazing purposes that it may be a question for many years whether they will be found profitable for cultivation beyond the point where natural moisture will suffice. In some of them the sheep industry is just now very profitable. Apart from these, and the other seven counties of which but a small portion lies west of the parallel, we have fifteen counties which may first be taken for the empire of irrigation in Nebraska. They are as follows: Lincoln, Keith, Perkins, Deuel, Cheyenne, Box Butte, Scott's Bluff, Banner, Kimball, Chase, Dundy,Hitchcock, Hayes, Frontier and Red Willow. These counties belong properly to the arid region and irrigation must be depended upon to make them fit for reliable agriculture. Ten of them are almost worthless, except for grazing, without it. In nearly all of them experiments have been carried far enough to demonstrate that the water supply is ample. In several, considerable progress has already been made with large public systems or small private ditches. Together they have an area of 18,218 square miles—more than the states of Rhode Island, Delaware, Massachusetts, New Jersey, Connecticut, New Hampshire or Vermont, and half as much as the total of these seven states.

It is in this large territory that the people of Nebraska may make a thorough test of irrigation as a means of rendering agriculture as prosperous and as staple as any other human pursuit. To put it stronger, it is here that the test must be made in order to prevent the retrogradation of the country back to wild prairie, or mere grazing grounds—in order to prevent the cowboy from driving out the farmer and the homesteader.

The character of these counties will be discussed with more detail when particular branches of the subject are taken up, but it is important to indicate at the outset the main features of the country and its people.

There is probably no finer climate in the United States than that of the arid region.It is adapted to the growth of all the cereals and of perhaps the largest variety of profitable crops that can be grown anywhere in the world. Its attitude ranges from 2,000 to 5,-000 feet, which contributes much to its healthfulness. Everywhere the soil is deep, rich and strong. The surface of the country,though very largely a rolling prairie, possesses more variety than can be found elsewhere in the state. This is especially the case in the western counties, where there are landscapes beauties that would surprise the Nebraskan who is acquainted with this state only by a study of the map on the wall. If a Kodak fiend should lose himself back of the range of Sidney hills, and not find his way to the railroad again until he had wandered over half a dozen counties, he would bring back on his camera material enough to justify the publication of a work on "Picturesque Nebraska."

A large proportion of the 60,000 people who dwell in the arid and semi-arid region have come in the last ten years. Outside of the towns, which with a few exceptions are very small, the inhabitants are principally homesteaders. They are good representatives of the sturdy class of settlers and have made Nebraska and other western states what they are. Most of them started with only their brawn and brain, and the land which the government had promised to give them when they had fulfilled the conditions of settlement. These men and their wives and children are made of good stuff. They do not ask the earth. A very small section of it is sufficient for their demands. And they come with the expectation of enduring some of the hardships of privations and sacrifice while the country is settling up and the homestead getting under way. But when crops fail in part the hand of adversity rests heavily upon them. When they fail entirely they suffer and pinch, and, finally, call for help. Sometimes they move away. That is what it means when we see the prairie schooner—driving the gaunt stock before it and trailing the family mare and her youngest behind it—drift slowly eastward in the direction of the old rooftree.

It is needless to write of the heroism of the frontier, but there are families all over the arid regions who are trying to brave it out, and who would blush to see the inside of their sod house exposed to the view of the world. Why do they stay and endure? Because they know the possibilities of that soil beneath their feet if the providence of God, or the ingenuity of man, can but show them a way to water it. They know the homestead they have fought so hard to stay with will yield them a handsome living, educate their children, and lay up a competence for old age. But without the assistance of the intelligence and the capital of the state the dream can never be realized.

PRACTICAL FRUITS OF IRRIGATION.

The success of irrigation is a matter of history, and a very ancient history at that. It is not necessary to refer to what has been done in other countries and other ages, however. We need not revive the recollection of irrigation on the Nile, nor describe the methods which have made the farmers of Japan a marvel of thrift, to convince anybody that the application or water by artificial means to a soil containing every element of strength will produce great and regular crops, with which it is hopeless for "natural farming" to compete. But, by way of demonstrating the practical fruits of irrigation, it is well to quote the experience of the state which adjoins our arid region on the west, Colorado, and has precisely similar connections to deal with.

It was the good fortune of Colorado to be so hopelessly rainless that its people perfectly understood that irrigation was a necessity. Next to having plenty of rain the great blessing is to have none, apparently, for then no valuable time is wasted in waiting for impossibilities to transpire and nobody goes to work under false pretenses.

All agriculture in Colorado is by artificial irrigation and independent of rainfall. Six of the largest irrigating canals in the United States have either been completed, or are in progress of construction, in the Arkansas valley, ranging from 24 to 100 miles in length. During the past season the prosperity of the large region reached by these and smaller canals has stood out in striking contrast to the poverty and distress of parts of Nebraska and Kansas. On the week begining October 5th the first carload of grapes ever shipped from any point in Colorado was sent from Canyon City to Denver. At the same time there were on exhibition at the state fair in Pueblo magnificent displays of fruit of all kinds from the valleys of the Gunnison and Arkansas. Thousands of bushels of apples—some of them fifteen inches in circumference, raised from trees six years old—were waiting for harvest at Fremont and throughout the Gunnison valley.

The prosperity of the San Luis valley was immense. The greatest wheat crop ever known was harvested, and it was of a quality equalled only by the best No. 1 Manitoba. Enough was stored at Monte Vista to keep a large mill running day and night for one year, besides the great quantities shipped out. Elsewhere in the United States—in the lake region as well as in Nebraska—the potato crop was almost a total failure, save for a few exceptional instances. This fact only added a brighter tinge to the gilt-edged prosperity of irrigated Colorado. From the San Luis valley and the Divide carload after carload was shipped to the east and big prices realized therefor. An entire trainload left Greeley for Chicago on October 6th. The returns seem almost fabulous. There is scarcely any limit to the variety of crops that can be grown under favorable conditions that exist in the irrigated portions of Colorado. Of the matter of profit I need say no more than that I have talked with farmers of Las Animas county who gladly pay $30 per acre annual rental for the use of irrigated farms near a good local market. And this is in sight of the New Mexico mountains, far remonte from the great Denver market.

It is to be assumed that neither space nor time need be wasted in further fortifying the theory that irrigation pays. If more evidence is needed it can be furnished without limit from the experience of New Mexico, Arizona, Utah, California and various foreign countries.

It is a fact not open to dispute that where capital has been found to make the water flow over our arid acres prosperity has come to abide. The question for Nebraska is, when will her people begin in earnest to reclaim that large portion of her domain which nature has reserved for the greatest ultimate productiveness?

THE WATER SUPPLY.

The question of the water supply for the arid regions is not now a matter of anxiety to the friends of the irrigation movement, though there are still found occasional skeptics who"take no stock" in the sources which must be depended upon. When Bill Nye said "the Platte river is about a mile wide and an inch thick," and that it "has a large circulation but very little influence," he voiced the contempt for western streams that is somewhat generally held. Buscientific demonstration put uttert ly to rout all questions of the reliability of the underground flow in the bed of the Platte, the Republican, the Arkansas and other rivers that cut their path through the plains.

There are three great systems of water supply for irrigation—the surface and underground rivers, the artesian well, and the storage, or reservoir system. Nebraska will make use of the two former methods, and it is already practically demonstrated that nearly every one of our arid and semi-arid regions is open to the cultivation of one or the other of these methods, and much of it to both. In describing local enterprises, in contemplation or actually underway, this branch of the subject will be more fully discussed with direct application to localities.

It is unnecessary to elaborate upon the artesian method, which is perfectly understood and remains only to be determined, with regard to particular districts, by skillful engineers. It is worth while, however, to say a word about the method of tapping the underground flow in the valleys of the Platte and Republican, which concerns a very large territory and is less understood.

The best illustrations of this method to be found at present in Nebaska is in Buffalo county, where the people of Kearney have constructed a ditch sixteen miles in length for the purpose of securing water power. They at first depended upon the surface supply. In dry seasons this failed them, and engineers of national reputations were sent for to investigate the underflow. They became perfectly satisfied that an inexhaustible supply of water ran through the loose gravel bed that lies beneath a strata of clay at the river bottom. Dredges were set at work and the canal continued up the stream below the level of the river, deepening as it went. The work practically demonstrated the wisdom of the engineers. Water was found in abundance, and when the operations are completed there will be a large square basin below the surface of the river to serve as a perpetual fountain for water supply and irrigation.

The same results have been obtained in Kansas. A recent official report in that state says of an experiment of that kind:

"First, the valley has a fall of seven feet to the mile. The underflow, or sheet water, is reached at a depth of seven feet below the surface. By commencing a ditch at any given point in the valley three feet deep—the usually depth for irrigating purposes—and extending it up the valley at a grade of three feet to the mile a distance of one mile, the ditch at that point would be just seven feet deep; or, in other words, the underflow would be reached. By extending the ditch another mile up the valley with the same grade, it would then just be eleven feet deep, or four feet into the underflow—bearing in mind that the underflow is struck at seven feet below the surface, which is on a level with the bed of the river. By extending the ditch a half mile further up the valley with the same grade as before, the ditch is then just thirteen feet deep, or six feet into the underflow, or of course six feet below the bed of the river. From that point the uniformed depth of thirteen feet is retained, giving the ditch the same grade as the river, namely, seven feet to the mile. Into this ditch, thus dug, drained the underflow. The problem is solved. It is a success. From the dam the ditch is conducted along the higher lands at a grade of only one and seven-tenths feet per mile—the usual grade for irrigation purposes. The ditch, when completed, will be twenty-five miles in length and will cost about $60,000. With the experience these men have had, they say they could construct another ditch of equal size for $10,000 less."

Neither government experts nor private investigators any longer entertain the slightest doubt the abundant supply of water available for the irrigation of the arid and semi-arid regions in Nebraska.

Facts, suggestions or criticisms in connection with this and succeeding articles will be cheerfully received as valuable contributions to their completeness. Next Sunday's article will deal with the irrigation enterprises already under way in Nebraska. W.E.SMYTHE.

T. B. MCPHERSON of Arapahoe, who managed the anti-amendment campaign in the valley with such conspicuous success, is rewarded with the vice-presidency of the Union Stock Yards bank at South Omaha.

WHEN the alliance lamb is safely deposited in the democratic tiger's stomach the last condition of that lamb will be infinitely worse than the first estate.

ONLY 531,399 claims for pensions have been filed since the first of June.