

ANCIENT IRRIGATION DITCHES ON THE PLAINS

The existence of prehistoric irrigation works in the mountainous regions of Arizona and New Mexico, have been matters of more or less common knowledge for nearly if not quite a century past. These skillfully constructed works, which were erected entirely by primitive human laborers, who were equipped only with implements of stone and of bone, bear faithful witness of the industry and patience of a by-gone age and of an all but vanished race, believed to have been of Cliff-Dweller or Pueblo stocks. However generally such information may have been disseminated, it is only within a comparatively recent period that the remains of more or less ancient irrigation works have been found in at least one section of the semi-arid Great Plains, namely, in the Oklahoma Panhandle and in the adjacent portions of Southwestern Kansas and the Texas Panhandle. One of the most extensive of these as well as one of the most perfect specimens, is located north of the Cimarron river, in Clark County, Kansas, quite near the northern boundary of Oklahoma.

The writer first visited the ruins of this ancient canal in company with Dr. Warren K. Moorehead, director of the Andover (Mass.) Museum of American Archaeology, in June, 1920. It is located in a region of loose, sandy loam surface soils, which, in times past, have been subjected to shifting both by wind and by water. In consequence of erosion, drifting and filling, instances wherein stream beds have been filled bank-full of silt and drift and, thus "beheaded," such streams thus forced to take new courses and to cut new channels, are not uncommon in that vicinity. The construction of this particular canal was begun at the lower end of the well defined channel of Four Mile Creek, a short distance west of the boundary line between Clark and Meade counties, whence the process of erosion and filling had practically obliterated the rest of the original channel.

The first 1,700 feet of the canal (A-B) has a course as straight as if it had been laid out by a modern civil engineer with a transit. Within this distance, it emerges from the low hills which bounded the original valley of this little creek. The cross-section of the canal is wide and shallow throughout

this part of its course, averaging about twenty feet in width, by fifteen to eighteen inches in depth, evidently so built as to permit the escape of surplus water in event of an unusually heavy, torrential precipitation. At the end of the 1,700-foot, straight-away section of the canal, its cross-section becomes narrower and deeper and, thenceforth, it follows contours and assumes a meandering course. That it was not intended to lose water by overflow below that point is further indicated by the fact the excavated soils and clays were almost uniformly deposited on the lower side of the canal in places where its course traverses sloping ground. At one point (E) the canal turns into the head of what was once a small, shallow ravine, the course of which was followed to its confluence with another ravine of approximately the same size and length. Immediately below this point of confluence, a heavy fill had been made—sixty feet long on top with a maximum width of fifty feet at the base—whence the course of the artificial channel turned into that of the second ravine, the latter being widened and deepened to its head.

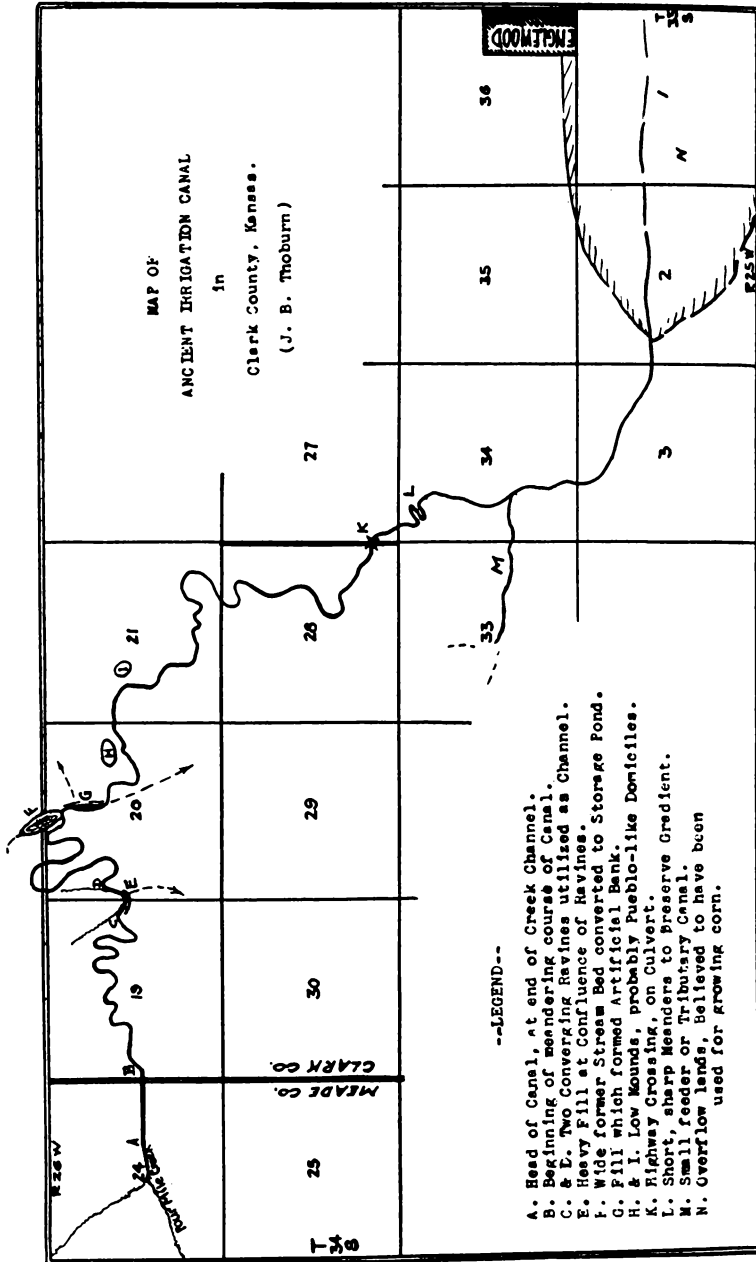
At another point the canal joins the channel of a much larger water course of an earlier period, long since ruined by erosion, drifting and filling so that it is now but a land-locked slough that is ordinarily dry. With the canal carrying a capacity discharge, several acre feet of water must have backed up the broad bed of this slough, thus, in effect, serving as a small, temporary storage reservoir (F) the contents of which would drain back into the canal as soon as the level of the water therein had been lowered sufficiently. Following the course of this large ravine for a short distance, it had been found necessary to construct a straight, narrow and comparatively high fill (G) to serve as one bank of the canal and to prevent the flooding of a depression which would have doubtless meant the permanent loss of an appreciable amount of water.

Along the course of the canal, at distances of several miles from either end, are several mound-like elevations which might easily be regarded as being of æolian, or wind-blown origin. Two of these which have been under cultivation for many years, however, contain chipped chert and flint, clam and mussel shells, calcined bones, potsherds, bits of charred wood and other vestigia of human occupancy. That each of

these may prove to be the ruin of what was once an imitation pueblo, with walls of earth and earth covered roofs, would seem to be at least within the realms of possibility, though, as yet, there has been no thorough investigation of such indications.

After the course of the canal has passed out of the rolling country into the more open and smoother prairie lands, it has fewer and less abrupt contour curves and its cross-section retains much more uniform size as to width and depth and, at intersection with public roads, the construction of culverts have been necessitated (K). At one place where the course of the canal traverses the more nearly level lands (L), there is a sudden acceleration of the natural grade for a short distance. In a soil of such granular and friable texture, a corresponding increase in the gradient of the canal would have meant erosion or soil cutting at the upper end of the increased slope, with a corresponding deposit of loose material that would have tended to fill the channel of the canal below the other end. There was neither timber nor stone at hand with which there might be constructed a weir, whereby the water might have been lowered a few inches without damage to the banks or bottom of the canal. But these resourceful, ancient engineers were not to be balked—they merely lengthened the channel to preserve its gradient by crowding several short, sharply tortuous meanders into a remarkably small space. That this expedient served its purpose perfectly, is abundantly proved by the result, even to this day.

Still lower in its course, the canal has a feeder which drains a small ravine and which once carried to the main channel the runoff storm water from an area of upward of 100 acres open prairie land. How the surveying and measuring and estimating and leveling was done in preparation for such an effort is, of course, a sealed book to us. Indeed, could men of our own race and of our own time, successfully achieve the same results with nothing more in the way of equipment and instruments than those possessed by these primitive engineers of some centuries back? While we may not be able to answer such a query, we find ourselves bound to respect the ability of those who were thus handicapped. And then, too, how was the excavation done? Fortunately, this question may be much more readily answered, since the earth and clay to be moved from the channel of the canal was



loosened by means of picks and gouges which had been fashioned from bones of the elk and buffalo, after which much of it was shoveled into carriers of rawhide or wicker-work with shovels shaped from the shoulder blades of the same animals, and transported to the dump on the backs or shoulders or heads of men and women. Yet one often hears some folks class the people of the native American race as indolent and lazy!

This irrigation system had no lateral ditches or trenches for the distribution of the water over the ground to be irrigated. The creek itself is not ordinarily a running stream at the point where it is joined by the head of the canal, its waters disappearing in the absorbent sandy strata beneath its bed. The purpose of this canal, therefore, was to supplement the natural rainfall, during the growing season, by flooding an area of land under tillage, located around and immediately below the lower end of such artificial watercourse. Hence, as the course of the canal approached its terminus, its gradient was gradually reduced in order to deliver the water at the level of the adjacent soil surface, which was thus sure to be flooded and thoroughly soaked whenever there was a heavy shower in the hills where the small creek had its sources, eight or ten miles distant, and regardless of whether there had been a shower on the land thus irrigated. Indeed, a single shower of abundant precipitation around the head of the creek, with the consequent flooding of the land at the lower end of the canal, at a critical juncture, might easily have spelled the difference between famine and plenty, so far as the resultant yield of corn was concerned. However, there is still a question as to whether the experiment was not foredoomed to failure because of the scarcity of timber with which to fence the big buffalo herds out of the communal cornfield.

Who were these ancient irrigators and what became of them? In reply to this inquiry, it may be stated that inferences if not indications thus far observed, seem to indicate that they had once lived under more favoring natural conditions farther east, where, with a more humid climate, they had tilled the soil and produced corn, beans, pumpkins, melons and gourds; but the fortunes of war had driven them and their people out on the high Plains, where the invasion of their little patches of tilled land by the big buffalo herds and the blasting, blighting "hot winds" of the Great American Des-

ert had cheated them of expected harvests. And the maize, or Indian corn, was not only a part of their sustenance but a part of the religion of their fathers, as well! Then, some of their hunters may have passed across the rest of the Plains country and visited the valleys of the Pecos, the Mora and the Rio Grande, where they had found the Pueblo peoples growing crops by means of irrigation. So, these patient, resourceful, determined "savages" doubtless borrowed some Pueblo irrigation engineering talent and returned to conquer the barren Plains country which, in a more recent era, has often worsted much better equipped men of our own race. Whether the experiment was a success or a failure, we may not know, but the evidences of a most courageous effort are eloquent of a determination that would have been worthy of any people. And then the hordes of the fierce Comanche came down from the North, to drive these primitive tillers of the soil southward in to Western Texas and, still later, westward into the mountains of New Mexico and Arizona, where they have been known as the Apache for upward of a century past.

Four or five centuries have elapsed since this worthy effort in the way of primitive conservation. For a century and a quarter past, the white man has claimed ownership of the land for the reclamation of which these earlier inhabitants toiled so strenuously. At best, however, the white man is not making the most of his opportunity with the land that finally fell within the scope of his ownership and exploitation. True, in favorable seasons, he reaps abundant harvests, but there is always the possibility of a deficiency of moisture during the growing season—aye, worse, the dreaded "hot winds," which so often wrought havoc with the crop prospects of the red men, hundreds of years ago, still blow sometimes, still arouse human fears and still blight human hopes. The white man does not need to dig long ditches as laboriously as the red man did, but he does need to store and conserve the surplus storm water, partly to irrigate the soil in time of scarcity and partly to mitigate the arid and drying sirocco, the blighting breath of which literally burns up the growing crops.

This is the problem of the Great Plains—a problem which has been calling for solution ever since the white man came

hither with his breaking plow. The climate which nature provided for the semi-arid region of the Great Plains was sufficient for the buffalo herds and for the Indians who did not till the soil. But the soils of the Plains region hold too much natural fertility to leave any part thereof unused because of a lack of moisture which, coming in the form of torrential rainstorms, is now permitted to run its wasteful way to the sea, unused. The day is at hand when engineering must be called to the aid of husbandry, in the effort to find anew the solution of this great problem, though in a much more enduring way.

As already stated, some of these ancient irrigation works are to be found on the Oklahoma side of the line, within a few miles of the one just described. Near the village of Gate, in the eastern part of Beaver County, there is a land-locked lake, sometimes entirely devoid of water and, at other times filled to the brim. On the edge of this lake is a group of mounds which are believed to be the ruins of imitation Pueblo structures. In other words, these prehistoric inhabitants, supposedly of the Athapaskan-Apache stock, not only attempted to imitate the irrigation agriculture of the Pueblo peoples but also, it would seem, they sought to adopt and adapt to their purposes the Pueblo architecture as well. There are traces of a large canal, which had its source in Horse Creek within a few miles of this mound group on the edge of the lake, and which had been used to irrigate land in the immediate valley of the Cimarron, but much of it has been destroyed as the results of floods in the valleys of both creek and river. Several other prehistoric canals are to be found in or near the valleys of the Beaver and the Canadian.

That there should be a more intensive study of the remains of this cultural era, goes without saying. Likewise, there should be a thorough investigation of the previous habitats or ranges and successive migrations of this interesting prehistoric people.

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