

RISE AND FUTURE OF
IRRIGATION IN U. S.

Selections From a Paper by Elwood Mead, Expert in Charge of Investigations, Office of Experiment Stations at Washington, D. C.—Influence of Irrigation Results in a Multitude of Small Proprietors Working for Themselves.

For the beginnings of Anglo-Saxon irrigation in this country we must go to the Salt Lake valley of Utah, where, in July, 1849, the Mormon pioneers turned the clear waters of City Creek upon the sunbaked and alkaline soil in order that they might plant the very last of their stock of potatoes in the hope of bringing forth a crop to save the little company from starvation.

Utah is interesting not merely because it is the cradle of our modern irrigation industry, but even more so as showing how important are organizations and public control in the diversion and use of rivers. Throughout the pioneer period of their history the settlers of Utah were under the direction of exceptionally able and resourceful leaders, who were aided by the fact that their followers were knit together by a dominating religious impulse. These leaders had the wisdom to adapt their methods and shape their institutions to conform to the peculiar conditions and environment of a land strange and new to men of English speech. They found that irrigation was necessary to their existence in the home that they had chosen, and that the irrigation canal must therefore be the basis of their industrial organization, which was largely co-operative; hence, the size of their farms, which are less than 30 acres upon the average, the nature of their social relations, which are close and neighborly.

That the great material results which quickly followed could have been realized without the cohesion which came from an association dominated by religious discipline and controlled by the superior intelligence of the head of the Mormon Church, is doubtful; but that the character of institutions in the valleys of Utah, both industrial and social, was chiefly due to environments in which they were placed is beyond dispute. Co-operation became the dominant principle simply because the settlers were in a land without capital, and it was beyond the power of the individual to turn the mountain current from its course and spread it upon his lands.

Only the labor of many individuals, working under organization and discipline, could make the canals or distribute the waters. A small farm was chosen, not because men were less greedy for land than in all other new countries, but because it was quickly seen that the extent of the water supply was the measure of production, and their ability to provide this was small. Diversified farming, which is one of the leading causes of the remarkably even prosperity of Mormon agriculture, was resorted to because the Territory was so removed from other settlements that it was compelled to become absolutely self-sustaining. The small farm unit made near neighbors, and this advantage was still more enhanced by assembling the farmers' homes in convenient village centers. One reason for adopting this plan, in the first place, was doubtless for protection against the Indians, but it has since become a permanent feature, which is still adhered to in making new settlements because most satisfactory to the social instinct. The construction of irrigation works

by corporate capital came as a natural if not inevitable evolution. There came a time in the districts first settled when the opportunities to divert water cheaply had largely been utilized, and when the expenditure required was beyond the means of either the individual or the corporation of many individuals.

In this country corporations have, so far as construction is concerned, taken the place of governmental agencies in other lands. Practically all of the larger and costlier works built within the last two decades have been of this character. Even in Utah, co-operation was not sufficient to reclaim all of Salt Lake valley. For forty years the table land north of the lake, one of the largest and best tracts of irrigable land in the valley, remained uncultivated, while the sons of the pioneers were compelled to seek homes in the surrounding states. To reclaim this land, a canal had to be carried for three miles along the precipitous sides of Bear River canyon. The flow of the river had to be controlled by an extensive dam and the Maud river twice bridged by long and high aqueducts, and the million-dollar outlay required was more than home seekers could provide.

The creation of water-right complications came with the building of corporate canals. Previous to this it had been the rule for those who built ditches to own the land these waters, and there was little difference as to whether the right to water went with the ditch or with the land, because the ownership of both was united in the same person. But when companies were organized to distribute water for others to irrigate with and to derive a revenue from water rentals, there arose the question as to who was the owner of the right to the water diverted—the company transporting the water or the farmer who used it. The laws of nearly all the western states make the ditch owner the appropriator. This has created a divided ownership of land and water, and many canal companies have transferred water-right contracts on the theory of absolute ownership.

OBJECTIONS TO CORPORATE CANALS.

Having dealt with the benefits derived from corporate investments in irrigation works, it is now proper to point out their defects. The most serious one is that nearly all large canals have been losing investments. The record of these losses is so stupendous that it is reluctantly referred to. A single enterprise in one of the territories represents to its projectors a loss of over \$2,000,000. The Bear River canal in Utah, which cost over a million dollars, was recently sold under a judgment for about one-tenth of this sum. A single canal in California represents a loss to its builders of over \$500,000. These are not isolated cases.

The reasons for failure should be more generally understood. The following are the most important:

- (1) The necessarily long delay in securing settlers for the land to be irrigated and in obtaining paying customers for the water to be furnished.
- (2) The large outlay and several years of unproductive labor required, as a rule, to put wild land in condition for cultivation. Settlers of limited means can meet this outlay

OUR BUSIEST MEN.



Photo. by Johnson.

ADJUTANT GENERAL CHARLES S. BURTON.

Charles S. Burton, who fills the responsible position of adjutant general of the state militia, under appointment from Governor Wells, occupies numerous other positions of trust. He is cashier of the State Bank of Utah, and director in the following named institutions: The Home Fire Insurance Co., The Provo Woolen Mills Co., The Salt Lake Theater, The Co-op Wagon & Machine company and Heber J. Grant & Co. The "News" photographer caught Mr. Burton in the attitude in which he is to be seen at nearly all hours of the day through the big plate glass windows of the State Bank, seated at his desk clipping coupons, or attending to the other multifarious duties of his position.

and in addition pay water rentals. Nearly all of the settlers on arid lands are men of limited means, hence, canal companies have at the outset to furnish water at small cost, or furnish to a small number of consumers.

(3) The unsuitability of the public-land laws to irrigation development.

(4) The acquisition of the lands to be reclaimed, in many instances, before canals are completed by nonresident or speculative holders, who would do nothing for their improvement.

(5) Expenses of litigation. Experience has shown that in the estimates of cost of a large canal provision should be made for a large and long-continued outlay for litigation. It begins with the adjudication of the stream and is protracted through the

CONTRADICTORIES OVER WATER RIGHTS.
THE APPEARANCE AND RESOURCES
OF THE ARID REGION.

The climate of the western half of the United States takes its chief characteristic from its aridity, or dryness. The heat of its southern summers and the cold of its northern winters are alike tempered and mitigated by lack of humidity. Neither the humid heat which penetrates nor the humid cold which penetrates the marrow in the heat of its southern summers and the cold of its northern winters are alike tempered and mitigated by lack of humidity. Neither the humid heat which penetrates nor the humid cold which penetrates the marrow in the heat of its southern summers and the cold of its northern winters are alike tempered and mitigated by lack of humidity.

The dominant feature in the physical appearance of the arid regions is its mountain topography. On every hand a rugged horizon meets the view. From north to south, from Canada to Mexico, the long mountain ranges make the backbone of the continent. Along the Pacific coast the Sierra Nevada and Cascade ranges lift their barriers to intercept the moisture and condense it into snow. Between these two principal chains, with their connecting ranges and outlying spurs, are many minor systems, so that the whole country is a succession of mountains and valleys, of forests and deserts, of raging torrents and sinuous rivers winding to their sinks upon the plains or making their difficult way to the distant ocean. The far west is thus a land of the greatest scenic beauties, and widely celebrated as such.

The cultivable lands lie in the valleys, rising with gradual slope on either side of the streams to meet the foothills. Narrowing to the mountains, these valleys widen as the river loses grade and approaches the sea or its confluence with a larger stream. There are valleys which will accommodate hundreds, others thousands or tens of thousands, and a few, like the Sacramento, in California, where millions may dwell.

In the eastern portion of the arid region, and in high altitudes farther west, the land is covered with nutritious natural grasses, which furnish ideal range for livestock. But the characteristic badge of the region is the sagebrush. This brave plant of the desert is a common plant in desolation by those who behold it for the first time, and until they learn to know it as the shelter and dependence of range live stock when the terrible blizzards sweep from the north and as the sure indication of good soil and the humble prophet of the field, orchard, and garden. Thus, it happens that to the casual traveler the appearance of the region is forbidding. It is only in localities where the work of reclamation has been in progress long enough to permit the growth of trees, with farms and homes, that the value of the soil and climate can be appreciated. There are such instances in all the seventeen states and territories of the far west. One of the most striking is the Salt River Valley of Arizona. Here the traveler, after a long and tiresome journey through waste places, finds himself suddenly confronted with homes rivaling in taste and luxury those of eastern states, and with orchards and gardens which resemble more the century-old gardens of France and Italy than a creation of the last twenty years.

The writer then next describes the mineral wealth of the arid region and its other sources of permanent prosperity, the present and future of irrigation, the growth of irrigation and need of better laws, the need of reform in the management of arid public land, shows that the homestead law is not adapted to secure the settlement of the arid regions and that the desert land was devised to promote the investment of capital, rather than to encourage settlement. Other topics are the Carey act which gives to each settler the right to segregate 160,000 acres of land and to control both its reclamation and disposal to settlers; the influence of range industries; the uncertainty as to state and federal jurisdiction in the control of streams and complications from lack of uniform laws.

The right to water which should be

recognized in the arid land is the right of use, and even this must be restricted to beneficial and economical use in order that the water supply may serve the needs of the largest possible number. Ownership of water should be vested, not in companies or individuals, but in the land itself. When this principle is adopted, the control of the water is divided precisely like the land, among a multitude of proprietors. Reservoirs and canals are then like the streets of the town, serving a public purpose and permitting ready access to private property on every hand. Water monopoly is impossible under this method, and no other abuse is encouraged by it.

PUBLIC SUPERVISION AND CONTROL OF IRRIGATION.

The entire discussion leads up to one inevitable conclusion: This is that irrigation, over and above all other industries is a matter demanding public supervision and control. Every drop of water entering the head gate, and every drop escaping at the end of the canal is a matter of public concern. The public must determine, through constitutions and statutes, the nature of water ownership. The public must establish means for the measurement of streams and for ascertaining how much water may be taken for each acre of land under the principle of beneficial use. The public must see that justice is done in the distribution of water among those who have properly established their rightful claims, and are difficult to look up. Later, we have thoroughly tried the methods of leaving all this to private initiative and management, and, along with magnificent material progress, we have reaped a large crop of deplorable financial results.

The national government alone can make the best and broadest study of the various economic questions relating to the development of agriculture on arid lands. This includes not only the measurement of streams and survey of reservoir sites, but also a consideration of practical methods of applying water to the soil and of social and industrial institutions adapted to the environment of the arid region. The nation alone can deal with the conflicting rights in interstate and international streams and with the construction of great reservoirs at the head waters, with a view to benefiting the several states living along their course. The national government is already active along all these lines, and the field for the expansion of its efforts is wide and inviting.

INFLUENCE OF IRRIGATION UPON PEOPLE AND COUNTRY.

While a description of existing conditions in the far west necessarily includes references to many evils and disappointments, there is a brighter side to the picture, and the future is luminous with new hopes for humanity. A vast population will make its homes in valleys now vacant and voiceless, yet potentially the best of our national heritage. They will create institutions which will realize higher ideals of society than the world has yet seen. Irrigation is much more than an affair of ditches and acres. It not only makes civilization possible where men could not live without it, but it shapes that civilization after its own peculiar design. Its underlying influence is that which makes for democracy and individual independence.

Where land can only be cultivated by means of the artificial application of water, and where that water is not under speculative control, it is owned in small holdings. This is so because irrigation intensifies the product of the land and so demands much labor, and it is a kind of labor which can not profitably be left to hired hands. The result is a multitude of small proprietors working for themselves.

IRRIGATION AS A TRAINING IN SELF-GOVERNMENT.

Another interesting feature of irrigation is the training it gives in self-government. A farmer under irrigation can not remain ignorant and indifferent of public questions. He has to consider his interest in the river

which feeds his canal and the nature of his relation to other users along its course. It is a training school in self-government and gives the first impetus to civilization in rainless regions. The capacity of the American farmer has already been demonstrated. He is the author of the best irrigation laws. Colorado was the first state to enact a law providing for the public control of streams and some sort of systematic procedure for the establishment of rights, but the credit of that is not due to her statesmen, but to the discussion of the Greeley Lyceum and the public spirit and independence of the irrigators under the Colony canal. Opposed to the conservation of the legal profession and the prejudice of those not practically familiar with the subject, they had a long and doubtful struggle to secure the adoption of a statute which for a time made the state the lawgiver of the arid region.

EFFECT OF IRRIGATION ON SOCIAL LIFE.

Heretofore one of the evils of the irrigated home has been its isolation. The valleys of many streams are narrow. The broad areas which lie between these valleys are the home of cattle and sheep, but not of men. The Anglo-Saxon thirst for land and the opportunity which the desert-land at once gave to gratify it, resulted at first in a wide separation between homes, and in a loss to the people of the advantages of schools, churches, and social life. Under the larger and later canals the tendency has been in the other direction. The European custom of making homes in village centers has been adopted in parts of Utah, Wyoming, Idaho and California, and steady gains in public favor. Where farmers live in villages, their families

enjoy ready access to schools, churches, libraries and entertainments. The agricultural society of the future in the valleys will realize a happy combination of the best features of life—the independence of town and country. Such conditions are favorable to the satisfaction of the social instinct which comes only with community association. These conditions are favorable to the growth of the best forms of civilization and the noblest institutions. This is the hope which lies fallow in the arid valleys of the west. Its realization is worth the struggle which is impending for the reform of our land and water laws, and which will impose demands upon our statesmanship and call for the exercise of the best wisdom of our nation.

THE COMMERCIAL IMPORTANCE OF IRRIGATION.

The commercial importance of the development of irrigation resources is being realized in the west at the present time as never before. Especially in California there is a new awakening, and an effort on the part of the best elements of citizenship to remove the obstacles which have formerly hampered both public and private enterprise of irrigation. The great barrier which the west is to have in the events of the twentieth century, World-wide forces are working to hasten the day of its completion, and the utilization of all its rich resources. The Orient is awake and offering its markets to the trade of the Pacific coast. With the development of this trade there will come an impulse for the completion of irrigation, and the harnessing of America by the enlistment of public as well as private means in the storage and diversion of its streams for the irrigation of its hundred million acres of arid soil. The harnessing of its water powers to mill and factory wheels; the crowding of its pastures with new millions of livestock; the opening up of its mines and quarries; the conversion of its vast forests into man habitations; the coming of a vast population and the growth of institutions worthy of the time and place.

Inventor of Wooden Match

Eventful Life and Mysterious Disappearance of John Hucks Stevens.

There is fairly accurate data regarding the earlier attempts at match-making. Who the first person was that actually invented the wooden splint match, however, is a matter of controversy. Apparently, like the telegraph, this discovery was made simultaneously in at least three parts of the world. But there is no doubt that John Hucks Stevens was the first of the English-speaking race to put into practical use this thought. Late in the twenties, or early in the thirties, he invented the composition which when applied to the wooden splints would ignite it, and his splint match soon superseded the cardboard, or pulling match. It was his match (then manufactured only in England, though used on both sides of the ocean), which secured for him the name of "match king" in 1835.

Mr. Stevens was always "eccentric," and cared nothing whatever for the financial returns from any of his discoveries. He was an excellent chemist, a somewhat exclusive profession in those days, but, having once solved any point which had baffled him, he lost all interest in the invention. Inquiry at the patent office many years ago elicited from the clerk this remark: "That man must have been a perpetual motion crank. There are models of dozens of things which he invented and allowed others to patent because he hadn't the business faculty."

We who knew the old gentleman smiled, for "perpetual motion" had been among the mysteries of which he sought the solution. That he accompanied the clerk through the central aisle until he stopped before a glass case containing some of Mr. Stevens' inventions, an "improved cotton gin" being the only one which I now recall.

His match was probably patented soon after he came to the United States—he being the first to manufacture wooden matches in this country—but that, that time, was not numbered and are difficult to look up. Later, he made several improvements, of which three are recorded November 16, 1838. Their entries now sound strange: "No. 1412—For preserving matches from accidental friction during manufacture." "No. 1413—Composition matter for friction matches." "No. 1414—Match for retaining fire."

So little did he care for fame that he frequently allowed his paid workmen who merely carried out the suggestions of drawings which he furnished, to patent machines, etc. He was an able man, but not a schemer, and was constantly victimized in business. Like his friend, Horace Greeley, he was easily duped, and he permitted others to make fortunes which were rightfully his, though he was always in comfortable circumstances.

Of his personal life his friends know but little. He was born in Harwich, Essex, England, June 25, 1806. From boyhood he seems to have lived within a door of the sea, and his life was a dream, relieved by sudden spells of energetic experiment, which only ceased when he had mastered his puzzle or become convinced that he was following the wrong path. In one of his many trips abroad he met Harriet Oldaker, a 16-year-old English girl, whose childhood had been spent in Belgium, Holland, France and such other countries as had chanced to appeal to his father's fancy. Mr. Stevens roused from his reveries long enough to fall deeply in love, and as the liking was reciprocated, the young people were soon after married in the English ambassador's residence in The Hague, Holland, after which they returned to the family home at Harwich.

Despite the fact that all the Stevens family have been rovers, they have been represented in this quaint little seaport for nearly two centuries. Tradition points to Henri Estienne, son of a noble family of Provence, who early in the sixteenth century established a publishing firm in Paris, as the founder of the race.

Just when the family crossed the channel, if this is its source, is not known; but certain it is that those of the later generations who have not been chemists and inventors have been in some way associated with the "fourth estate," and all have been in contact with the mania for travel.

Marriage did not counteract this tendency in John Hucks Stevens, so early in '36 he let his brothers, Edward and William, have the English and European rights to his match, while he came on to New York city, where he soon established a factory for matches, which, though previously in use in the United States, had not been manufactured here.

His sons still talk of the sport they had in the storeroom above the factory—a place in which he frequently locked them in later years, when they had reached manhood. John Hucks Stevens always remembered to bring the boys food while in duration, for their father utterly forgot them when he returned to his laboratory, and has been known not to think of material for a week. As to the lady, they enjoyed this enforced retirement, passing their time in converting wooden boxes, in which matches were then sold, into sleds. These were realized his responsibility to do by strings and exchanged for goodies that admiring children attached to their stead.

When the Millers became convinced that the millennium was at hand, Mr. Stevens was one of the early adherents to that peculiar faith and thenceforth was a strict vegetarian.

His ensuing fifteen years were happy ones, but this peaceful period came to an abrupt end when, in 1851, his wife, in '56. It is probable that his mind was somewhat affected by his grief at that time, as soon thereafter he returned to his old roving habit, accompanied by his wife and two children, but calmly leaving the younger ones in the care of the oldest son, who was not yet of age. Occasionally, in after years, he would make an announcement to his children, stay for varying lengths of time and leave as abruptly as he came. Then would follow letters, at irregular periods—letters couched in quaint phraseology and written in flowing characters, whose delicate tracery, very even, but not readily deciphered by those more familiar with the commercial penmanship of today.

When the Stevens family came to the United States, in the early '60s, they came with legal papers, which he assured his listeners were destined to make all the family wealthy after his death, adding:

"I dislike business, but it is a pleasure to know that I have amassed wealth for my children. Remember this, if I never see you again, I expect to die in California, which I like better than any place I ever visited."

He first went to San Francisco about the time of the civil war. Not long afterward he returned to the land of gold, from which he wrote, but gave meager accounts of what he was actually doing, or his plans. In '81 one of the sons saw a notice of his death in a Philadelphia paper, and started with his family for the Quaker City for the purpose of seeing his father's grave and listening to the account of his last moments. In New York city they stopped over, to enable the grandchild to see places associated with his memory. While they were walking down Broadway the son turned toward one who had been the inventor's favorite grandchild and said:

"Did you notice the old gentleman who just passed? Don't forget that face. If he were not dead I would speak to him; the resemblance is so striking." The grandchild looked back and was surprised to see that the stranger was also intently watching, having stood still to do so. Privately the grandchild was a girl's, yet with the delicacy of an ascetic, flowing hair and silky beard, white as the driven snow, the man was not one who could be seen and forgotten.

A few hours later the travelers reached Philadelphia, only to be met with the assurance that the death notice was a mistake. Though the folk in the house from which the paper had come were buried, admitted that John Hucks Stevens had been ill there, they maintained that he had recovered and left the city. There was no record of his demise at the morgue. The editor of the paper in which the article had appeared was unable to identify the writer. The obituary had contained an accurate outline of Mr. Stevens' life and evidently had been written by one well acquainted with the inventor's peculiarities. Yet detectives never unraveled the mystery.

Did he die as stated in the article, and was buried under a false name, while some interested person kept silent for the sake of the contents of the trunk he so carefully guarded? Or was he the gentleman who so keenly looked at his son, then on the way to his father's grave, as he supposed? Probably no one will know this side of the hereafter. Wherever he may be, few remember the man who gave us our wooden match—which he regarded as the least of his many discoveries, which it is probably the only one not yet superseded by later inventions.—Wenona Stevens Abbott in Los Angeles Herald.

NEW COUNSELORS TO PRESIDENT OF RELIEF SOCIETY



MRS. ANNIE TAYLOR HYDE.

Mrs. A. T. Hyde is the daughter of the late President John Taylor, and was born in Salt Lake City in 1843. In 1870 she became the wife of Alonzo E. Hyde, and is the mother of eight children. Her active work in the women's organizations of the Church commenced when she was eighteen years of age, she becoming associated with the Relief Society as a teacher in that year. In 1879 she was appointed counselor to Mrs. Hannah T. King, who was at that time president of the Young Ladies' Mutual Improvement Association. Since that time she has been a zealous worker in the interests of both these societies, her efforts having been tireless in sustaining them in their aims. No work has been so tedious, and no difficulties so disheartening as to tire her patience, and her work has been a distinct influence in their progress. An important organization which owns Mrs. Hyde as its founder is the Society of the Daughters of Utah Pioneers, which was founded in April, the initial meeting taking place at an eastern trip which included Chicago, New York, Buffalo and Washington, and was appointed as her appointment as counselor to President Bathsheba W. Smith upon her return.



MRS. IDA SMOOT DUSENBERRY.

Mrs. Ida Smoot Dusenberry, daughter of the late President A. O. Smoot and Anna K. Smoot, was born in Salt Lake City in 1873. About a year afterward her mother moved to Provo, where her father had previously made a home, having been called to preside over the Utah Stake. Mrs. Dusenberry's education was obtained in the Brigham Young academy, from which she graduated in 1897. A year later she graduated from the kindergarten department of the Chauncey Hall college, Boston, and since that time has been in charge of the Brigham Young academy kindergarten training school, in which work she is greatly interested and very successful.

In 1899 Mrs. Dusenberry organized the parents' class, which has rapidly increased in numbers and has been productive of great good. She was vice president of the women's congress held in Salt Lake City in 1900. Mrs. Dusenberry is a very intelligent woman of great strength of character, of cheerful disposition and persuasive manner. She has not, therefore, been prominently connected with any of the Church organizations, except so far as her labors in the academy may be so considered, and this made the call come as a great surprise to her. But she is through heredity and training greatly interested in the work, and this, with her natural enthusiasm and executive ability, will cause her to faithfully, earnestly and intelligently strive to perform all the duties of the important office with which she has been honored.