

HISTORY OF IRRIGATION IN THE STATE OF WASHINGTON *

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THE STATE EPOCH OF CANAL BUILDING

Private enterprises, however, did not idly await the Government's aid, but went on in leaps and bounds. The largest project is that known as the Sunnyside Canal, already mentioned since the survey thereof, and properly belongs to the preceding period. The first survey was begun in 1885 by J. D. McIntyre as chief engineer and completed by 1889. This survey provided for the intake two miles above where the Naches flows into the Yakima, the ditch to run west of the Ahtanum basin, cross the Ahtanum five miles west of its confluence with the Yakima River, follow along the steep hillside south of Ahtanum Creek to Union Gap, then across the Yakima River by pipe line, to the easterly side of the river, at which point the elevation obtained above the Yakima River and above the Sunnyside line is 179 feet — thence along the foot of Rattlesnake Range in a southerly direction to a point about north of Prosser, a total distance of ninety-eight miles of canal. The cost estimated is \$500,000, and storage reservoirs may be built at \$100,000 which would double the capacity of the canal. In order to irrigate successfully the whole tract of 200,000 acres it was also advised that a lower canal be built. The Yakima Canal and Land Company was organized December 4, 1889, with a capital of \$1,000,000. Walter N. Granger was made its first president. He gives us the following interesting incident: "At the instance of friends, in 1889, I came from Montana to look over the irrigation project presented by that portion of the lower Yakima Valley locally called Sunnyside section. So one June morning, accompanied by a guide, I left North Yakima. We soon passed the Gap, Park Bottom and out into the valley. A few miles farther down we ascended Snipes Mountain and traveled along its summit the better to view the country on either side. . . . As I gazed on the scene I then and there resolved that a city should some day be built. My mind was then made up regarding the feasibility of the canal project, and the next day we rode to the nearest telegraphic station, where I wired for my crew of engineers." (*History of Klickitat, Yakima and*

* Continuation of a thesis submitted by Miss Rose M. Boening, of Yakima, as part of her work for the Master's degree in History in the University of Washington.

Kittitas Counties, p. 222.) The company obtained an option from the Northern Pacific Company for the purchase of all railroad lands in the Sunnyside region. When the enterprise seemed so promising, the Northern Pacific made advances to the irrigation company for consolidation, with the result that the Northern Pacific took two-thirds of the stock and the new company was known as the Northern Pacific, Yakima and Kittitas Irrigation Company. It proposed to build seven reservoirs in the mountains and to build one canal in Kittitas County and two in Yakima. William Hamilton Hall, a famous engineer from California, was procured to verify the work of McIntyre, on which he reported favorably.

Work was begun in the early part of 1891 on the lower Sunnyside ditch, the one which has its intake just below Union Gap, "where the river pinches itself between two high hills—Nature seems to have designed it as a place for an intake of a great canal." They took over the Kennewick ditch, which had just increased its capital stock from \$10,000 to \$15,000. This they proposed to enlarge and extend so as to carry "one thousand cubic feet of water per second of time and serve 68,000 acres of land."

Work was continued, and on March 26, 1892, was held a great celebration, for twenty-five miles had been completed. The *Yakima Herald* says, "The announcement of the date of the ceremony was very brief, but sufficient to attract a large throng of people, who early in the morning could be seen wending their way down the river road by every means of conveyance that could possibly be secured. . . . Paul Schultze, president of the company, arrived in his special car from Tacoma. Many prominent men were there to witness the ceremony and inspect the great work, which is but the beginning of the most important system of irrigating canals in America. The intake of the canal where the dams and headgates are located is seven miles from and within sight of the two Buttes, the historic battleground. There a platform had been built, and at 10 o'clock Hon. R. K. Nichols, as master of ceremonies, called the assembled people to order. . . . Hon. Edward Whitson, Hon. J. B. Reavis, Hon. Gardner C. Hubbard (of Washington, D. C.) and Paul Schultze made speeches appropriate to the occasion. Miss Dora Allen broke a bottle of champagne over the headgates as the water swirled into the new canal and the band played lively airs." The first water was taken by new settlers from the main canal in April, 1892. The financial depression of 1892 caused the work to be suspended, but even ere the panic had passed work began again, and by 1893 Superintendent Granger's June day resolution had been fulfilled.

As early as 1894 the company surveyed the site and prepared for construction by hewing tamarack timbers for the dam, but this was to be the work of the Federal Government and belongs to another epoch. In 1902 Walter N. Granger claimed this project to be the fourth largest irrigation system in the United States and the largest in the Northwest. One million dollars had been expended. Forty thousand dollars had been expended for the headgates. Counting the smaller laterals at the lower end, an aggregate between 600 and 700 miles in length; the main canal had a top width of 62½ feet, bottom 32 feet, banks 8 feet high, initial capacity 800 second-feet. The canal covered an area of 64,000 acres of irrigable land, of which 32,000 are now under cultivation.

Besides this project, the Yakima Valley had many others, far too many to give more than a passing mention; for this valley was and is today the center of greatest irrigation interest. In January, 1892, arrangements were made for the construction of a canal from Horn Rapids on the Yakima to the Columbia, the ditch to extend along the south side of the Yakima. This work was by the Yakima Irrigation and Improvement Company. The operations made things lively in the vicinity of Kennewick during the whole of 1892 and 1893. This ditch proved inadequate, but has since been enlarged, and now claims to be the finest of its kind in the state.

On April 19, 1894, was completed, with appropriate exercises, the opening of the Yakima Irrigation and Land Company Canal, which would irrigate 4,000 acres.

In 1892, an attempt was made to irrigate the arid lands around Kennewick by the Yakima Irrigation and Improvement Company. It was not a complete success, though the company spent much money constructing a canal from the Horn Rapids some seven miles below Kiona. The ditch proved too small, but, with the financial depression, the company could not enlarge it, and so suspended development.

In 1902, the ditch, water right and realty holdings passed into the hands of the Northern Pacific, Yakima and Kittitas Irrigating Company, who soon enlarged the ditch and under the supervision of John Russell was built what is "claimed to be the finest irrigation canal in the state." At Kennewick, twenty-one miles from the headgate, it is five feet deep, eighteen feet wide at the bottom, and about 15,000 acres can be irrigated. A perpetual water right costs about \$35 an acre.

Some plans never reached a realization. In 1895 the survey for a large canal called the Naches and Columbia River Irrigation Canal was made under the direction of the State Arid Land Com-

mission. The intake was to be at the north side of the Naches River three miles below the intake of the Selah Valley Canal; it was to cross the Naches by means of an immense inverted syphon, circle Moxee Valley, pass through the ridge east of Union Gap by a tunnel 6,100 feet long, continue down the Yakima Valley to Rattlesnake Mountain and pass around it to the lands overlooking the Columbia. It was to be 140 miles long and to carry at its head 2,000 second-foot water. Bumping Lake was to be used as a storage reservoir.

The Prosser Fall Irrigation Company spent much money in a project to irrigate the high lands south of the Columbia, by raising it 100 feet. The water supplied would have irrigated 4,000 acres, but they could not stem the financial depression, and in 1899 the company went into the hands of a receiver.

In 1892, the Cowiche and Wide Hollow Irrigation District held an election at which was carried by a vote of fifty-two to fifteen the proposition to bond the district for half a million dollars for the construction of an irrigation canal. The plan was to take water out of the Tieton River by a canal ten and one-half miles long and to distribute the same by three laterals, one to cover the Cowiche and Naches ridge, one the valley and a third the foothills. It was to cover 46,000 acres.

Nor were the activities limited to the Yakima-Benton country. The Kittitas Valley Irrigation Company surveyed a canal. The intake was at Easton from the Yakima River and portions were constructed previous to 1901. The Bull Ditch belongs to this portion of the late '80s. It takes its water from the Yakima, is seven miles long and serves 1,500 acres.

The Hawley Ditch, according to Professor Lyman (private letter), was the first in Walla Walla County, having been built in 1891 or 1892. We now have the West Side Ditch and the East Side Ditch with their sources in the Touchet River and combined length of about nine miles. These Hawley ditches serve 1,000 acres.

According to the *Annual Report* of the Bureau of Statistics, January 1, 1896, Kittitas County is estimated as having about 30,000 acres under ditches and 100,000 more irrigable.

The Wenatchee country has developed little, for there, like the Okanogan country, cattle raising was carried on, since the means of transportation were still lacking. Fifteen thousand acres are first-class irrigable lands, of which not more than one-tenth were under irrigation in 1896. In 1891 Arthur Gunn, financially assisted by J. J. Hill, constructed the Gunn Ditch. The water was taken from

the Wenatchee River near Monitor, and about 12,000 acres were irrigated.

A canal had by 1896 been constructed in Franklin County, utilizing the waters from the Palouse River, irrigating 6,000 acres. In Walla Walla County was built the canal which utilizes the water from the Walla Walla River. It covers 8,000 acres between Pasco and Wallula Junction.

The Spokane Falls Irrigation Company had twenty miles of main ditch and expected to serve 75,000 acres.

Douglas County had the Coöperative Irrigation Company whose canal extended twenty miles, and with the Moses Lake Irrigation Company, made that county among the active ones.

Though the Federal Government did much to encourage irrigation, it continued to give actual aid to the wards of the government living on the reservations. It was estimated by William Redman, engineer, in his report of June, 1897, that by constructing more lateral ditches, 50,000 acres could be irrigated from the system then in existence. This same year shows the main canal to be 12 45-100 miles long with a capacity of 210 second-feet with 11 and 8-10 miles of laterals; the Toppenish Canal to be 3 2-10 miles long with 1 86-100 miles of laterals with a capacity of 104 second-feet; the Waneto, a natural slough, 12 miles long. In 1896 the Government built the Irwin Canal, naming it after the then Indian agent. In 1894 Congress appropriated \$30,000 for irrigating machinery and appliances on the Indian Reservation.

Connected with the Reservation was passed by Congress an interesting act, July 23, 1894, granting the Columbia Irrigation Company a right of way through the Indian Reservation provided that the grantee should at all times furnish the Indian allottees along said right of way with water sufficient for domestic and agricultural purposes of irrigation, and these rights should be free.

Yet in spite of our seemingly great development, state comparison reveals some surprising facts. Bulletin 16, Department of Commerce and Labor, Bureau of the Census, gives as follows: "In total of number of acres irrigated in 1889-1899-1902, as also in total number of farms, Washington stands lowest in state comparison—but Washington shows the greatest relative increase in the total construction cost of irrigation systems." In 1902, Washington ranked ninth in number of irrigated farms; last in number of irrigated acres; ninth in constructive cost of system; last in length of main canal and ditches. The state had one-fourth of one per cent of its acreage un-

der irrigation in 1902, but nearly four-fifths of this acreage and one-half of the irrigated farms are in the Yakima Valley.

The year 1900 dawned rosy and red for it ushered in the period of colossal enterprises, and the Federal Government came on the scene as a doer of things, and not as an onlooker. The change was perhaps due to the effective work of the National Irrigation Congress which will be discussed later, or to the apparent failure of the Carey Act, or to the new spirit which believed that government is beneficial and should be active along industrial lines. The surveys made by the Geological Department as a result of an act passed March 20, 1888, authorizing the Secretary of the Interior, through the Director of the Geological Survey, to make examinations of that portion of the United States where agriculture is carried on by means of irrigation, as to the natural advantages of storages for the storage of water for irrigating purposes, with the practicability of constructing reservoirs, under I. C. Russell in 1892, who examined Central and Southern Washington with special regard to its water resources, and under George Otis Smith in 1901, who made a detailed study and discussed a number of available sites for storage reservoirs, did much towards getting this state before the country.

To President Roosevelt may be given the title of "Father of National Reclamation." He urged it upon all occasions and that part of his Message of December 3, 1901, relating to the subject has become "a classic upon the subject." His was undoubtedly the first definite step taken by one in authority. This led, June 17, 1902, to the passing of the famous National Reclamation Act. This provided that all moneys received from the sale and disposal of public lands beginning with the fiscal year ending June 30, 1901, including the fees and commissions in excess of allowances to registers and receivers, and excepting the five per centum of the proceeds of the sales of public lands set aside by law for educational purposes, shall be set aside as a fund known as the "reclamation fund," to be used in the examination and survey, for the construction and maintenance of irrigation work, for the storage, diversion and development of waters for the reclamation of arid lands. The Secretary of the Interior is authorized to make examinations, then withdrew from entry all lands required for constructing the irrigation works. When it is determined that any irrigation project is practicable, he may cause to be let contracts for the construction of the same, payment shall come from the reclamation fund and the limit of area per entry shall be determined according to the amount required to support a family; also of the charges which shall be made per acre upon the said en-

tries. The said charges shall be determined with a view of returning to the fund the amount expended. The entryman must comply with the homestead laws and reclaim at least one-half of the total irrigable area of his entry for agriculture. No right to the use of water for land exceeding 160 acres to any land owner. The Secretary of the Interior is authorized to use the fund for the operation and maintenance of all reservoirs and irrigation works constructed under the provisions of this act. When the major portions of the payment have been made, the management and operation shall pass to the owners of the land irrigated thereby. Nothing in this act shall in any way affect or interfere with the laws of the State.

In 1915, the reclamation fund, according to the *Smithsonian Institute Report* for that year was \$100,000,000. The time over which the payments were extended was changed from ten to twenty years. It is believed that the absence of any test or qualification for settlers on the projects or a lack of capital to tide them over may mean failure to themselves and the Government. Unfair benefits are derived by private land owners, though the act was supposed to have provided against this; again it is claimed that private development is hampered by the withdrawal of Government lands. This could be easily remedied and perfect harmony made to exist. The short period in which the settler must pay could be remedied by extending it to thirty or forty years, and not demanding payment on the principal for the first five or eight years, but expecting the settler to pay up his interest only.

With the machinery organized, Washington was fortunate in the almost immediate attention which it received and almost simultaneously two projects were begun, the Okanogan and the Sunnyside. The reconnaissance and preliminary surveys for each began in 1903. The construction was recommended by the Board of Engineers, October 9, 1905, for Okanogan, and October 16, 1905, for Sunnyside; and the construction was authorized by the Secretary, December 2, 1905, for the Okanogan, and December 12, 1905, for the Tieton and Sunnyside; June 16, 1906, for the Wapato; the first irrigation by the Reclamation Service, season of 1907, by the Sunnyside unit, of 1908, by the Okanogan unit. The Okanogan project was practically completed October, 1910, a year before the Sunnyside unit.

We need not go into the details of building these projects, for what dweller in this great commonwealth has not watched them build? The Okanogan Project includes the storage dam in Salmon Lake and the Conconnully Reservoir, controlled by the dam on the Salmon Creek, two miles below Conconnully, Washington. The Salmon Lake Reser-

voir is controlled by a short inlet canal from Salmon Creek, and a concrete outlet work. Conconully Reservoir is controlled by means of an outlet tunnel discharging into Salmon Creek below the storage dam; it also includes a diversion dam, twelve miles below the reservoir, and a canal system watering lands between Okanogan and Riverside; also a pumping system to supplement the gravity supply by pumping from the Okanogan River to approximately 1,050 acres of land on the sandy portions of the project known as Robinson Flat. The power for the pumping is generated by two power plants constructed at drops Nos. 1 and 2 on the upper main lateral, and transmitted to the pumping station near the town of Omak by five and one-half miles of transmission line. This project when complete could supply water for 10,099 acres. In 1912, a board of engineers recommended that the capacity of Salmon Lake be raised from 2,000 acre-feet to 3,000 acre-feet, by raising the outlet structure and by building a low embankment across the lower end of the lake. The last had not been done by 1917, since the neighboring settlers feared damage to their property by seepage. The distribution system consisted of about forty miles of main canals and sublaterals and did not provide a direct delivery of water to each farm, except where the main canal traversed the land, but the ranchers found it unsatisfactory to construct their own farm ditches, and on a majority vote of the water users in their association, and the approval of the department, the Government constructed the laterals. By 1916, sixteen miles of small earth ditches of ten second-feet, twenty-four miles of iron pipe lines, thirteen hundred and thirty linear feet of steel flume and one thousand feet of minor wooden structures, as headgates, weirs, etc., had been built. What this project has done for that country would be hard to estimate.

The next great project carried on is that known as the Yakima Project. It divides itself into the following units: the Sunnyside, the Tieton, the Wapato and the Kittitas units.

The Sunnyside Canal System was acquired by purchase from the Washington Irrigation Company in December, 1905. The system consisted of a moveable diversion dam and wooden head works structure; a main canal about fifty-six miles long; two main laterals with a total length of about twenty-five miles; about fifty miles of smaller laterals; a wasteway on mile seventeen on the main canal known as the Zillah wasteway; together with other property. This the Government improved, enlarged and extended until today it consists of about sixty miles of main and fifty miles of branch canals with increased capacity. The old system could irrigate 65,000 acres, the present, 110,828

acres. The Government improved the Zillah wasteway and added the Sulphur Creek wasteway. The Snipes Mountain Canal was enlarged from ninety second-feet capacity to a hundred and ninety second-feet, main canal at mile fifty and twenty-three hundredths serves about main canal at mile fifty and twenty-three hundredths serves about 10,000 acres lying on the opposite side of the Yakima River from the main project. It crosses the river by means of forty-eight inch diameter wood stave pipes placed beneath the river bed, operating under a maximum head of one hundred and seventy feet. The Prosser Canal, diverting from the main canal at mile fifty-five, serves 3,000 acres on the south side of the Yakima River, which it crosses in wood stave pipes on the steel bridge. October 6, 1914, the Sunnyside was agreed upon to be extended eastward to Benton City. This Benton Canal serves 4,600 acres and was completed by June, 1915. Other minor extensions were made from the Snipes Canal and Lookout District on the main canal.

Water is stored for the units taking water from the Yakima River, at Bumping Lake, which is at the head waters of Bumping River, a tributary of Naches River, which is itself a tributary of the Yakima. This was completed in 1915. It covers 1,300 acres and has a storage capacity of 34,000 acre-feet. The first attempt at this dam had been made by the Northern Pacific, Yakima and Kittitas Irrigation Company in 1894.

A second reservoir is formed by the Kachess Dam, located on the Kachess River, about seventeen hundred feet below the most southerly portion of Lake Kachess. It is an earthen dam fourteen hundred feet long; maximum height sixty feet. Surveys for the water storage at Lake Kachess were made by the Northern Pacific, Yakima and Kittitas Irrigation Company, but construction was not undertaken by that company. In May, 1903, the Cascade Canal Company commenced the construction of a crib dam at the mouth of the lake. This work was completed on June 1, 1904. By agreement, the Reclamation Service assumed control of this dam April 1, 1907.

The third reservoir adding to the flow of the Yakima River is formed by the Keechelus Dam, located at the foot of the lake, six thousand five hundred feet long, with a maximum height of sixty-eight feet. Earlier surveys of this were made, but no construction completed until taken up by the Reclamation Service in 1906.

The fourth is at Lake Cle Elum, at the outlet of the lake; a dam with a maximum height of twelve hundred feet, a crest length of seven hundred feet and a volume of four hundred and twenty-five thousand cubic yards. An outlet tunnel approximately two and one-

half miles long is built from the lake to the Yakima River, thereby obtaining 117,500 acre-feet of substorage.

During the year 1905 the feasibility of the Tieton unit was investigated and approved by the Secretary, March 27, 1906. This system is designed to furnish water for 34,500 acres. This unit consists of a regulating reservoir, a diversion dam and headworks, main canal and distribution system. The regulating reservoir created by the Clear Creek Dam is on the North Fork of the Tieton River. The purpose of the reservoir is to equalize the diurnal flow of the Tieton River during the months of July and August. Construction was begun on the dam April, 1914, and completed by November of the same year. The diversion dam is located on the Tieton River, approximately fifteen miles above its junction with the Naches River, about eight miles below the McAllister Dam site. It is a concrete weir three feet high and one hundred and ten feet long. At the end of the dam on the right side of the river is located the headworks structure of the main canal. This structure is built of reinforced concrete and contains three 4x5 foot gate openings, each controlled by a cast iron sluice gate operated by hand. The left end of the dam terminates in low retaining walls. The main canal of the Tieton unit runs along the south side of the Tieton Canyon for twelve miles, at which point it is five hundred feet above the river and passes through the rim of the canyon by way of a tunnel to the project lands below. The distribution system consists of three separate units, covering approximately 12,000 acres each, namely, the Naches Branch, which waters the lands between the Naches River and the North Fork of Cowiche Creek; the Cowiche-Yakima branch, which waters the lands in the Cowiche ;and the Wide Hollow branch, which waters the lands between the Cowiche Mountains and Ahtanum Creek. This would indicate the great length of laterals and sub-laterals, a total of three hundred and twenty miles. The Tieton Reservoir is to be located on the Tieton River at McAllister Meadows at an altitude of two thousand eight hundred feet. The dam is to be one hundred and ninety-five feet in height and one thousand feet long, and to contain nine hundred and ninety-one thousand cubic yards. The capacity of the reservoir is to be 185,000 acre-feet. Work was begun on this in 1917, but because of the war work was suspended in the Spring of 1918.

The Kittitas unit consists of those mains and laterals diverted from the Yakima River in the vicinity of Ellensburg. The 62,000 acres lying on both sides of the river are made productive through this unit.

The Wapato unit consists of those mains and laterals which carry

water from the west bank of the Yakima River, near Parker, to the reservation, irrigating 106,000 acres of land by gravity and 14,000 acres by panning with power generated at drops in the canal. These projects are considered very successful and the purpose of reclamation, i. e., "to make homes for the homeless" has been accomplished to the extent of hundreds, and the increase in land values is shown in every report.

The future work of the Reclamation Service will be to complete the Sunnyside and the Wapato units as officially approved: Kittitas High Line, Pomona High Line, Naches High Line, Roza High Line, Kennewick Extension of the Sunnyside Canal and the Benton or Leadbetter Canal.

Mr. R. P. Tule gives 48,799 acres as under irrigation in 1889, 135,470 acres in 1899, and 334,378 acres in 1909, in Washington. June 30, 1914, \$6,555,299.73 was the reclamation fund in Washington.

The entering into irrigation activities by the Federal Government by no means lessened the interest of private concerns, and these have continued to increase in numbers, in capital, and in extensiveness of project until that part of the State west of the Cascades, too, may boast of its irrigation projects.

In 1900, construction work was begun by the Spokane Valley Land and Water Company. Liberty Lake is the head of this canal. It was built four miles long and watered 600 acres, ten miles east of the Spokane City limits. It was later extended to twenty-two miles, serving 10,000 acres. In 1901 fields were put into alfalfa and a five-year old orchard was ditched and put into shape for irrigation. The results were so satisfactory that the "practicability was thoroughly established."

The Fish Lake Canal was completed in 1902. It distributes water from Fish Lake over 5,000 acres of rich land between Houser Junction and Rathdrum, near Spokane. The canal is seven miles long and eight to twelve feet in width, and carries nine cubic feet per second.

George Otis Smith, of the United States Geological Survey, said, in 1896, that Kittitas County is still irrigated by canal ditches, but by 1902 this was no longer true; for in 1902 the Cascade Canal Company was formed to succeed the Inter-Mountain Irrigation Association, with a capital of \$150,000. It proposed to build two canals, one to irrigate 15,000 acres, the other 30,000 acres of Kittitas Valley land. It began its work August 29, 1903, on the lower canal, which has its intake on the north bank of the Yakima, five miles west of Thorpe. It is ten feet wide at the bottom, five feet deep, and has a

capacity of one hundred and seventy cubic feet per second. Within the first eight miles of its course it passes through a 600-foot tunnel, and just north of Ellensburg it passes through another tunnel of three hundred and eighty-eight feet. The canal is forty-two miles long and supplies 14,000 acres. The company built a dam at Lake Kachess, storing a body of water twelve feet deep and covering twenty-one square miles. The water was turned into the canal May 13, 1904. This is claimed to be one of the best in the State and is strictly a Kittitas County project, since all the capital stock is held by persons residing in that county. Altogether there are 70,000 acres of land under irrigation in the egg-shaped valley, twenty-five miles by twenty miles, and if the Kittitas Reclamation District Canal be constructed as planned, it will put nearly all the land under water.

The largest private project in the Okanogan country is the West Okanogan District Project, which is located along the river between Oroville and Tonasket. This project furnishes water for 5,000 acres. The Pleasant Valley Irrigation Project, comprising the Boston-Okanogan Orchard tracts, serves about 2,000 acres, and the Okanogan Power Irrigation Company's project furnishes Brewster Flat with water.

The Pasco Reclamation Company in Franklin County irrigates 10,000 acres, the waters for which are taken from the Snake River by electrically operated turbine pumps and carried through pipe line, thirty-two to thirty-six inches in diameter.

One of the greatest projects of the Twentieth Century undertakings is the High Line Project of Wenatchee. This was attempted in 1892, but nothing came from it except that two farmers near the point of diversion constructed a small ditch to water their farms of fifty acres. In 1901, F. M. Scheble and L. MacLean were sent by the Wenatchee Commercial Club to interview W. T. Clark, of Yakima, who had built and operated the Selah Moxee Canal. Marvin Chase, present State Hydraulic Engineer, made a preliminary investigation, and a survey the following October, and on May 26, 1902, construction was begun. This project was financed by Robert Livingston, Portland, Oregon. On May 10, 1903, water was turned into the canal. The intake is on the north side of the river, which is spanned by pipe line in order to water the lands around the Wenatchee. This covers about 6,500 acres. In 1906, assisted by stockholders of the Great Northern Railroad, the Company extended the project into Douglas County by carrying the water across the Columbia River by a pipe line 12,000 feet long, having constructed the first bridge across the Columbia. This extension watered about 6,000 acres. Since 1906,

by means of pumps, water has been given to another thousand acres. This project is now owned by the Wenatchee Reclamation District and is under the district management and is giving efficient service. In 1902 the assessed valuation of Chelan County was \$1,200,000. In 1916 it was \$19,000,000. The assessed valuation increased \$1,000,000 for every thousand acres irrigated.

Walla Walla has three principal irrigation projects today. The Burbank Project is the largest. It was formed about 1900, and covers about 12,000 acres. The water is pumped from the Snake River. This company formerly had a dam nine miles long below Walla Walla, but it proved unsuccessful, and so the pumping plant was put in. The Attalia Irrigation Company was organized in 1917. Before this date it was in the hands of various minor companies, entirely private concerns. However, all these private undertakings failed. The county then appointed three commissioners (with the approval of the land owners), who were to have general supervision over the company. A pumping plant was established on the Columbia River and the water flows through a fifteen-mile canal. The Gardena Project had its beginnings in 1905, although it had its smaller beginnings as early as 1890. It takes its water from the Walla Walla River, and carries it through a twenty-one mile canal and waters 7,000 acres, one-fourth of which is in Oregon.

President Benjamin Fowler in his address before the Nineteenth National Irrigation Congress said (p. 15): "The chief gift of irrigation lies in the raising of standards of excellence," and thus with new standards for agricultural products, many lands have been made producers of greater amounts and of better grades by added water supply, and thus we see new projects going in even on the west side of the Cascades. The western or coast portion of Washington is humid, but because of the slight rainfall in the summer months there is a growing tendency to supply water during these months.

The oldest of these projects is at Sequim. This little valley of 2,000 or 3,000 acres is located in the eastern part of Clallam County. The water is taken from the Dungeness River. Without irrigation it is practically worthless for farming, but with irrigation it is a gem among the farming districts of Western Washington. The Sequim Irrigation District had its twenty-first annual celebration on the 20th day of May, 1918. The Dungeness Canal has been in operation for five years, and the Cline District is only just now constructing its projects. These are projects built by private capital for the benefit of the stockholders' lands.

Yelm Prairie, about eighteen miles south and east of Olympia,

celebrated last spring the completion of an irrigation canal coming from the Nisqually River. About \$100,000 has already been expended, and when completed the canal will serve 10,000 acres.

An irrigation district has recently been created near Centralia. This project will irrigate about 4,000 acres of prairie land.

THE STATE EPOCH OF IRRIGATION LEGISLATION

All this development did not come without the efforts of the people grouped together under various names. It would be quite impossible to say which has done most and what the extent of influence wielded by any one has been. Each in itself was created by necessity through good influence, and each has helped to supply the need, in part at least, for which it was created.

The United States Geological Survey has played no little part. The first survey was begun by the Government in 1888, in connection with special studies relating to irrigation in the arid West. In 1893 the investigations of stream flow in the Yakima Basin were begun. This survey and the data are so important in the apportionment of water that the records have been extended to greater accuracy than in any other basin in the United States. Of this flow, Major J. A. Powell says that there is more than enough water flowing through Yakima County to irrigate every acre of arable land, and in this respect the Yakima Valley is exceptionally and especially favored, as its water supply is superior to that of any other region in the West with but one exception, Boise, Idaho. It has prevented many a money-wasting proposition, as artesian wells and reservoirs. This could have been done only by the best experts.

Another group, less expert but more enthusiastic, has been the National Irrigation Congress. The first meeting was held September 15 to 17, 1891, in Salt Lake City, Utah, with C. C. Wright, of California, as president. A great body of men from the Atlantic to the Pacific, inspired by a great idea, caused "the star of empire to take its way westward." The early congresses urged Federal cession of lands to states for the purpose of developing irrigation, and this finds expression in the Carey Act, but in the Congress at Phoenix, 1896, George H. Maxwell, of California, took strong ground in opposition to state cession of public lands and favored the national irrigation policy. He was the apostle in this great move, but unlike most such cases the day of fulfillment was close at hand. He carried on the propaganda in every section, until the passage of the National Irrigation Act, June 1, 1902, and thus buried the state cession policy of the first National Irrigation Congress.

In 1897, Chittenden reported that the subject of irrigation was

made a clause in the River and Harbor Bill passed in 1896, providing for the examining of reservoir sites in the West, with a view to establishing the question whether or not they were practicable and desirable for three things: First, improving the navigation of navigable rivers; second, providing water for irrigation of arid lands; third, preventing destructive floods. He says: "So we fought from one end of the country to the other. We had thirty senators, and year after year we got appropriations in the River and Harbor Bill in the Senate to build reservoirs. The Senate passed it, but the House, in which we had but one-tenth of the political power, turned us down, but it was not long ere the force of our strength made itself felt." The reader can judge the influence of this booster organization.

The State has found organization a good thing, though not until quite recently. The Washington Irrigation Institute was born January 14, 1914, with Hon. E. F. Benson as president during its entire life. The Institute was the outgrowth of the annual meetings of "operation and maintenance officials" of the Washington District of the Reclamation Service. The maintenance officials of private irrigation companies were invited, with the public officials, in October, 1912, to go into problems with which all were concerned. The purpose was to deal with phases of irrigation development in Washington: (1) construction and operation of irrigation systems, (2) preparation of land, methods of irrigation, (3) legislation that will permit greater agricultural expansion under irrigation. It, too, boasts of having accomplished something, and takes to itself the credit for the new water code and the present admirable irrigation district laws. The United States, with all its legal talent, is now displacing its "Water Users' Association" system by the "Irrigation District Law," as the best possible practice under which to operate. The Institute claims to have secured even more. The last Legislature authorized the State College to select a site for an experiment farm, but provided no funds for the purchase of land or equipment. The college appointed a committee to investigate. As a result a farm of about eighty acres, a donation from the Northern Pacific Railroad with options from adjacent owners for 200 acres more, was located near Grandview and under the Government pumping plant for the Sunnyside Canal.

Through the agricultural associations considerable influence was wielded, as noted by the donations made by Congress from time to time for investigations on the part of the Agricultural Department. In 1900, an appropriation of \$50,000 was made by Congress "to enable the Secretary of the Interior with the Secretary of Agriculture to investigate methods of utilization of irrigation waters in agricul-

ture." And again in 1908, \$150,000 to enable the "Secretary of Agriculture to investigate and report upon the best methods of irrigation and usage of irrigation waters . . . and upon the use of different kinds of power for irrigation and drainage."

We find also the local organization as the Yakima Husbandry Association. In 1902, A. J. Splawn was the chairman of the executive committee. He brought out in a paper the fact that the grazing of hundreds of thousands of sheep on the head waters of the streams was affecting the supply and since agricultural interests were ten fold greater than the stock interests, this ought not to be allowed to continue. A set of resolutions were drawn up in consequence of these facts and sent to the Secretary of Agriculture.

During the early eighties the projects were built by local capital, and the stockholders of the companies were the men for whose ranches the water was to be used. These were a financial success and his attracted outside capital, and we have irrigation companies formed from outside capital who developed projects for the purpose of offering for sale to the land owners, water as a commodity. This period extends, in most states, from 1886 to 1898, but the State of Washington has continued this to the present. In the table given in the Annual Report of the Bureau of Statistics of Agriculture and Immigration for January 1, 1896, there is shown the great number of companies operating independently of the land, and offering water as a commodity. They often took options on neighboring lands and sold it to settlers together with the water right.

The country became filled with land speculators who grabbed the land with no intention of buying a water right and settling, but holding it until some real settlers should come along willing to pay a handsome price for his relinquishment. The Canal Company could not tell a "real settler" from a speculator until it was ready to deliver the water, for then the "land grabber" wanted neither water nor title to a water right.

Many a company went under during the 1893 financial stress. To correct the evil of separate ownership of land and water and speculative possibilities, Congress passed the Carey Act which was to make possible a means of vesting the control of the land in the company building the irrigation project. The Bill was introduced by Senator Joseph Carey, of Wyoming. "This act ushers in the epoch of State and National aids in irrigation. . . . It has had more far reaching effects in producing material development in the arid West than has any other single act of National legislation." (*United States Experiment Station Report for 1910*, p. 263). However true this may be for the

West, or for particular states in the West, not one project was completed under it in the State of Washington, for reasons shown later on.

Federal Government legislation as to reclaiming desert land had its beginning in 1877 as already discussed. In 1891, the 1877 Act was amended as follows: At the time of filing, a map is required showing mode of contemplated irrigation and showing source of water. The amount of land was limited to three hundred and twenty acres. No patent shall be issued until his assignors shall have expended in the necessary reclamation and cultivation thereof, by means of main canals and branch ditches, at least \$3.00 per acre. One dollar at least shall be expended the first year, and not less than one dollar the second year and also during the third year. Another law was passed the same year to aid in the development of irrigation. This Act provided for the right of way through the public lands and reservations of the United States, to any canal or ditch company formed for the purpose of irrigation, and only organized under the laws of any state or territory which shall have filed with the Secretary of the Interior a copy of articles of incorporation. Maps of such canals, after ten miles have been built, shall be filed within twelve months of that time with the register of the land office.

These Acts were followed August 18, 1894, by the famous Carey Act, an act to aid the public land states in the reclamation of desert lands therein. By this act the Secretary of the Interior, with the approval of the President, was authorized and empowered, under proper application of the state, to conduct and agree with each of the states, to donate, grant and patent, free of cost, not exceeding one million acres in each state as the state might cause to be irrigated, reclaimed and occupied, and not less than twenty acres of each one hundred and sixty acre tract cultivated by actual settlers, within ten years next after the passage of the act, as thoroughly as is required of citizens who enter under the said desert land law. The state was required to submit a map showing the mode of the contemplated irrigation and the course of the water, and was forbidden to lease or rent such lands; but might contract to secure reclamation, cultivation and settlement. No person could receive more than one hundred and sixty acres.

This State was enthusiastic and on March 22, 1895, an act was approved creating a Commission of Arid Lands, which began business on June 22, 1895, by establishing an office in North Yakima, the center of irrigation activities. H. K. Owens, an engineer, was secured and began in July a survey for a canal one hundred and fifty miles long and 85,566 acres were selected which had been withdrawn from the public domain. Water was to be taken from the Naches River. Then the

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securing of contracts for construction of the irrigation works was in order, but here the weakness in the Federal law became more and more apparent as one attempt after another failed, for the land could be made the security but the security was faulty in the matter of attaining title; for patents to land could not be issued until actual operation and partial cultivation had taken place. Again, acceptance of the terms of the act required special legislation on the part of the state accepting the grant. The territorial experience with special legislation was such that our State Constitution prohibits special legislation. Then, too, the State was in no way protected in the assumption of its responsibility. This then led to the amendment passed June 11, 1896, which provided for a lien or liens created by the state to which such lands are granted, and when created shall be valid against each separate legal subdivision for the actual cost. When water is obtained, the patent shall be issued to the state, but the United States shall not be liable for any lien. This improved the bill greatly, but it still retained the serious defect of a time limit of ten years in which the reclamation must have been accomplished. This brought forth a second amendment passed as a rider to an appropriation bill, and approved March 3, 1901, which counted the ten years from the year in which the state's grant is approved and gave the power to the Secretary of the Interior to extend the time not to exceed five years.

In 1910, March 15, another amendment was added which authorized the Secretary of the Interior, upon the application of a beneficiary state or territory, "To withdraw temporarily from settlement or entry areas embracing lands for which the state or territory proposes to make application . . . pending the investigation and survey preliminary to the filing of maps and plats and applications for segregation. Provided that if the state or territory shall not present its application for segregation and maps and plats within one year after such temporary withdrawals the lands so withdrawn shall be restored to entry as though such withdrawal had not been made."

Many states availed themselves of this opportunity. Idaho and Wyoming, in 1908, took an additional million acres and Idaho has today a third million acres. Oregon did not fare so well due to poor state laws, but after adopting, in 1909, the Idaho-Wyoming laws, is at present meeting with success, and by 1914, 155,649.39 acres were applied for but none segregated nor patented. Washington entered into the contract but necessity for such aid was not felt, for this was the period in which the "then most extensive Sunnyside project" was under way, besides the many lesser ones. Then, too, the State Government was under a conservative regime and feared much state activity. Perhaps

the machinery which was made to put into operation the Carey Act was the principle reason for Washington's failure to make use of it.

The legislative act of 1895 shows a lack of business experience. This law would have worked a hardship on land speculators and these might be men of no little influence, and so for economic, political and personal reasons the Carey Act did not work magic in our fair State, even though the land and water was made common ownership, and adequate water was supplied for all lands under a project and the State supervision should have encouraged investors.

An interesting controversy arose between the people living along the Sunnyside Canal and those living on the reservation. We have already noted that irrigation had begun on the reservation almost immediately with the Indians accepting it as their home, with the building of the Irwin Canal and extending the others during the nineties. Opposition came from the Washington Irrigation Company whose lands had been already rapidly settled. In 1905, the Washington Irrigation Company, the successor to the Northern Pacific, Kittitas and Yakima Irrigating Company, builders of the Sunnyside Canal, brought an injunction suit, to restrain from taking the waters to use on the reservation; for on February 19, 1903, the then superintendent of the Yakima Reservation filed on one thousand cubic feet per second of water for the use and benefit of the reservation. While the suit was pending, Ethan A. Hitchcock, Secretary of the Interior, undertook to compromise and in March, 1906, awarded one hundred and forty-seven second-feet to the Washington Irrigation Company. Much disgust at the unfairness was expressed. The Superintendent of the Indian Reservation said, "The Sunnyside project in 1905 and 1906 had 40,000 acres under canals and being irrigated, with an ultimate irrigable area of 90,000 acres, and these lands were allowed six hundred fifty second-feet of water, while the Indians with irrigation systems with a capacity to serve 80,000 acres and an irrigable area of 120,000 acres, and with irrigated area of 47,000 acres, were allowed only one hundred forty-seven second-feet."

In 1912, a commission was created by Congress to investigate the feasibility of procuring impounded waters for the Yakima Indian Reservation and things are being satisfactorily adjusted. (*Report of Superintendent of Indian Reservation*, House Document No. 1299). For the purpose of doing justice to each party a Senatorial Committee was created in 1912 for the purpose of investigating the justice of Mr. Hitchcock's awards. Everything has been satisfactorily adjusted, since the Government has taken over the Sunnyside Canal, and the great storage reservoirs have been built, and there is sufficient water for both.

The State has even been ready, to a limited extent, to aid the individual, the corporate or the federal promoter of irrigation development. Because of the humid western part and the dry eastern part, the State has lacked an aggressive policy. Its laws have not always been wise. This we may attribute to inexperience and because irrigation flourished in the State, in spite of indifference on the part of the Government. We have not reached the time where every foot of ground must be utilized in order to support the population.

It is interesting to note that irrigation was not absent from the minds of the citizens when they met, in 1889, to make their State Constitution. Art. XXI, Sec. 1, provides as follows: "The use of waters of the State for irrigation, mining and manufacturing shall be deemed a public use."

The year 1890 marks a systematic organization of irrigation, and in order to protect all parties in their legal right in the use of water for irrigation an act was passed which provided that every person, association or corporation owning or claiming any interest in any ditch or canal, shall, on or before June 1, 1890, file with the Clerk of the County the name and full description, giving location of the headgate, name of stream from which it comes, amount of water claimed under such ditch, present capacity and the number of acres irrigated. It also provided that the Court might, when thought necessary, appoint a commissioner with qualifications, as theoretical and practical knowledge of the science of hydraulics, as will enable him to construct and operate measuring devices as may be necessary to place in any ditch. His salary was made \$7.00 per day to be paid by the County.

The year 1890 also marks the beginning of the district organization for irrigation. Utah has the honor of having enacted the first district law on January 20, 1865. The Wright law, an amendment on Utah's law, was enacted in California, March 7, 1887. On March 20, 1890, (*Laws of Washington 1889 and 1890*, p. 671) an act was ratified by Washington's Governor providing for the organization and government of irrigation districts and the sales of bonds arising therefrom. This law was amended in 1895 (*Laws of Washington, 1895*, p. 432) and has been further improved, until today the "District Law" is thought superior to the Water User's Association, the authorized organization of federal projects. The district system is being substituted by the Reclamation Service for its organization. The district system is a business organization of the stockholders of a project and the governing board levies assessments for the whole.

In 1895, the Legislature provided for a Commission of Public Lands to take, select, manage and dispose of all public lands of the

State of Washington. All proposals for construction of irrigation works shall be filed with him. These laws (*Irrigation Laws, 1916, p. 116*) are easy of access and so need not be given.

The second legislative assembly created the State Board of Horticulture which has aided the fruit growers, who in turn created a demand for better irrigation facilities.

In February, 1904, Governor Henry McBride appointed an Irrigation Committee for the purpose of investigating the subject of irrigation, and recommending such changes in the laws "as may be deemed for the best interest of the State." This Board stated that since the waters of the State belonged to it, its right should be asserted; and that the State should for the present permit private individuals and corporations to use its waters to aid in the development of its resources; and that the right to use water should be appurtenant to, and, under ordinary circumstances, inseparable from the lands. These were incorporated into legislation and the water code began to have laws of real benefit to the people.

In the session of 1917, the office of State Hydraulic Engineer was created, and on June 15, 1917, Marvin Chase, the present incumbent, began his work. His duty is to supervise all public waters within the State, their appropriation, diversion and use, and officers connected therewith. He shall inspect all dams, canals, ditches, irrigation systems and hydraulic power plants insofar as may be necessary to assume safety to life and property. All persons claiming a right to divert any waters shall petition the State Hydraulic Engineer, and he shall investigate and file findings with the Superior Court which shall proceed as in civil action.

During the last few years the State has shown a stronger tendency toward an aggressive irrigation policy. This was well expressed by Governor Lister in an address before the Third Annual Washington Irrigation Institute (*Proceedings, p. 105*) "If we could have a system whereby we had a fund of say \$2,000,000 for irrigation projects and no interest charge whatever for the first five or ten years—if we could keep that money constantly at work, and when the payments were made covering one project, again use the money for some other project, I think we would begin then to bring about a really steady development of irrigation projects, and it would be better if it were done in that manner than to have some one great big project requiring ten, twenty or thirty million dollars that we were trying to work out and the ultimate completion of which would require many, many years."

Governor Lister had in mind the Palouse country which embraces 100,000 acres of land, 80,000 of which are arable. This land is largely

owned by the Northern Pacific which has offered to sell it to the State for \$5.00 per acre, and which, according to Governor Lister, (*Proceedings of the Third Annual Report of the Washington Irrigation Institute, 1916, p. 105*) "The officers in charge say the State is willing to sell at the minimum price of \$10.00." The Palouse River is the only practicable source. Measurements of its flow have been made since 1897, which have shown the flow insufficient, and thus a series of reservoirs would be necessary. Rock Lake, Potlatch, Wash-tucna and Coulee would be possible, but the Potlatch Reservoir lies within Idaho and there are complications; for action on the part of the legislature of Idaho would be necessary and protests would be brought by the settlers of the basin who would object to having their farms destroyed or endangered. This project has been too great for individual enterprise and Congress has been unable to handle it with its limited funds. Then, too, the Commission appointed in 1913 as provided in Act (*Laws of Washington, 1913, p. 298*) to make a survey of the Palouse country, reported unfavorably as to the feasibility of getting storage water. Whether feasible or not, the fact remains that there are hundreds of acres that are needed and the State must find a means of reclaiming this land.

The Horse Heaven country offers itself as another problem which the State should help solve. And now (*Seattle Star, August 9, 1918,*) comes the cry for "Lands with Social Centers for Veterans after the war." This movement, led by George Dilling and Dr. Ellwood Mead, would have the 275,000,000 acres of waste land in the United States made homes for those who must begin life anew. We may yet have the opportunity to take an active part in making this State, which was once "a wilderness so unpromising that it evoked derision in the Halls of Congress," into the land of fortune and opportunity.

BIBLIOGRAPHY

ORIGINAL SOURCES

Federal Statutes

- (1) Act of July 26, 1866. United States Statutes at Large. Vol. 14, Sec. 9, p. 253.
- (2) Act of July 9, 1870. United States Statutes at Large. Vol. 17, Sec. 17, p. 218.
- (3) Act of March 3, 1877. United States Statutes at Large. Vol. 19, Sec. 1, p. 377.
- (4) Act of August 30, 1890. United States Statutes at Large. Vol. 26, Sec. 1, p. 391.
- (5) Act of Oct. 2, 1888. United States Statutes at Large. Vol. 25, Sec. 1, p. 526.
- (6) Act of August 18, 1894. United States Statutes at Large. Vol. 28, Sec. 4, p. 422.

- (7) Act of June 17, 1902. United States Statutes at Large. Vol. 32, Part I, p. 388.
- (8) Act of June 11, 1896. 6 Federal Statute Annotated, 1905, p. 398.

Federal Reports

- (1) United States Census Report for 1890. Extent of Irrigation in the various Counties.
- (2) Bulletin 16, Department of Commerce and Labor, Bureau of the Census.
- (3) Experiment Station Official Bulletin, 1903.
- (4) Experiment Station Report, 1910. Irrigation under the Carey Act, p. 461-468.
- (5) Annual Report of the Bureau of Statistics, Agriculture and Immigration for January 1, 1896.
- (6) Bureau of Statistics, 1901. Agriculture and Immigration.
- (7) Annual Report of the Smithsonian Institution, 1915. Reclamation Act, June, 1902.
- (8) Fifteenth Annual Report of the Reclamation Service, 1916.
- (9) Indian affairs, Laws and Treaties. Charles J. Kappler, compiler. Government Printing Office, Washington.
- (10) Charles Wilkes. United States Exploring Expedition, 1838-1842, Vol. 4. Lea Blanchard, Philadelphia, 1845.
- (11) Russell, Israel C. Bulletin of the United States Geological Survey, Nos. 107, 117. Possibilities of Artesian Wells in Washington.
- (12) Report of the Superintendent of the Indian Reservation. House Document No. 1299.
- (13) Senate Executive Document, Vol. 5, 2nd Sess. 63rd Congress. Commission created to investigate the feasibility of procuring impounded waters for the Yakima Indian Reservation.
- (14) Letters from Nathaniel J. Wyeth in the Report of the Commission of the House of Representatives on the Oregon Territory, presented February 6, 1838.
- (15) Official Proceedings of the National Irrigation Congress held in Chicago, Illinois, 1911, December 5-9. Donnelly and Sons, Chicago, 1912.
- (16) Geological and Water Resources of a portion of South-Central Washington. Water Supply Paper 316. Government Printing Office, Washington, 1913.

Washington Laws

- (1) Act of January 20, 1864, on Riparian Rights. Laws of Washington, 1863-64, p. 113.
- (2) Act regarding Irrigation and Water Rights in Yakima County. Laws of 1873, p. 520.
- (3) An act appropriating \$1,000 for the purpose of sinking an Artesian Well in Yakima County, Washington. Laws of Washington, 1887-88, p. 5.
- (4) Act accepting the Grant of Arid Lands and authorizing the disposal thereof. Laws of Washington, 1895, p. 452.
- (5) Act to authorize the Government to make Surveys of the Palouse Country. Laws of Washington, 1913, p. 298.
- (6) Irrigation Laws. State of Washington, 1916. Olympia, 1916.
- (7) The Water Code and its Administration. Bulletin No. 1. Office of State Hydraulic Engineers, Olympia, 1918.

State Supreme Court Decisions

- (1) Thorpe vs. Tenem Ditch Company. Washington Reports, Vol 1, p. 566.
- (2) George Barber vs. Henry Isaacs. Washington Reports, Vol. 10, p. 124.
- (3) Benton vs. Johncox. Washington Reports, Vol. 17, p. 277.