

narrow and consequently deepen the main channel by forcing it to scour itself out. It has been decided to use the machine and repair shops retained at Fort Stevens, on the Oregon side, because of the heavy expenditures involved in their removal to the Washington shore.

MISCELLANEOUS.

Many of the observers reported that the month was very bright and cold, with but little moisture, most of which fell in the form of snow, so that in many localities the depth of snow on the ground is greater than usual, notwithstanding the deficiency in precipitation. During the first five days of the month a severe storm prevailed in western Montana which blocked the traffic on the Great Northern Railway between Essex and Summit, immediately west of the Continental Divide. Hail and sleet occurred in many places west of the Cascades on various dates. Solar halos were recorded at a few places on the 7th, and lunar halos were observed in many places on the 6th, 7th, 8th, and 9th. Thunderstorms occurred at Corvallis, Oreg., on the 11th, and at Port Orford, Oreg., on the 13th. The following high winds were recorded: North Head, Wash., 84 miles southeast, on the 12th; Tatoosh Island, Wash., 62 miles southeast, on the 13th; Seattle, Wash., 48 miles south, on the 12th; Pocatello, Idaho, 42 miles southwest, on the 2d; Walla Walla, Wash., 39 miles southeast, on the 12th; and Lewiston, Idaho, 34 miles west, on the 2d. The prevailing direction of the wind was from the southwest.

IRRIGATION IN IDAHO.

By S. H. HAYS.

Idaho during the last five years has probably been the scene of greater irrigation development than any of the other Western States. Owing to special advantages in the way of water supply, private investors as well as the Government have been attracted to the southern portion of the State. The Boise-Payette and Minidoka projects in the southern portion of the State are among the most notable of those undertaken by the Government.

The so-called Carey Act, which has been largely responsible for Idaho irrigation development, was first enacted in 1894, and provided that 1,000,000 acres of land should be granted to each of the States in the arid region conditioned upon their securing the irrigation and reclamation of these lands. In 1896 it was provided that the State might create a lien against the separate legal subdivisions of land to be reclaimed for the cost and expenses of reclamation. Originally the act expired by a 10-year limitation, which prevented any large use being made of it, but by the act of March 3, 1901, it was provided that the 10-year period of time should be so extended that the State might have 10 years in which to reclaim each project. In order to carry out the terms of the act, it was provided by State legislation that the State Board of Land Commissioners should consider the proposals of private persons or corporations for the construction of the necessary irrigation works, that they should fix the amount of the lien upon the land and should provide for the construction of the works under State supervision and the ultimate turning over of the works to the settlers. This plan provided State supervision, construction by a private corporation, and ultimate municipal ownership. The State statute being broad in its terms permitted the State Land Board a wide latitude in making contracts so that the board might make each contract to fit the particular conditions in each case.

TWIN FALLS SOUTH SIDE PROJECT.

The most extensive of the earlier works to be constructed under the terms of this act in the State of Idaho was the project of the Twin Falls Land & Water Co. This company entered into a contract with the State of Idaho in the year 1903 for the construction of the irrigation system now covered by what is generally known as the Twin Falls South Side Project. The contract called for the construction of a dam in Snake River at the present town of Milner, a main canal approximately 80 miles long, and an elaborate system of laterals. Construction was rushed as fast as possible, and water was first turned into the canal March 1, 1905. The dam by which water is diverted from Snake River is approximately 2,000 feet long and 80 feet high at its highest point. It is of the type known as rock-filled, being constructed of large boulders with earth and gravel sluiced in. The width up and down stream of the rock section is approximately 100 feet, the total width with the earth facing being 450 feet. The dam has been in use for five years and has given excellent satisfaction.

Two small rocky islands in the center of the stream form a part of the dam. On top of one of these islands are 99 gates, forming the principal spillway. On top of the other island a concrete weir with flashboards furnishes an additional spillway for extreme high water. The entire irrigation system called for under the contract with the State was constructed within the five-year period, and the works were in the fall of 1909 turned over to the settlers, a corporation composed of the settlers having been organized for that purpose. These works cover an area of 215,000 acres, approximately 150,000 acres of which are already in cultivation.

The growth of towns has been rapid. In colonizing the tract it was soon found that unless towns were established the settlement of the country would be greatly retarded. The town of Twin Falls, the principal town on the tract, which had less than 200 inhabitants on the 1st of March, 1905, now has a population of over 7,500. It has electric lights, telephone system, waterworks, an excellent sewer system, and is now paving a considerable portion of its streets. A court house, costing \$150,000, is in the course of construction; two hotels, costing to exceed \$100,000 each, are already built and open to the public; and at the last session of Congress \$10,000 was appropriated for the purpose of purchasing a site for a Federal building.

Original landholdings on the tract averaged 120 acres to each farm. The average landholding is now 68 acres, a change that necessarily results from the fact that irrigation calls for intensive cultivation. There are now living in towns on this tract in the neighborhood of 10,000 people.

TWIN FALLS NORTH SIDE PROJECT.

The next in point of time and the greatest in magnitude is the project of the Twin Falls North Side Land & Water Co. The works of this company take water from the north end of the Milner Dam above described through a canal extending in a northwesterly direction a distance of 97 miles and having also a lateral system covering several hundred miles. The area under this canal is approximately 230,000 acres. Very heavy work was encountered in building the first 4 miles of the main canal on this project, and in order to secure efficient service this section of the canal was lined with concrete, giving it a capacity of 3,250 cubic feet per second. The normal flow of Snake River in ordinary years is 6,000 second-feet up to the 15th or 20th of July. In order to supplement this supply,

160,000 acre-feet of water is to be impounded in reservoirs for use on this project.

Water was first turned into the canals on this project during the season of 1909, and figures as to the acreage under cultivation are not yet available. Like the South Side Project, the original landholdings averaged about 120 acres, but the average present size of farms is not in excess of 80 acres.

The principal towns on the project are Jerome and Wendell, each having a population of between a thousand and fifteen hundred. Each of these towns has hotels costing from \$60,000 to \$70,000, electric lights, water-works, and telephone service. They have railroad connection over the Idaho Southern Railroad with the Oregon Short Line at Gooding, a thriving town of 1,500 people just at the edge of the project, and the Oregon Short Line is now building an additional line of road through the tract extending from Bliss to Rupert. The towns of Bliss and Hagerman, with a population of 500 each, were already established before the building of the irrigation works. The company constructing this project has a completely equipped agricultural department in charge of experts whose business it is to study the local conditions and advise the farmers as to the best methods to be used in the cultivation of crops. Observations as to weather conditions are also taken in connection with this department.

SALMON RIVER PROJECT.

The main feature of this project is the great Salmon River Dam, a concrete masonry structure rising to a height of 220 feet above the rock foundation upon which it stands. Its upstream face is curved in plan to a radius of 225 feet, thus forming a horizontal arch with abutments in the solid rock sides of the canyon. It is so constructed that an ample factor of safety is obtained. The site is particularly adapted to this type of dam. A dike of especially hard lava crosses the canyon at this point. The Salmon Falls River, from which the water is taken, flows through a box canyon with lava sides. Above the dam there is a widening of this canyon so that the reservoir will have a superficial area of 3,500 acres when the water level in it is at the maximum flow line. The outlet from the reservoir is a concrete-lined tunnel having a sectional area of 110 square feet and a capacity of 1,250 cubic feet per second. The mouth of the tunnel is so located that 180,000 acre-feet of the waters impounded in the reservoir can be utilized when the reservoir is filled. The outlet tunnel turns immediately beyond the portal and extends approximately 1,300 feet parallel with the canyon. Beyond this tunnel is 2,242 feet of open canal that terminates in the second tunnel 2,258 feet long.

The main canal has a capacity of 1,250 cubic feet per second. The canals already constructed cover 100,000 acres of this project. Seventy per cent of the dam at this time is already constructed. Water was furnished for the use of settlers during the past season. Eighty thousand acres of the land have already been taken by settlers.

This most interesting work has been in charge of F. C. Horn, constructing engineer, and A. J. Wiley, consulting engineer, both of whom have heretofore been employed in similar capacities by the United States Reclamation Service.

TWIN FALLS OAKLEY PROJECT.

The construction of this project calls for the building of a dam across Goose Creek at a point about 3 miles above the town of Oakley. There is an unusually fine body of land in this locality, and the building of irrigation works to cover this tract has been under consideration by various persons at different times for the last 20 years.

The dam now under construction is of the earth type with a concrete core wall. Its total length along the top is a little over 1,100 feet. The dam has a total height at the highest point of 142 feet, being the highest dam of this type in this country. The canals in connection with this work will cover an area of 60,000 acres. With the exception of probably 5,000 acres, the land is already taken.

The plans for this project call for one of the most effective and up-to-date irrigation plants yet constructed in the State. The works are particularly designed to procure a high duty of water.

The general character of the soil on all of the projects named above is what is commonly known as volcanic ash, a particularly fertile and valuable soil especially suitable for alfalfa which when planted acts as a fertilizer and adds the necessary humus.

The water right on these projects to which the settler is entitled varies from one-hundredth to one-eightieth of a second-foot per acre, but this is a maximum only, the settler being entitled to so much water only as his crops require under a rotation system. An economical and efficient use of water is provided for. The duty of water varies with the nature of the crop and the character of the soil. An excellent crop of oats has been raised with one irrigation, but in a majority of years probably two irrigations would be required for grain crops. Alfalfa and other grass crops require more water. On most of the area included in these projects three crops of alfalfa are annually obtained. The Oakley Project has been found specially valuable for sugar beets. All of the tracts are suitable for general farming.

These projects are notable for speedy construction, rapid settlement, and quick and efficient reclamation.