

vestor in water projects. In some of our states the common law doctrine still prevails in modified form and is a serious handicap to the adoption of modern administrative water codes. The Canadian provinces should be congratulated upon the freedom with which they can adopt laws suited to their conditions, without a long period of turmoil and expensive litigation by those who wish for some personal or financial benefit, to have streams flow undiminished to the ocean.

**Administrative Problems.**—Although our water code has been in effect four years, we are just reaching the point where its practical operation can be observed by the irrigator. All rights to water on a number of streams have been adjudicated and recorded, and water masters have been in charge of distribution. These water masters are appointed by the Water Board, but are paid by the county court. They are thus not as responsive to orders of the superintendents and the board as if paid directly by such board, and subject to dismissal for cause. Another difficulty has been the requirement of law that water masters should be residents of the district from which they are appointed. This prevents the promotion of experienced men to the more complicated districts.

In defining water rights in Oregon, the Water Board has generally specified a particular rate of flow for a definite irrigation season. Where the amount of water thus decreed was too small to furnish an adequate irrigation head, rotation was authorized. In this way each man could at any time ascertain whether or not his neighbor was taking more than his share. In case of rotation among a group of neighbors, the total quantity of water used by any one should not exceed the sum of that allotted to each. Self-interest will cause each man in such rotation group to see that he gets the total quantity of water his full share of the time. Such a decree is almost self-executing, as the average water user is honest, and will not take more than he is entitled to, if he knows the water supply is now sufficient for all. In Wyoming, where they have had long experience in distributing water, it is the exception rather than the rule to call out the water master to administer such decrees.

For old rights, one cubic foot per second is usually allowed for 50 to 80 acres, depending upon local conditions. All new grants for irrigation purposes have been restricted to the rate of one cubic foot per second to 80 acres. The average irrigation season or time between the last killing frost in the spring and first in the fall, has been carefully estimated from official records, at 120 days. The above rate of flow will deliver during such a period three acre feet of water on each acre of land. This in general is sufficient for alfalfa, the ordinary crop requiring the greatest amount of water.

Much difficulty is encountered in defining and protecting rights on flood water streams. On such the floods run off early in the spring, leaving the stream practically dry during the summer months. Rather than build expensive reservoirs, the pioneer settlers flooded their lands by means of ditches or temporary diversion dams, thus storing water in the soil itself. In most cases but one crop of wild hay, yielding about one ton to the acre, is produced, but under favorable conditions one to two cuttings of alfalfa have been produced.

In such cases, a larger rate of flow is allowed and the total quantity of water for the irrigation season limited to 2.5 to 4 acre-feet per acre. The volume limitation in certain cases has been further qualified by defining the amount in acre feet which can be diverted within any

period of, say, thirty days. Such a decree is difficult to enforce. No reliable and inexpensive instrument has yet been devised for automatically recording acre feet. The water master must be employed whether a controversy exists or not, and no water user will know whether or not he is getting the amount of water decreed him, unless he keep an independent record throughout the entire season.

Many water masters will thus have to be employed as each ditch will have to be measured one or more times each day. If the water master is not present when water is being run, his records will be incomplete.

Under such system it will be difficult to convict one of stealing water. It will also be difficult to convince each water user that he has received his full share of water. Such system of defining water in acre feet is more suited to large canal systems where numerous ditch riders are necessary to distribute the water, and where but little additional expense would be entailed in keeping accurate ditch records of the volume of water used each day.

**Irrigation by Pumping.**—Gravity irrigation under large ditch systems did not become a complete success until the common carrier canal was abolished, and water was made by law appurtenant to the land. Those planning to pump water have not forgotten the early experiences of the water user under such canals where the charge for water, after the expiration of the original short time contract, was increased by the company in accordance with the settler's ability to pay. It is believed that pumping for irrigation purposes will not reach its fullest development until both the power and the water are made appurtenant to the land benefited, either through the district or state ownership and distribution of power.

This question is of particular interest to Oregon for the reason that we have a considerable area which cannot be economically supplied by gravity canals, but which may be irrigated by pumping from adjoining streams, or from underground sources.

Along Snake River, in eastern Oregon, a pumping plant was recently installed for the irrigation of 6,000 acres where the maximum lift was over 100 feet. An irrigation district has been formed for the irrigation of 20,000 acres adjoining the above project where the lift will be 200 to 300 feet, and the land about 2,300 feet above sea level.

In central Oregon there are great interior basins, each containing several hundred thousand acres of level land, where the rain fall does not exceed the evaporation. In most of these basins a limited supply of water is found from 20 to 40 feet below the surface. With a permanent supply of cheap power this water could be pumped for at least partial irrigation of these districts.

**Public Interest.**—It is the duty of the state engineer to refer to the state water board any application wherein the proposed use conflicts with determined rights, or is a menace to the safety or the welfare of the public. This board can direct the refusal of such application after full hearing, if public interest demands. This feature of the law has recently been upheld by our Supreme Court and marks a distinct advance in water legislation.

In Oregon, we have a number of large irrigation projects which can be developed at reasonable cost. Unfortunately the early settlement in these districts has occurred along the streams and there is a strong natural tendency to complicate and delay the construction of the larger projects through the construction of power plants in the stream channels, or the building of railway lines through available storage basins. If the entire stream