

states has done perhaps more than any other agency of equal cost to develop and stabilize, not only irrigation but hydraulic power, mining and domestic water supplies. Conditions are so similar on each side of the international boundary that the same beneficial results are reasonably certain to accrue to the western provinces of Canada as a result of stream gaugings.

(2) The greater part of the water which is used for irrigation, power and other purposes, falls in the form of snow and rain on the elevated ranges and table lands. It is accordingly difficult to convey, distribute and apportion the water which collects in these great cold storage plants to thousands of users in the valley below. This task is well-nigh impossible without water measurements, and as a rule the more general and accurate the measurement, the greater the efficiency and the less the chance for controversies and litigation.

(3) The flow of rivers and creeks should not be only equitably apportioned among irrigation enterprises, municipalities, power companies, and other legal takers, but the flow of each canal or other water system should be equitably subdivided among those entitled to its use. Water deliveries based on guess-work lead to disputes, and disputes to litigation. Reliable water measurements and records usually safeguard the water user from both and enhance the value of his rights.

These and other arguments which might be presented point to the conclusion that utilized waters and those that might be utilized in the future, should be measured and the flow recorded. This conclusion, however, confronts us with another difficulty, and that is one expense. The water user has a right to enquire as to the cost of such measurements and whether he can afford to have measuring devices installed and maintained. In reply to such enquiries, it may be stated that most of the measuring devices, particularly those used in connection with irrigation systems, are relatively cheap. The costlier water meters are installed by municipalities usually at the expense of the consumer, to keep tab on the domestic supply, and this type could not well be used economically by irrigators. In what follows, the customary methods of stream, canal and water pipe measurements are briefly reviewed and the cheaper devices described.

### **The Measurement of Streams.**

This work, in both the Dominion and the United States, is for the most part conducted by Government agencies, although private corporations sometimes make systematic and long-continued measurements independently of the Government. This is particularly true of streams utilized by power companies.<sup>1</sup> The records of these companies are generally accepted at their full face value by the government, and in many cases are published in the same papers with the results of government measurements upon streams in the neighborhood. These government publications give the details of the methods of measurement used and of the equipment employed, and no object would be attained in repeating that information here, except to say that the current meter is the standard instrument for the measurement of the larger streams, and the meter or the weir for the measurement of small discharges. In many cases a meter is used during the flood flow, and the low water flow is led through a weir and determined with more accuracy than is possible with a meter. Among the publications that may be considered of an educational nature along the lines of river measurement may be cited: