In practice the location of the rain-gauges would be selected according to the conformation of the country, so as to secure such a proportion of higher or lower records as to bring the arithmetical mean roughly into accord with the physical facts. It is clear, however, that the only method by which an arithmetical average can be made to approximate reasonably to the actual rainfall for the whole area would be the provision of so large a number of gauges that the effect of the differences in area to which their readings applied should be eliminated. The objection to this would be the cost of providing and maintaining the gauges and of obtaining the readings.

Another and more scientific method is to use the readings of rain-gauges, not as direct indications of precipitation, but as elements in a calculation whereby areas of equal rainfall may be determined. This is achieved by the plotting of isohyetal lines on a map of the area. It may be explained that by an isohyetal line is meant a line passing through points having the same rainfall for the period under review, say, a year. Such lines are determined by means of all the available data, using for the purpose the readings not only of the rain-gauges established in the specific area under consideration, but also those over a large tract of surrounding country. By the utilization of these data, and comparing the reading of one gauge with another, lines along which the precipitation is uniform can be determined, and provided that the isohyetal lines are sufficiently close to each other, it is a safe inference to apply to the area enclosed by any two of them a mean value of precipitation, and so arrive at the total rainfall for the period with much greater accuracy than by the application of an arithmetical average of the gauge records.

It must, however, be noted that the drawing of isohyetal lines is not accomplished merely by the mechanical process of linking up on the map gauges showing similar records, but is a process requiring great judgment, mature experience, and attention to the natural configuration of the district. One of the advantages of the isohyetal method is that it attracts attention to anomalous readings, and enables errors to be detected.

It must be recognized that by a different locating of rain-gauges the records might, on arithmetical average, have given a higher value than on the isohyetal method. In such a case the assumed rainfall would exceed the facts, and an error in this direction might easily entail serious consequences by leading to exaggerated anticipations of yield.

It may be asked, what useful purpose can be served by these observations. The answer, in the case of Birmingham, is, as indicated above, that, as a portion only of the ultimate scheme of reservoirs has been constructed, the question of available rainfall will clearly be an important element, not only in finally deciding the capacity of future reservoirs, but also in determining the date on which they must be provided; for it is clear that, if more rain than had been assumed can safely be expected in the summer months, when there would be available capacity to store it (and if there were not, it would follow that the reservoirs were already full), the date for the construction of further reservoirs could be somewhat deferred. Similar considerations to these would apply in the case of all partially-developed gathering grounds. It is, however, taking too narrow a view of a question of this kind to confine it to considerations

of immediate and local utility, and the writer is quite sure that all of the members of the Municipal Waterworks Association share with him the opinion that the collection and careful collation of hydrographic statistics for the whole country is of great national importance.

The establishment of rain-gauges, and the keeping of records, are carried out by most water undertakings. There have, however, been cases where rain-gauges have been discontinued on the completion of works on the ground that they were not longer of any practical service. Even if this be true as regards a particular undertaking, it is manifest from what has already been written that returns of rain-gauges in one district furnish valuable data for the laying down of isohyetal lines beyond such district, and as all water undertakings have benefited by information previously ascertained, collected and collated, some return for the benefit received should be made towards the common stock of knowledge on the subject. The object to be aimed at is to obtain a continuous record of rainfall observations covering the country, so as to enable isohyetal lines to be plotted for every district.

In the opinion of the writer it should be made a statutory obligation on all water undertakings and local authorities generally to establish and maintain properlylocated rain and stream gauges, and to make them available for national purposes.

WEST VANCOUVER WATER SUPPLY.

This municipality has under way an important water scheme, work upon which is to proceed without delay. A contract was awarded a few weeks ago to Mr. M. P. Cotton, the amount of it (\$90,000) indicating that the project is of considerable size. The scheme provides for the installation of a reinforced concrete reservoir of 230,000 gallons capacity, and served through a settling tank by a 6-inch wood pipe line from an intake in Sisters Creek. The reservoir will be 16 feet deep and about 50 feet in diameter. The undertaking has been contemplated since 1912, when the municipality first faced the problem of obtaining a pure and adequate supply. Engineers investigating the available sources recommended a supply from Cypress Creek for the western section of the municipality and Sisters Creek and Capilano River as sources of supply for the eastern section. Last year, however, new plans were prepared covering the whole of the eastern district, and making provision for a supply from Sisters Creek. The cost was estimated at about \$150,000, and the by-law was carried through. Tenders were called and the offers ranged from \$98,000 to \$120,000. The contract was awarded to a Vancouver firm which undertook to accept bonds for \$98,000. It was found, however, that the bonds could not, at that time, be sold and the contract had, therefore, to be cancelled.

The council then decided to reduce the cost by the substitution of wood for steel pipes, and the elimination of the dam at Sisters Creek. It was proposed to have an intake and pipe the water through a settling tank to a 230,000-gallon reservoir or tank without making any change in the previously proposed distribution of the water.

The scheme, as finally adopted, involves about 18 miles of wood pipe, 6 inches in diameter. The contract provides for completion next spring.