

United States of America.—At present there is no State or Federal aid, as in Canada, but certain States have enacted legal machinery in the interests of landowners. This legislation varies somewhat in each State, but is generally on the lines of our own Land Drainage Act, 1908. The Federal Government has under the Department of Agriculture a most valuable branch of drainage investigations. Its functions are, as its title indicates, to explore every aspect of drainage of wet areas, surveys, hydraulics, soil-surveys, schemes, and the financial and costs side. This branch of drainage investigations is most valuable, and although it does no actual construction work, yet it covers all schemes in progress, carries on experiments thereon, issues bulletins, and advises engineers and the general public as to best procedure, practice, &c. Its publicity department is proving most valuable, and is much sought.

Public agitation is now directed towards gaining State aid in the various projects of the future, as it is held that the State is equally concerned with the individual in the advancement and increased productiveness of the country. Again, many projects are too large for the successful financing and carrying-out of operations without State assistance.

LEGAL MACHINERY : DRAINAGE DISTRICTS.

Petitions.—In both Canada and the United States the procedure is much the same as in New Zealand. All petitions for forming drainage districts in Canada must be signed by a majority of the landowners; while in the United States it varies in different States, some requiring the petition to be signed by a majority of the landowners, others by the owners of a majority of acres, and in some instances a petition signed by three landowners is sufficient.

Objections.—The usual machinery for hearing objections is much as laid down in our own Land Drainage Act.

Classification.—Great care is taken in this connection, and every endeavour made to assess the benefits likely to accrue. Classification varies from an acreage basis to, say, five different classes of benefits. In some States the various highways, railroads, &c., may be assessed for likely benefits.

Finance.—This may be effected in several ways: (1) By issue of provincial debentures (as in Canada); (2) each landowner pays his share of cost in cash, in advance of construction; (3) by the issue of certificates; (4) by the issue of bonds. Of these, (1) and (4) are the most practicable and in general favour.

The Canadian debentures have a currency of not less than twenty nor more than thirty-five years. In the United States the bonds usually extend over a period of from ten to twenty years; but it should be noted that these represent private issues.

Comparison.—Comparative analyses of the several Land Drainage Acts in the United States with the New Zealand Land Drainage Act, 1908, shows the latter to be much in accord, but it does not offer the same variety of classification.

Considering the Act respecting land drainage of Manitoba, it is found similar in many respects to the Swamp Drainage Act, 1915, of New Zealand, but the latter has several features much in advance of the former as regards resumption of lands, construction of roads, &c. In fact, the Swamp Drainage Act, 1915, has several features which appealed strongly to the authorities in Canada and the United States, and copies are desired by those advocating State assistance.

GENERAL PRACTICE.

In considering a new project in either country, extensive engineering surveys, data as regards precipitation and run-off, and other details are called for, and it is only after deliberate analysing of all information and finance proposals that the works should proceed. This is the approved method, but it is not general. Engineers complain that the layman does not appreciate the necessity for spending money on collection of data, and this especially applies to land-drainage. Large sums of money are expended in the assembling of data considered necessary for power-installations, dams, &c., and business people realize the necessity.

In the United States much of the way is cleared for the drainage engineer, as practically the whole of the States are covered by meteorological and hydrographic surveys. The precipitation, run-off, gauging of all streams, their velocities, and so on, are available, and thus a drainage coefficient is at once known for a particular district. This data enables the engineer to design with some measure of exactitude such channels, outfalls, and laterals as will meet the requirements of the area he is dealing with.

This points markedly to the disadvantages engineers in New Zealand labour under, due to a complete absence of systematic observations of precipitation and run-off. Flood discharges of our rivers and streams are sadly wanted, and can be only arrived at under largely supposititious conditions, and the employment of formulæ which lead to indifferent approximation. Actual observations extending over a period of years are essential. To assist the Land Drainage Branch in this matter several flow-recorders and current-meters were obtained, and will shortly come to hand.

CLASSES OF DRAINAGE.

Drainage may be said to come under one or the other of the following headings: (1) Gravity drainage; (2) salt-marsh drainage; (3) drainage by means of pumping. Fortunately, the major portion of the swampy areas in the United States can be reclaimed by gravity drainage. This also applies to New Zealand. All the above classes were closely looked into and deductions made.