

The design of a drainage system is by no means a simple matter if conscientiously accomplished. It is in fact so complex and so ill-adapted to the use of rigid rules that many are prone to jump at the conclusion that almost any amount of latitude in fixing the sizes of drains is permissible, and as a consequence the subject does not receive the serious study that it should. This attitude is difficult to overcome particularly as the result of defective design is, as a rule, only an economic loss that is hard to prove and probably never realized by those on whom it falls. It is to be hoped—nay, it is not to be doubted, for conservation is becoming a watchword, that engineers will come to realize, and realizing prevent this economic waste.

FIELD CROPS IN CANADA.

The condition of field crops in Canada is presented in a bulletin of the Census and Statistics Office, and shows good averages for all provinces as well as for all crops. Fall wheat was hurt by the hard winter in Ontario, but fared better in Alberta. The estimated yield is 23.24 bushels for the former province and 27.89 bushels for the latter. The total estimated yield is 17,706,000 bushels. The condition of spring wheat at the end of July, 1911, was 90 for the whole of Canada, being 85 to 95 in the Maritime Provinces, 80 to 89 in Ontario and Quebec, 90 to 96 in the Northwest Provinces and 85 in British Columbia. Oats and barley have an average condition of 88 for Canada, 85 to 95 in the Maritime Provinces, 80 to 90 in Ontario and Quebec, 88 to 100 in the Northwest Provinces, and 87 to 89 in British Columbia. Rye, peas and beans range from 78 to 84 in Canada and buckwheat 81.85. Mixed grains have a condition of 86, which is 14 per cent. less than last year, and flax is 91, which is nearly 20 better. The average of corn for husking is 86 and of potatoes 85.64,—being in each case a little higher than last year. Potatoes, turnips and mangolds range from 81 to 85, or about the same as a year ago. Hay and clover and alfalfa are 80 to 83, which is a little lower in each case than last year. Corn for fodder has an average condition of 87, sugar beets of 79 and pasture of 79. The eastern provinces are lower than the figures quoted for the whole of Canada, and the western provinces are higher. The highest averages are given for Manitoba, Saskatchewan and Alberta. Sugar beets have a condition of 81 in Ontario and Alberta.

Compared with last year's crops in the Northwest Provinces, the condition of spring wheat in Manitoba south of the Grand Trunk Pacific Railway is 88 to 39, of oats 88.72 to 38.85 and of barley 85.16 to 34.92; and north of the same railway the condition is 92.21 to 77.42 for wheat, 90.71 to 72.90 for oats, and 88.95 to 50.84 for barley. In Saskatchewan south of townships 25 the condition of wheat is 90.19 to 69.33, of oats 88.27 to 61.64 and of barley 89.03 to 65.89; and north of townships 24 the condition of wheat is 98.22 to 67.69, of oats it is 95.35 to 63.88, and of barley 94.58 to 71.30. In Alberta south of townships 31 the condition of wheat is 93.89 to 24.93, of oats 95.28 to 20.43 and of barley 93.70 to 26.36; and north of townships 30 the condition of wheat is 97.84 to 71.55, of oats 97.95 to 65.68 and of barley 105.95 to 73.60.

The area of spring wheat in the Northwest Provinces this year is 1,500,000 acres more than last year and of oats 341,000 acres, but no increase is shown for barley.

The yield of hay and clover is estimated at 12,189,000 tons for Canada, being 1.43 tons per acre, and the largest yields for provinces are 4,736,000 tons in Ontario, 5,028,000 tons in Quebec, 254,000 tons in Prince Edward Island, 941,000 tons in Nova Scotia and 885,000 tons in New Brunswick.

THE ROAD BOARDS OF GREAT BRITAIN.

General Directions and Specifications Relating to the Tar Treatment of Roads.

(Continued from last week)

9. The quantity of tar used to coat 1 ton of stone should be approximately from 9 to 12 gallons, varying according to the sizes of the stone, the grade of tar used, the method of mixing and other conditions.

10. The tar-macadam after having been spread and levelled should be rolled into a smooth surface, but too much rolling should be avoided.

Less rolling is required than in the case of water-bound macadam.

A 10-ton roller is a suitable size for use in most cases, but good results can be obtained by using a 6-ton roller, and finishing with a 10-ton roller.

11. In order to get the best results from the use of tar-macadam, it is advisable to apply a coating of tar to the surface after the road has been used by traffic for several weeks. This tar should comply with the provisions of Road Board Specification for Tar No. 2, and should be poured or sprayed on the surface at a temperature of about 270 deg. Fahr.

12. Stone chippings, crushed gravel, coarse sand, or other approved material (free from dust), not larger than will pass through a $\frac{1}{4}$ -in. square mesh, should be used for gritting in quantity not exceeding 1 ton for 400 to 350 super. yards if grit is used, and 1 ton for 200 to 250 super. yards if coarse sand is used.

Note.—These general directions are not intended to displace or to discourage the use of proprietary articles of which there are several of proved value.

ROAD BOARD SPECIFICATION, No. 3

General Directions for Surfacing With Pitch-Grouted Macadam.

1. Any road which is to be surfaced with pitch-grouted macadam should have a proper foundation or sub-crust of adequate thickness to bear the traffic likely to use it.

2. Before laying a new surface of pitch-grouted macadam, the thickness of the old crust, including foundations, should be ascertained by opening trial trenches at intervals, averaging about 150 yds., extending from the haunch of the road to the centre, such trenches to be made alternately on opposite sides of the road.

3. The thickness of the surface coating of pitch-grouted macadam when finished and consolidated by rolling should be $2\frac{1}{2}$ in. to 3 in. (except on very light-traffic roads, when the thickness may be 2 in.) for single-pitch grouting, and from 4 in. to $4\frac{1}{2}$ in. for the double-pitch grouting hereafter described.

4. In the case of naturally hard subsoils, not materially softened by infiltration of surface water, the total thickness of the road crust, including foundation, if any, after consolidation by rolling of the new pitch-grouted surface, should not under ordinary circumstances be less than 6 in. unless the subsoil is so hard as in itself to act as a good foundation, in which case the thickness of the road crust may be reduced to 4 in. In the case of clay or other yielding subsoils, the total thickness should not be less than 11 in.

5. The finished surface should have a cross-fall of about 1 in 32.

If the crust is not sufficiently thick at the crown to enable this cross-fall to be obtained with a new coating of the thickness above mentioned, then the old surface should be