Country.	Area (Square Miles).	Population (Latest available figures).	B. Horse-power available (1915 estimate).	B. Horse-power developed (1915 estimate).	Per cent. utilized.	Horse-power per sq. mile of Area. Available.	Horse-power per sq. mile of Area. Developed.
United States ..	3,026,600*	92,019,900†	28,100,000	7,000,000	24.9	9.3	2.31
Canada (A)	2,000,000	8,033,500	18,803,000	1.735,560	9.2	9.40	0.86
Canada (B)	927,800	8,000,000	8,094,000	1,725,000	21.0	8.74	1.83
Austria-Hungary...	241,330	49,418,600	6,460,000	566,000	8.8	26.8	2.34
France	207,100	39,601,500	5,587,000	650,000	11.6	27.0	3.14
Norway	124,130	2,302,700	5,500,000	1,120,000	20.4	44.3	9.02
Spain	194,700	18,618,100	5,000,000	440,000	8.8	25.7	2.27
Sweden	172,900	5,521,900	4,500,000	704,500	15.6	26.0	4.08
Italy	91,280	28,601,600	4,000,000	976,300	24.4	43.8	10.7
Switzerland	15,976	3,742,000	2,000,000	511,000	25.5	125.2	32.0
Germany	208,800	64,903,400	1,425,000	618,100	43.4	6.8	2.96
Great Britain ..	88,980	40,831,400	963,000‡	80,000	8.3	10.9	0.91
Russian Empire§,	8,647,657	182,182,600	20,000,000	1,000,000	5.0	2.3	0.12

Canada "B" refers to the presently most thickly populated portion of the Dominion.

Canada "A": 2,000,000 sq. miles taken as the area treated in the Conservation Commission's estimate of available water-power, and the area which we may expect to see fairly thickly settled during the next few decades. This includes the area indicated by "B" and includes the 8,000,000 population of "B." The area of the whole Dominion is 3,729,750 sq. miles. The powers given are a 1917 estimate.

*Excluding Alaska (area about half million sq. miles).

†1911 Census + 12 per cent.

‡The estimate for Great Britain is almost certainly much too high.

§A recent estimate by the Ministry of Ways of Communication ("Electrical Review," February 22nd, 1918).

From this it appears that between 15 and 16 millions of the world's industrial horse-power is at present developed from hydraulic resources. The following table shows approximately the hydraulic power developed in the various regions, and also the ratio of this to the total industrial horse-power, excluding railways.

	United Kingdom.	Continental Europe.	United States.	Colonies.
Millions of h.p. ..	.08	6.5	7.0	2.0
Percentage of total industrial h.p.	0.6	27.0	24.0	33.0

Perhaps the most interesting feature of these tables is the extremely small proportion of available hydraulic power developed in the United Kingdom. It is the most backward in this respect of all the countries listed, except Russia, and its 8.3 per cent. compares very unfavorably with the 43.4 per cent. of Germany.

The Empire's Water-power Possibilities

The question as to the amount of potential water-power in the Dominions and Dependencies of the Empire is dealt with in more detail in the following pages.* So great is the lack of reliable data, however, in reference to all but one or two of the colonies, that any estimate of the total power must be looked upon as highly speculative. The main powers are to be looked for in Canada, India, New Guinea and New Zealand, and it is fairly certain that in these countries alone there is a potential water horse-power of the order of 40 millions. When to this are added the resources of East, South, and Central Africa, Egypt, Ceylon, Tasmania, Australia, British Guiana, Burma, the Malay States, and our own islands, it appears that in the aggregate the hydraulic resources of the Empire are extremely large, and that they are as yet barely tapped.

Reason for Neglect in the Past

There have been many good reasons for their comparative neglect in the past. The general abundance of coal in proximity to centres of industry; the necessity for a heavy initial outlay to bring most of the larger powers into bearing; the lack of co-ordination between possible producers, users, and financiers of power; the lack of markets for the energy which would be made available; and the remoteness of most of the powers from present centres of activity have all contributed. Moreover, the highly efficient combination of the hydraulic turbine and the electric generator, capable of handling large powers, is of comparatively recent development.

*Wherever hereafter in this report the term horse-power is used, it is to be taken as meaning continuous 24-hour power unless otherwise stated.

Recent Development

The developments in engineering science in the past decade, and more particularly the developments in electro-chemical, electro-physical, and electro-metallurgical processes, and in the possibility of high-voltage electrical transmission have removed some of these reasons. Transmission lines exceeding 200 miles in length are in existence to-day, and only financial considerations now set a limit to their possible length. Any distance is feasible electrically and mechanically.

Electro-metallurgy and electro-chemistry have rendered it possible to handle materials not workable by any other means; have made available new materials; and have greatly cheapened the production of many important materials of wide use. Aluminium, calcium carbide, chromium, cyanide, silicon, carborundum, are products rendered commercially possible only by electrical processes, while alkalis, hypochlorite, phosphorus, magnesium, and sodium nitrate are produced most economically by such processes. Great developments have recently taken place in the production of electrolytic copper and zinc and in processes of the electric smelting and refining of metallic ores.

All these processes demand relatively large amounts of energy. The world's production of calcium carbide, for example, was 340,000 tons in 1913, requiring 400,000 continuous e.h.p. for its production, while the energy used at the end of 1915 for electric furnaces in the United States alone was approximately 300,000 e.h.p.

Nitrogen Fixation

In the utilization of atmospheric nitrogen for the production of nitric acid and the manufacture of nitrates, great developments have taken place during the last decade, and in Norway alone over 400,000 e.h.p. is now absorbed in its production. The world's annual consumption of nitrogen in its various combinations is about 750,000 tons, representing a value of about £50,000,000, and this demand is increasing yearly. Four-fifths of this supply has been produced hitherto from natural nitrate deposits, but in view of the rapid depletion of these deposits, and of the diminution in the fertility of most of the great wheat and cotton-growing areas of the world, the production of artificial fertilizers by one or other system of nitrogen fixation must, in the near future, become a question of national importance.

At the present time the world's consumption of fertilizers amounts to close upon 6,000,000 tons per annum, and this will probably be doubled within the next 20 years. To-day, the efficiency of the electrical production is low, amounting in the case of calcium nitrate to about three-quarters of a ton per e.h.p. year. By adopting the cyanamide process the consumption of energy may be cut down to about one-fourth, but even in this case the production of the equivalent of 12,000,000 tons of fertilizers per annum would require 4,000,000 continuous e.h.p.

It is estimated that the 200,000,000 acres of arable land in Canada alone may ultimately require some 10,000,000 tons of nitrates per annum to maintain their fertility, and this in itself would necessitate the absorption of an appreciable portion of the whole hydraulic energy of the Dominion.