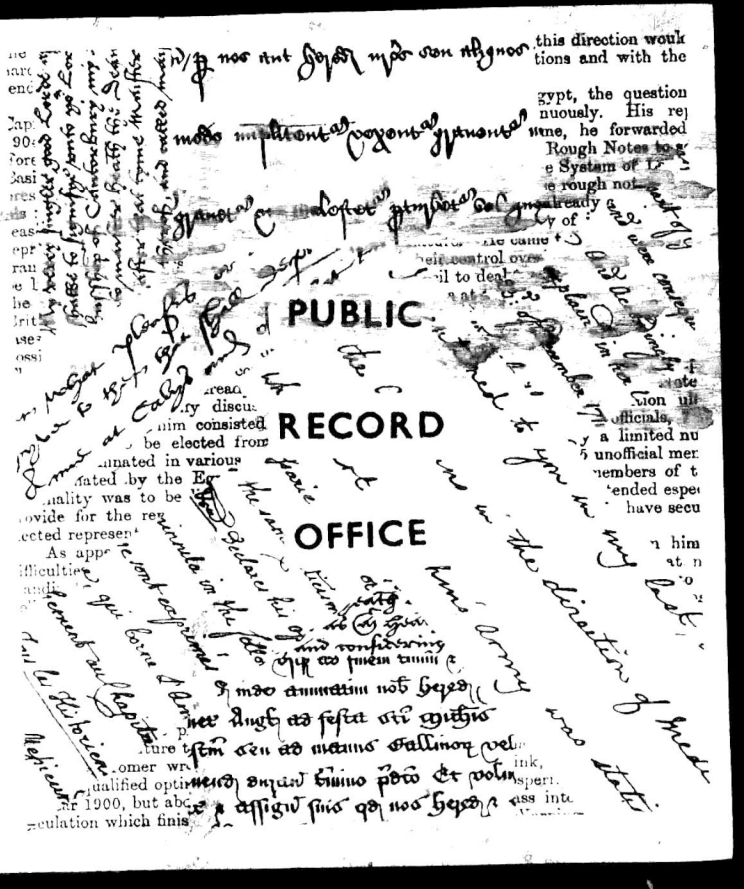
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I have done, the chief reason being that the boring machines which he recommends are much larger than those which I had in view. Mr Lewis' estimates are £9000 for initial outlay on plant and £8500 per annum for recurrent charges. After discussion with Mr Lewis regarding his experience in South Africa of the smaller machines, I agree with him that it might be wiser to purchase the large ones. I therefore accept his estimates. It may be as well to emphasise here, as I have done in past correspondence with Government, and as Mr Lewis now reiterates that a boring policy involves the engagement of a special staff for the purpose. It would be better that the Government of Kenya should not inaugurate the policy and purchase the plant until they thoroughly realise this and have made up their minds to meet the recurrent charges out of revenue. Only a small proportion of the expenditure is likely to be immediately and directly recoverable.

7 With regard to the probabilities of success of boring, I agree with Mr Lewis that there is a fair likelihood of success in the metamorphic rocks, though I do not agree that the ratios of success to failures is likely to be nearly as high as 7 to 1 as suggested in paragraph 146. Even if every possible case is taken to study the geological conditions in each case and select the most suitable points for boring. In the volcanic areas of the Masai Reserve it may

well be the case that any water obtained is too saline for use. Only trial can determine this.

Chapter VIII Water Laws

8. Mr Lewis devotes 41 pages to an analysis of existing laws and its administration, but only 17 pages to his general recommendations. It would have been preferable if he had dealt more fully with the recommendations, for we are naturally well acquainted with existing laws and are cognisant of its defects and the difficulty of administering it. In 1922 a comprehensive draft water bill was put up to Government after revision by the Attorney General and Government ordered it to be printed for public criticism. The financial difficulties of 1922 caused action to be suspended, as it became obvious that the Ordinance if enacted could not be administered without an addition to the then existing staff. The reduction of the Public Works Staff by about 50% in that year entirely precluded the possibility of administering a detailed Codified law on a subject of much complexity. The administration of water laws is always complex and difficult because almost every landholder, whose farm is riparian to flowing water, desires to divert for one purpose or more and almost every diversion affects to a greater or less degree all other riparian land whether alienated or unalienated and frequently also native reserves and township reserves on the course of the stream. The hydrometric survey which has been

started in a small way they would in due course have supplied valuable data as regards the discharge of streams at different seasons at various points on their course, had to be abandoned for financial reasons. Without such data which can only be secured by observations at metering stations over a long period, the alienation of water rights by licences which would give a high degree of legal security of tenure to the licensee would be hazardous. Mr Lewis has emphasised in para 186 the simplicity of granting rights in land compared with the difficulty of granting rights to divert and use water. As he mentions knowledge of the land can be secured by one act of survey, while adequate knowledge of flowing water can only be secured by investigation extending over years. Probable future demands as well as existing demands also have to be evaluated. In his paragraph 200 as well as in Chapter IX Mr Lewis has pointed out the importance of the acquisition by the State of hydrographic data and that "a system of State determination of rights can never be a success without a proper staff

7 Faced with this situation at the end of 19.. I decided that the best thing to do, as an interim measure, was to make the best of existing laws to decentralise as far as possible, to utilise the District Committees in European areas in an advisory capacity; to crystallise, as much as possible, the conditions

which I decided would be suitable for the issuance of permits under existing law; to take measures to ensure that each applicant knew these conditions; and to give as much security of tenure as possible under the circumstances, while at the same time safeguarding Government and other users, both present and prospective, against errors due to our present inadequate knowledge of the regime of the streams. Briefly stated the steps leading up to the ~~acquisition~~ issue of a water permit under Section 152 Crown Lands Ordinance 1915 and Water Permit Rules 1919 were established as follows:

(1) Application giving details of the proposal, to the Executive Engineer, on a form (which also states the conditions on which permits are issued) accompanied by a sketch map illustrating the proposal.

(2) When the application is in order (or after it has been put in order if not initially so) submission by the Executive Engineer of an "Objection Form" to each riparian holder, who would be likely to be affected if the application were granted.

(3) Receipt by the Executive Engineer of the views of the riparian holders as expressed on the "Objection Forms".

(4) a) If no objections exist, or if they have been overcome, submission of the file to the Chairman of the District Committee with the Executive Engineer's views, which are either stated verbally at the meeting or in writing.

b) If objections exist, or if the Executive

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b) If objections exist, or if the Executive

Engineer disagrees or is dissatisfied from the
Government point of view with the application as
submitted or of other circumstance necessitates
examination, correspondence or visit
by the Executive Engineer ensue on the case
demands. In difficult cases which are
negotiations are often greatly prolonged and
take up a very high proportion of the time
of executive officers. There are often a
dozen difficult cases, widely separated
locality, current in one Divisional
time. When objections have been overcome
or reduced or when it is apparent that
they cannot be overcome without further
action the file is sent to the Chairman
the District Committee of the district.
Applicant and objectors are given opportunity
to attend and state their case.

(5) Hearing by the District Committee at
whom advice is tendered (a) to issue the
permit (b) to refuse it (c) to issue it
in a modified form

(6) Despatch of the file with the Executive
Engineer's comment to the Director of Public
Works.

(7) If the Director of Public Works agrees
with the recommendations of the Executive
Engineer and District Committee (as he
does in the majority of cases) the
permit is issued in those terms.

(8) If the Director of Public Works disagrees
the file or requires further enquiry about
the file is returned to the Executive Engineer
and further procedure varies with

the nature of the reason for return. In very
difficult and contentious cases the matter has
to be referred to the Attorney General or
Government on the case demands. I cannot
call to mind any case where the Director of
Public Works has in recent years issued a
permit in an European area contrary to the
formal advice of the District Committee without
the concurrence of Government. Where Natives
Reserves would be affected the views of the
Chief Native Commissioner are solicited and
naturally prevail.

Mr Lewis has in paragraph 176 drawn
attention to the autocracy of the water
system. In a legal sense he is correct,
for absolute power rests with the Director
of Public Works. Nevertheless as a practical
issue Mr Lewis has failed to give prominence
to the fact that an officer of Government
is responsible for his actions to the
Government he serves, and, if challenged,
he has to defend his actions to the
Government's satisfaction. Moreover an
aggrieved party is always at liberty to
call on his representative in Legislative
Council to bring the matter before Council
by question or motion. In practice therefore
the existing procedure for the
issue of water rights is no more autocratic
than any other case where a head of
a Department — e.g. the Commissioner of Lands
or Chief Native Commissioner — is by law
the final authority by law for a particular
decision. As a matter of fact Mr Lewis

is wrong in his belief that it is unusual to
best the determination of water rights in an
individual. As will be observed from Chapter
of the enclosed pamphlet on "Modern Water
Legislation":—

(1) In British Columbia the duty is entrusted
to the Comptroller of Water Rights with right
appeal to the Minister of Lands.

(2) In Alberta and other Prairie Provinces
Canada the it rests with the Minister
Public Works

(3) In New South Wales ~~Victoria Australia~~ and
Italy with the Minister of Public Works.

(4) In Western Australia with the Minister
Water Supply, Sewerage and Drainage
in certain cases with the Governor

(5) In New Zealand with the Minister
Public Works in some cases.

(6) In Spain with the Governor of the Province
with right of appeal to the Minister
Public Works.

10. I wish to emphasise here that I do
contend that it is best that the right
to issue water licences should be
vest in such an unrestricted manner
with an individual. In fact from
further establishment of a Water Board
(as advocated by Mr Lewis) is
embodied in the Draft Water Bill, 19
which I have referred to above.
What I do contend is that the procedure
which was inaugurated in 1922 and
now in being was the best under the

financial circumstances which prevailed during
the last few years. It has enabled development
to proceed rapidly; there has been no litigation;
and in very few cases has marked
dissatisfaction been expressed; while the
record of water rights has been adequate
though not by any means the best.
The only alternatives which presented themselves,
after the reduction of Staff in 1922 were
either the entire abolition of State Control
or the adoption of a system of local
Control which would have led to most
unsatisfactory results. The abolition of State
Control would have necessitated the
repeal of certain sections of the Crown
Lands Ordinance 1915. It would have
retarded development and caused many
landholders to divert water at the expense
of their neighbours. It would have
created enmity between neighbours
for there is no single matter which
gives rise to so much unfriendliness
between farmers as uncontrolled
water disputes. After these preliminary
observations in defence of the action
taken in 1922, I will now proceed to
make some general observations on the
more important points in Chapter V. of
other than those which I have just
dealt with.

Chapter ~~VIII~~ Part I

19. Mr Lewis devotes 10 pages to an explanation
of English Common Law in relation to

water rights and arrives at the conclusion that it is unsuitable for the conditions which prevail in Kenya. I agree entirely with his conclusion and have already embodied my opinion of the unsuitability of the common law in the pamphlet which I enclose. Mr Lewis then proceeds to discuss in the following pages the provisions of Crown Lands Ordinance 1902 regarding water and of the Rules of 1903 and 1909. Probably quite correctly he arrives at the opinion that both Sets of Rules were ultra vires on account of them not having been based on legislative authority covering them. As I have already stated I do not agree with his interpretation of Section 3 of Crown Lands Ordinance 1902, namely that it is merely declaratory of Common Law. I do not propose at this general comments to enter into the reasons for agreement with the interpretation given in Judge Barth's judgment in the case Bowles v Secretary of State, which accords with the views of the late Attorney General (Mr Lyall Grant) and Solicitor General (Mr Jowett) and my disagreement with the interpretation by Judge Pickering in the case Hasham Jamal v. Partab Singh. I may say however that I think it possible that Mr Lewis' arguments may be to some extent influenced by his association with Roman-Dutch law, which was the basic law of much of South Africa, on which

the Act of 1912 was founded (vide "Modern Water Legislation" page 66). I do not, of course, contend that the Ordinary rights of Common Law were modified materially by Crown Lands Ordinance 1902: and, in respect of freehold land (including that in the Coastal belt) the common law was probably in no way altered.

12. Mr Lewis' interpretation of the Sections of Crown Lands Ordinance 1915 relating to water and of the Water Permit Rules 1919 as given on pages 132 to 136 of his report are I think, Substantially Correct. I have already made some general comment on the administration of Easter law and will therefore make no further reference to the details of pages 137 to 144 where Mr Lewis deals with that subject. If all the details were to be commented on this letter would become most voluminous.

Chapter VIII Part II

13. The first 12 paragraphs of this part are devoted to an explanation of certain principles of water law and of the difficulty of framing a law to embody them so as to secure satisfactory administration. (No reference especially to the unsuitability of such rigid and detailed establishment of principles (or "formulae") that the quantitative determination of water rights could properly rest with a Court. In other words he regards water Courts on the lines of the Water Act of 1912

of South Africa or unsuitable for Kenya. I do not think there is any country where Courts determine water rights except South Africa and Southern Rhodesia I fear that the method would be unsuitable for Kenya.

14 In paragraph 197 he reiterates the defects of common law and refers in the next paragraph to American practice. Although his remarks may convey a correct impression regarding the procedure in some of the State American States for water laws vary greatly in the different states, they are of no opinion liable to give a false opinion of American practice in general, especially in the western States. I have given a summary of the water law of Wyoming in pages 47 to 51 of the pamphlet which I enclose and will not refer further to the subject here as it has no great bearing on the recommendations of Mr Lewis' report.

15 In the last ten pages of the Report we find some definite recommendations of a general character, and it is necessary in consequence to examine these pages more closely. I note with surprise that Mr Lewis has not even referred to the Draft Water Bill of 1922, a copy of which was handed to him and which might have been regarded as representing in detail the considered policy of Government technical advisers, when

financial consideration permitted of its introduction. I wrote to Mr Lewis before I left the Colony inviting his attention to the absence of reference to it in his Report and soliciting his views but no reply had been received — nor was there time for a reply to be received — up to the day of my departure. However I can find nothing of vital importance in Mr Lewis' recommendations which is in disaccord with the Draft Water Bill although there are many important provisions in that bill to which Mr Lewis has not referred in his Report.

16. In paragraph 199 of the Report the recommendation is made that the power to grant water rights should rest with a Water Board and not with an individual officer of Government. The Water Board is provided for in the Draft Water Bill on the same lines as the Power Board is provided for in the Electric Power Ordinance 1919, that is — the Board can be established at any time by the Governor in Council and any of the powers, duties and obligations vested by the Ordinance in an individual officer (or in the Governor in Council) can be transferred to the Board for administration by Rules under the Ordinance. If the Ordinance were enacted as at present drafted the Water Board could be established immediately and be given the power of granting water rights as advocated by Mr Le

17 In paragraph 200, together with the first part of paragraph 196, we find the crux of the whole question of the enactment of water law and its administration in Kenya Colony. The proper administration of a water law, such as those of the Dominions, is expensive because it entails so much lengthy investigation, so much knowledge of varying quantities, and enquiry into so many details — each involving investigation. Yet it is only by means of such technical administrative staff that the data, on which to base the quantitative determination of water rights, and to enable those rights to be granted with a high degree of security of tenure could be acquired, and a water law of the type contemplated by Mr Lewis satisfactorily administered. I agree entirely with Mr Lewis' advice. In fact it was largely on account of my advocacy of that opinion that Mr Lewis' advice on water law was sought, because it was thought by Government that it might be able to devise some water law which, while being cheap to administer, would give greater satisfaction than the present administration of existing laws. It is clear that he knows of no method which would be satisfactory as well as inexpensive.

18 Paragraphs 201 to 204 are in general quite sound. Mr Lewis emphasises the

importance of flexibility in certain principles, which should not be enacted but left to the discretion of the Water Board. He also advocates certain definite principles, the chief one being:- Absolute quantitative definition of water rights and of the restrictions to protect future national needs and people occupying land other lands upstream to the stream. Definition also to be by period — or in other words - the times of the day or year at which the right may be exercised, not exercised, or exercised only in part, must be fixed absolutely. I quite agree with Mr Lewis's statement that "To fix these restrictions in such a way as will ensure the maximum beneficial use of the water of the river is an exceedingly difficult matter."

2019 In paragraph 204 Mr Lewis reiterates the importance of absolute definition of rights and their restriction. He also suggests something analogous to the South African River Boards to do the police work. There has been the subject of consideration several times in the past. The situation on some of the much used streams will render either the establishment of a Board or the employment of a water warden essential in the near future.

20 In paragraph 205 Mr Lewis advocates diversion of purpose into the two parts

of Common Law, namely :- Ordinary and Extraordinary, and does not recommend the South African method. I prefer the diversion in the Draft Water Ordinance, which is a modification of British Columbian Law to suit the conditions in Kenya.

21 I agree with Mr Lewis that South African Law with regard to "normal flow" should not be followed.

22. In paragraph 207 Mr Lewis rightly emphasizes the difficulty of dealing with storage dams but contributes nothing new to solve the difficulty. I find the last sentence of the paragraph somewhat in disaccordance with earlier paragraphs, for he ~~emphasizes~~ appears to advocate powers being granted to the Water Board to modify rights which the Board has previously granted, the security of which Mr Lewis regards as so vital. I do not deny the necessity for power to modify. It is in part covered by the Draft Water Bill.

23 I agree in general with paragraph 208, with certain reservations which I need not refer to here.

24 In paragraph 209 there are details with which I agree and others with which I do not concur. To deal with all the subjects which Mr Lewis touches on,

important though they are, would make this little encroachment voluminous. The principles which I have advocated are expressed in the Draft Water Bill. In general I consider that Ordinary Common Law rights should attach to a farm and any action which involves an obstruction of a stream or a diversion of it irrespective of the purpose should only be legal if authorised under licence.

26 With regard to paragraph 20 I agree that there is no immediate necessity for providing for Co-operative Schemes for irrigation and other uses of water, which have played so important a part in the development of Canada, Western States of America, South Africa and other countries on the lines of the legislation of those countries. There is however need for power to grant water rights to Associations of Landholders (incorporated under proper Articles of Association) for the execution and administration of joint projects affecting a number of farms. In several cases important projects both of water supply and swamp drainage have been held up through lack of legal machinery. Provision is made in the Draft Water Bill for such power. I do not agree with Mr Lewis that there is no immediate need for power to impose compulsory servitudes. Quite small projects, very important

to the individual farmer are often held up on account of lack of this power. Provision is made in the Draft Water Bill for such Compulsory Servitudes are however very difficult to administer and in consequence the desirability of the early introduction of the power to grant them may be arguable.

27 In his paragraph 212 Mr Lewis [illegible] the useful study of his proposals. I have already advised that the report should be published after this has been done I consider that a Committee should be appointed to advise on the action to be taken by Government with regard to Water Law and the provision of machinery for its administration. The basis of their deliberations should be Mr Lewis' Report and the Draft Water Bill (1922) and [illegible] certain Water Laws of other countries and correspondence with the administrators of those laws would be at their disposal for reference. I think it is highly inadvisable that such a large proportion of the time of the present officers and clerks of the Public Works Department should be taken up with the administration of Water Law, often precluding them from undertaking duties more properly pertaining to their offices. The Committee would have to deal with many important principles

of water laws which have not been touched on by Mr Lewis in his report. One of these is the principle of charging fees and rentals, by which a portion of the cost of the administration of water laws can be reimbursed to the State at the expense of the persons chiefly benefiting therefrom. I have dealt in some detail with the subject on pages 30 to 35 of the pamphlet which I enclose. The fees and charges therein stated as prevailing in the Countries have probably been increased in almost all cases in recent years.

I am

Sir

Your obedient Servant

H. L. Sikes

Enclosures of

COLONY AND PROTECTORATE OF KENYA.

MODERN WATER LEGISLATION

BY

H. L. SIKES,

Bachelor of Arts (Royal University of Ireland), Bachelor of Engineering (Royal University of Ireland), Associate Member of the Institution of Civil Engineers, Fellow of the Geological Society, Fellow of the Royal Geographical Society,

GOVERNMENT HYDRAULIC ENGINEER,
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PREFACE.

Prior to the introduction to the Legislative Council of the Colony and Protectorate of Kenya of an Ordinance to provide for the more efficient control of the water resources of the Colony, it has been thought desirable to state some of the main principles of the recent legislation of the Dominions and of some other countries, in pamphlet form. The literature on this subject is voluminous and not readily accessible.

It is hoped that a perusal of the pamphlet will help those, who have not the time or inclination to study the water laws of other countries and the extensive literature relating to them, to acquire a general idea of the principles of the recent water legislation on which the proposed Water Ordinance for Kenya Colony is based.

The history of water law in other countries during last century indicates frequent fluctuations of public opinion, which during the last few decades has crystallised and manifested itself to different degrees in different countries in stable enactments defining and codifying the powers, duties and obligations of the State, and of the public, regarding the conservation, diversion and use of State controlled waters.

A chapter on Hydrometric Survey is included, as this subject is so closely related to water conservation and control, that unless the State acquires a knowledge of its water resources by survey, it is not in a position to control them adequately, and provide for their utilization in the best interests of the public.

Nairobi, 31st May, 1921.

MODERN WATER LEGISLATION.

CONTENTS.

CHAPTER I.

THE NEED FOR WATER LEGISLATION IN A NEW COLONY.

The term "conservation" as applied to the natural resources of a country is a comparatively new one. It has been used with reference to such resources as timber, oil, water and coal, its precise meaning varying with the attributes of the resource considered. In each case, the idea of the intervention and control of the state to safeguard the beneficial utilisation of the resource in the best interests of the community, is involved.

Water resources differ to some extent from other resources in that their maximum conservation is most adequately secured by their maximum beneficial utilisation.

It has been said that the water resources of a country are its greatest resource when the demands of the future are considered. "The rivers are the greatest asset of the nation when regulated for all beneficial uses." (1)

The conservation of water supplies is inseparably connected with that of another State resource, namely forests. The literature on the influence of forests in relation to rainfall, evaporation, and stream discharge is voluminous, and it is now definitely established, beyond possibility of dispute, that the removal of forests in conjunction with the resulting soil erosion tends to cause permanent streams to become seasonal.

Only one reference will be quoted on this subject.

"The relation of forests to water power development is of the greatest importance. It is a well-known fact that the soil of forests retains the water of precipitation more uniformly, and releases it gradually, so that during dry seasons a supply of water is assured. Professor Ebermeyer states that considering the evaporating factor of free land as 100%, the evaporation of the forest land is only 22%, other conditions remaining the same. (2)

(1) Hydro-electric Development and Engineering, Koester, 1925.
(2) Loc. cit.

Water flowing out to sea, whether it be the flow of rivers in dry seasons, or the flood discharge during wet weather, when unused for the manifold purposes to which water can be applied is an economic waste, as is also the loss of water, which would otherwise be put to beneficial uses, by evaporation in swamps on river courses. It is also an economic waste to utilise water inefficiently, whether it be by the employment of inefficient machinery to transmute water power, or to irrigate lands by excessive and deleterious application of water.

Uses of Water

Apart from the essential uses of water for domestic purposes, private and municipal, steam raising, industrial processes, washing farm products, etc., all of which use comparately small quantities, the uses of water for irrigation and the transmutation of the energy derivable from moving water, known as "water power development, stand out pre-eminently.

Irrigation versus power.

Up to recent years, irrigation was indisputably the chief use of water in non-humid countries, apart from its essential uses, but concurrently with the perfecting of the governors of hydraulic turbines, and rapid strides in economical methods of long distance transmission of electrical energy, the economical development of the power reaches of rivers began to challenge the right of irrigation to occupy the first place.

In arid and semi-arid countries, where irrigation is essential to bring crops to maturity, the use of water for irrigation must always stand supreme, except for the essential uses mentioned above, and even in Canada, where the rainfall is high and coal abundant, Mr. W. H. Grunsky, the Legal Adviser of the Water Power Branch of the Department of the Interior, considers it doubtful which use of water will in the future occupy the premier place in Canada. (1)

Apart from the consideration of the ancient irrigation systems of Egypt, India, Ceylon and Mesopotamia, the countries which developed their irrigation resources to the greatest extent in early times were probably Italy and Spain.

These countries evolved legal codes for the control of the diversion and use of water for irrigation several centuries ago, but during the last decade, the immense latent possibilities of their water power resources have, as in all other important countries endowed with these resources, assumed an importance not realised before. Both these countries are deficient in coal resources, and in such countries, the conservation of water powers becomes a prime necessity, to enable them to retain their position in the competition of the industrial world.

(1) Water Legislation and Administration in British Columbia, Mr. W. H. Grunsky, Report of Water Rights Branch, British Columbia, 1912.

Spain has recently been engaged on the investigation of an extensive State scheme of hydroelectric development, involving the construction and interlinking of central generating stations and the distribution of electrical energy by a network of mains throughout the country. In this project, private enterprise is to be afforded full scope in developing the power available from power reaches of rivers, and supplying electrical energy in bulk to the State mains, the energy from which will be available for distribution to railways, mines, townships and the requirements of agriculture (1).

The controversy regarding the relative importance of the needs of agriculture and of power has probably been more acute in America than elsewhere.

Except in humid countries, where the rainfall is well-distributed throughout the year, and where the surface of saturation, or water table, is near the surface, the proportion of water conveyed in earth channels, which is lost by evaporation and absorption, is a high percentage of the water diverted. In certain soils very little if any proportion of such loss finds its way back to the river of origin. As the aridity of a country increases, and where the rainfall is seasonal, this percentage becomes increasingly high, and it is clear that the use of water for irrigation can only be carried out at the expense of the power resources of a river.

When water is required both for irrigation and power, perhaps the most ideal conditions which could obtain, to enable water to be available for both uses, would be those in which the upper reaches, only were suited for power development, and where water is only required on the lower reaches for irrigation.

The first condition would be complied with, if such a high degree of continuous humidity prevailed on the upper reaches, that irrigation is unnecessary, and if, in addition, this condition were coupled with steep gradients on the river.

The second condition would be fulfilled if the lower reaches only have flat gradients, unsuited for power development, but coupled with such low atmospheric humidity in the region traversed that it is in that region alone that irrigation is essential for agriculture.

Fortunately these are hydrographic conditions which are approximated to in many countries, and are ones which prevail to a considerable degree in the case of many of the rivers in East and Central Africa.

(1) Engineering, June 11th, 1920.

The necessity for securing the best and most efficient utilisation of water resources in the best interests of the community is one to which all civilised countries are now alive. "We have been lavishly wasteful of natural resources, but we are just entering upon a period in the economic history of civilisation, which is to be characterized by conservation." (1)

Priority of use.

The conflict regarding the priority of the various uses of water is one which has assumed considerable proportions in some countries, and most countries have evolved a schedule of uses arranged in order of priority.

This order, except for first priority for domestic and municipal uses, must, however, be liable to variation according to the hydrographical and economic conditions prevailing on the river. Owing to the impetus which has been given in recent years to the development of water powers almost every country has found it necessary to revise its water laws in order to safeguard the public interest, while complying with the demand for concessions and also to inaugurate hydrometric surveys to ensure that the State shall acquire a knowledge of its extremely valuable water resources the value of which was never adequately recognised in any country prior to the opening years of the last decade.

It is to be noted that this recent rush to develop water powers by means of State projects and concessions is not confined to countries like Italy, Spain, Switzerland Norway and Sweden, which have to import most of their coal, but also affects countries richly endowed with coal resources.

Out of a total installed capacity of 1,844,571 h.p. in central electric stations in Canada in 1919, 1,652,661 h.p. or 89.6 per cent is derived from water. Yukon develops 97.4 per cent of its primary central electric station energy from water. Ontario develops 95.7 per cent from water, indicating markedly the commercial adaptability of water power for central station work even where in competition with convenient and reasonably cheap coal supplies. Manitoba develops 95.2 per cent from water, practically entirely from the Winnipeg River power reach. Quebec develops 94.9 per cent of its central station energy from water although first class coal supplies are available in the province. Alberta develops 43.2 per cent from water although an abundant coal supply is available (1).

Mr. J. T. Johnson, Chief Hydraulic Engineer, of the Water Power Branch of the Dominion of Canada writes in the "Report on the Winnipeg River and Storage Investigations" 1915:

(1) Address by G. S. Houston of the Department of the Interior, Canada, to the Eighth Annual Convention of the Western Canada Irrigation Association.

"The conservation of natural resources is one of the most important public problems which has in recent years confronted the people of Canada. The widespread publicity given to the question in the Press and on the platform during recent years resulted in an active interest being taken in all forms of governmental activity respecting water power.

Of the many phases of the conservation proposed and practised, that having to do with the conservation of water for power is probably the most productive of direct and immediately favourable results". (1)

Work of Committee in England.

With the price of coal advancing rapidly, the increasing intensity of production of road, air and water vehicles driven by internal combustion engines now using petroleum and its modifications, but probably largely using industrial alcohol in the future, it is safe to predict that unless economic methods of employing other sources of energy are discovered, water power, where it exists will be the chief source of energy in the future. Schemes to develop water powers, which are now considered uneconomical on account of high capital expenditure, will in a few years time come within the economic limit.

"With water power as a fundamental necessity in the industrial future, the regulation and conservation of river waters is to-day being demanded on a large scale, and this will naturally become more insistent as time goes on." (2)

In this connection, reference may be made to the work in England of the Water Power Committee of the Conjoint Board of Scientific Societies, London, and of the Water Resources Committee of the Board of Trade.

The terms of reference of the latter Committee, which were originally confined to questions of water power, were subsequently enlarged so as to involve, in addition, a consideration of the steps which should be taken to ensure that the water resources of the country are properly conserved, and systematically used for all purposes. The Committee has up to the present published two interim reports.

Great Britain has developed less of her available water powers than any other large and civilised country in the world, with the exception of Russia, published statistics shewing that the proportion of her developed water powers to undeveloped ones is 8.3 per cent, as against 43.4 per cent in Germany and 25.5 per cent in Switzerland (3).

(1) Water Resources Paper No. 27, Central Electric Stations in Canada, 1919.
(2) Winnipeg River and Storage Investigations, J. T. Johnson, 1915.
(3) Preliminary Report of the Water Power Committee of the Conjoint Board of Scientific Societies, 1918.

The necessity for securing the best and most efficient utilisation of water resources in the best interests of the community is one to which all civilised countries are now alive. "We have been lavishly wasteful of natural resources, but we are just entering upon a period in the economic history of civilisation, which is to be characterized by conservation " (1)

Priority of use.

The conflict regarding the priority of the various uses of water is one which has assumed considerable proportions in some countries, and most countries have evolved a schedule of uses arranged in order of priority.

This order, except for first priority for domestic and municipal uses, must, however, be liable to variation according to the hydrographical and economic conditions prevailing on the river. Owing to the impetus which has been given in recent years to the development of water powers, almost every country has found it necessary to revise its water laws in order to safeguard the public interest, while complying with the demand for concessions, and also to inaugurate hydrometric surveys to ensure that the State shall acquire a knowledge of its extremely valuable water resources, the value of which was never adequately recognised in any country prior to the opening years of the last decade.

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(2) Winnipeg River and Storage Investigations, J. T. Johnson, 1915.
(3) Preliminary Report of the Water Power Committee of the Conjoint Board of Scientific Societies, 1918.

The reason for this is undoubtedly, not so much her large coal resources, or the numerous demands on the water for domestic and municipal purposes, great as these are, as the hampering influence of the riparian rights doctrine of English Common Law. The principles of this doctrine have been abandoned, or much modified, in practically every other large country in the world, where they formerly prevailed.

Such a multiplicity of opposing interests confront a prospective operator, not only those interests involving the beneficial use of water, but the common law right of a riparian proprietor to have a river flow past his land in practically its natural condition whether he makes use of it or not, that the procedure to acquire a water right by Act of Parliament is such an expensive and uncertain business, that development is held up.

> "At present there is no department charged with the duty of exercising general control over the use of water in the interest of the whole community. Notwithstanding the fact that such control in relation to specific purposes, such as water supply, has been recommended as essential by numerous Royal Commissions, Select Committees and other bodies during the last 50 years, no remedial legislation has been passed. The Committee thinks that such should now be established in relation to all uses of water. The water resources of the country cannot otherwise be properly conserved and fully and systematically used for all purposes, and there is a real danger that at no distant date some of our communities in England and Wales will not be able to provide themselves with proper and adequate water supplies unless such control is established. The provision of adequate and proper public water supplies must, of course, always be the primary consideration, but it is also of great importance that the requirements of the community for water for power and other purposes should be met as far as practicable. The allocation of water has become too serious a matter to be left solely to a succession of Parliamentary Committees which are constituted from time to time to deal with particular Bills and have no continuity of existence, and which are unprovided with machinery by which schemes can be considered in relation to and co-ordinated with natural resources and needs for all purposes" (1).

The appointment of a permanent Commission, consisting chiefly of technical men, is recommended by the Water Resources Committee. The primary function of the Commission would be to compile a record of the water resources and water requirements of the country, and for the purpose of obtaining this essential information, it is recommended that the Commission should be empowered to investigate and make surveys.

(1) Review of Second Interim Report of Water Power Resources Committee, Water and Water Engineering, July, 1920.

It is suggested that in England and Wales all furture proposals to take water, whether surface or underground, for any purpose other than for private domestic use, should be submitted to the Commission for their consent.

English Law

The principles of English Common Law in relation to water have never been coded, and are amplified by court decisions given in particular cases, which are often made to apply to cases where the circumstances are totally different from those affecting the case on which the decision was given.

No water right under the Common Law of England is satisfactorily defined and assured until it has been secured by litigation or by Act of Parliament. Uncertainty of tenure militates against development. As the Common Law is relaxed and State control substituted, so does the beneficial use of water increase (1).

Common Law principles in relation to water are probably less objectionable in humid countries like England, where the water table or surface of saturation is usually near the surface, and evaporation co-efficients are low, than in tropical, and semi-arid countries, where most of the water used for irrigation is lost to the river of origin.

Even in England, as in other countries before the introduction of modern water legislation providing for adequate State control of the diversion and use of water and the registration and record of water rights, expensive litigation on water matters is rampant, and the absence of a water code renders the uncertainty of legal decisions so great, that appeals are frequent, reducing the unsuccessful litigant to a state of bankruptcy after payment of lawyers, expert witnesses and costs.

In one case recently, where a large company endeavoured to obtain water rights, for power development in Great Britain, by means of a private bill, it is said that the company expended £12,000 in the attempt to get the Bill passed, but unsuccessfully, owing to the opposition of private fishing interests. The result will probably be that a large industry will be driven to Switzerland, Norway or Sweden where the water laws foster the development of power resources. In countries where irrigation is practised, the need for efficient State control of water resources is probably more necessary than in those countries where, owing to humid conditions, water is not important for agriculture.

State control of water

The history of water legislation in Italy, Spain, South Africa, Canada, the Western States of America and Australia—all great irrigating countries—which will be referred to later, prove in unequivocal language that those countries which have adopted an adequate and sound system of State control of their water resources have flourished, both in power and irrigation development.

(1) Law, Finance and Administration, Irrigation, Roads, and Bridges, Strange, 1920.

"As riparian irrigation grew up under no correct system so claims to water were made without right foundation, and did not rest on a scientific hydrographic basis" (1).

"Failures in irrigation have generally not been due to wrong application of water but to bad laws and deficient control. There is no form of legislation more difficult than that connected with irrigation. . . . Irrigation on any scale without proper administration is impossible. . . . To secure that administration, centralised State control is necessary. . . . A law which was originally designed for a country with a humid climate (where water is looked upon as a nuisance to be got rid of by drainage), is not applicable to a country with an arid climate (where water is regarded as a blessing to be fully utilised). The development of irrigation is greatly affected by the water law under which it is practised and particularly by the prescriptions fixing the ownership of the water, beds and banks of streams". (2)

Investigation of water resources.

Numerous references could be quoted from Government publications of the Dominions, the United States, and other countries, and from the technical papers to prove that it is now thoroughly recognised that it is one of the most important obligations of the Government of a new colony to investigate its water resources, and to provide by law for the conservation of these resources in the best interests of the community, in accordance with modern legislation.

At a later stage in this paper the main principles of this modern legislation, as applied in the Dominions, the United States and some European countries, will be briefly reviewed, and the basis on which they rest examined.

Although it is significant that the water laws of a country must be suited to the hydrographical, economical and political conditions which prevail in it, and that there cannot for these reasons be uniformity between the water laws of countries where the conditions are so diverse as those prevailing in, say, Australia and Canada, it is most desirable that where marked diversity does not exist, as in Kenya Colony, Uganda and Tanganyika, the water and electric power laws should be the same, and that hydrological observations and investigations should be based and conducted on the same broad plan.

(1) Loc. cit.

THE NEED FOR HYDROMETRIC SURVEY.

Before proceeding to examine the broad principles on which modern water legislation is based, and the water laws of other countries, it may be as well to endeavour to make it clear that no system of water legislation is of value, without inaugurating concurrently with it a systematic investigation of the water resources of the country.

The requirements of such an investigation are numerous and their importance cannot be too strongly emphasised. They are included in the general name "Hydrometric" or "Hydrographic" Survey.

Although a topographical survey may take many years to complete, when an area of country has been surveyed, to the degree of accuracy and precision contemplated, the survey of that area is complete.

A Hydrometric Survey on the contrary is a progressive activity. It contemplates:—

Principles of hydrometric survey.

(*a*) The continuous gauging of all rivers and streams not only when the rivers and streams are flowing at their normal and minimum discharges but also at their flood discharges—not at widely separated intervals, but at as frequent intervals as possible—not at one point on the course of each, but at as many points as possible. The method adopted for attaining this end is the establishment of metering stations at the points selected on the courses of the rivers and streams. In the case of all except the smallest streams, the form which a metering station usually takes is simply the installation of an erect graduated staff, firmly fixed at a suitable point close to the bank, or in a recess in the bank, the reduced level of the zero of graduation being a fixed and known figure. The cross section of the river is taken at the site of the metering station. Observations on the velocity of the current in longitudinal sections of the river are made with a current meter at regular distances across the cross section, and at either two or three depths at each point on the cross section some half a dozen times at various stages of the river. These observations enable the velocity and discharge curves for all stages to be plotted.

Subsequent observations at the metering station, merely consist of the reading of the level of the water on the graduated staff at as frequent intervals as possible, a work which can be done by anyone who can read figures with reliability, and readings can be taken at a number of different metering stations, not too widely separated, in a day.

This method, though not so precise as gauging by weir, is inexpensive, and has been found in Canada and other countries, to be sufficiently precise for practical purposes, for all except the smallest streams.

In the case of very small streams, it is advisable to instal an inexpensive weir gauge in a permanent manner, and the level of the water passing over this is read on a small graduated staff, in the same manner, at frequent intervals.

(*b*) The investigation and examination of the power reaches of rivers; the production of maps and data shewing the maximum capacity of each power reach, for economic power transmutation—not only the power derivable from the minimum flow of the river at the head available from the difference of level between the top and bottom of a pronounced waterfall, included within the limits of the power reach—but the maximum power which the reach is capable of producing by making use of this flow, augmented by the increment derived from storage of flood water at suitable sites, at the total head economically available from the difference of level between the upper and lower limits of the power reach.

(*c*) The investigation of sites for reservoirs, suitable for the storage of flood waters.

(*d*) The investigation of sources of supply for townships; the formulation of projects for the supply of such townships, and the reservation of the water required therefor, with due regard to future development.

(*e*) The investigation of large irrigation and drainage projects.

(*f*) The investigation of sub-surface supplies of water by trial bores.

(*g*) As side issues in the activities of hydrometric survey, not so important from a direct and evident economic point of view, but activities of importance none the less:—

> Observations on the evaporation from lakes, swamps, and soils, on absorption of soils and rocks, and on discharge from catchment areas, in their relation to rainfall and humidity.

Hydrometric survey in Canada.

Of all countries in the world, there is probably no country which has organised its hydrometric surveys on a more comprehensive and well organised system than Canada. The Water Power Committee of the Conjoint Board of Scientific Societies, London, has stated its view that all colonies and dependencies of the Colonial Office would do well to organise their hydrometric surveys on the Canadian System.

In order to show the general scope and organisation of the work in Canada, one cannot do better than quote from the "Report of Hydrometric Surveys for the Calendar Year, 1916" in its relation to the provinces of Alberta and Saskatchewan. This is given in Appendix No. 1 of this paper.

The majority of important countries, including the Union of South Africa, the hydrometric survey of which was started many years ago, are now carrying out hydrographic investigations.

It must be stated with all possible emphasis, that it is [illegible] and not five or ten years hence, that all colonies which have regard for the conservation of their [illegible] resources, and future economic development, should start their hydrographic survey.

Before data could be collected sufficient to afford a reasonably accurate guide to operators, whether such operators be the Government, municipalities, companies or private persons, continuous gaugings extending over several years are necessary. The more extensive the gaugings [illegible] more reliable they are.

It is evident that it is only after a long series of observations that the minimum, normal and maximum discharges of rivers can be ascertained with accuracy, and at present Government and companies desiring to operate are faced with great uncertainty regarding the [illegible] flow of [illegible] of supply which can be relied on and the flood discharge to be guarded against.

Time is not available to them, when a scheme is proposed, to make a continued series of gaugings, and in those cases where projects have been evolved and carried out on inadequate data, by Government, companies and private persons, the operators have generally found to their cost, when too late, that they had relied on a much more constant flow than experience in operation proved to have been warranted.

Recommendations of the Water Power Committee of the Conjoint Board of Scientific Societies

The observations of the Water Power Committee of the Conjoint Board of Scientific Societies, London in their preliminary report of July, 1918 may be quoted in support of this. This committee was formed with the express object of acquiring data regarding the water resources of the Empire, and stimulating the investigation of these resources:—

" . . . it should be borne in mind—

"(1) That to be of reliable value from a commercial point of view the hydrometric studies must give a continuous record for a number of years, and show not only the minimum low water flow, but also the maximum flood conditions that have to be met in designing the headworks.

"(2) That the investigation of suitable rivers should include contour plans of the sites, profiles along the entire power reach of the river, and along the banks; also studies of lakes or lochs for storage, where they exist, and of the possibility of inter-connecting two or more such lakes to feed one large project. These studies should be in sufficient detail to allow of preparing preliminary plans and estimating capital and operating costs, in order to demonstrate the capacity available and the commercial feasibility of development.

"(3) That to develop the most obvious power site on a river without full investigation of the whole power reach of the river may not secure, and may make it impossible to secure, the maximum advantageous use of the river by the development of two or more sites.

"(4) That to secure the maximum possible use of a river, the investigation should therefore be made by the Government rather than by private interests.

"(5) Especially is this the case where storage may be developed, in order that the maximum possible storage may be secured, and that the water may be equitably distributed to, and the cost of the works equally borne by, the various interests benefited. Proper storage may greatly improve flood conditions and enhance the value of land as well as increase the power available.

"(6) That, without complete surveys, the capacity of a river cannot be acurately judged. The pondage created by the dam will in many cases more than take care of the daily peak load, thus increasing the power available beyond that due to the minimum low water flow, and this may be still further increased by storage at the head waters.

"The power capacity of a river may sometimes be increased by such means by 100 or 150 per cent or more." (1)

Hydrometric survey in other countries.

Although reference has been made chiefly to hydrometric survey in Canada, it is important to note that this is not the only country where organised hydrometric surveys or other detailed investigations are being carried on. Almost all recent water legislation includes as one of its most important provisions the establishment of a branch to carry on this valuable work, and in addition to that country, Australia, New Zealand, India, South Africa, Italy, Spain and Switzerland are actively engaged on investigations in addition to some of the Crown Colonies. It is to be expected that all progressive Crown Colonies will shortly fall into line with other countries, when it is recognised how important it is to start these investigations early in a country's history.

(1) Preliminary Report of the Water Power Committee of the Conjoint Board of Scientific Societies, 1918.

"The flow of a stream varies greatly from year to year, and yet the engineer is expected to make estimates and prepare plans from observations extending over a short period. Systematic observations should be carried on over a period of several years to determine the general behaviour of a stream. Many failures of large power, irrigation and other projects have been due to the fact that the plans were made without sufficient information regarding the water supply." (1)

The papers of the United States Geological Survey, which has given close attention to this matter for 30 years, shew that in the United States the period over which the observations should be carried to provide absolutely reliable data, varies from 5 to 20 years, the period varying for different streams and different districts according to the meteorological and hydrographic conditions affecting them. (2)

Investigation of sub-surface waters.

The investigation of sub-surface water supplies and the acquisition of knowledge of water-bearing strata by means of investigatory bores should be one of the chief activities of hydrographic or hydrometric survey in a new country.

Knowledge of the probable situation of underground waters and of the practicability of making them available for beneficial use is of inestimable value to a consideration of the problems of closer settlement in new colonies, and of the creation of a water supply on lands which are deficient in surface water resources.

Much work has been done in this direction in the Union of South Africa by the Irrigation Department, in the United States by the Geological Survey, in Australia by the Water Conservation and Irrigation Commission of New South Wales, and by other Government bodies.

The legislative enactments of these countries in relation to private wells and bores are chiefly aimed at the prevention of waste, with insistence on beneficial use of the water obtained, and non-interference of new bores with the discharge of existing ones. In the case of Australia sanction by Government is required before a new well is started, or an old one enlarged. As a statistical measure, insistence by Government on the supply of information giving details of the strata penetrated, and the location of the well and its discharge, is of great importance to the compilation of data regarding sub-surface water resources.

No matter how carefully an examination of the geology of the district is made, and all surface indications examined, there must always remain a varying degree of uncertainty regarding the probability of tapping an underground supply, until the results of bores in similar formations in the same district are known.

(1) Report on the Progress of Stream measurements for the Calendar Year, 19[illegible], Dominion of Canada.

(2) Water Supply Paper No. 336, Washington.

Investigatory bores at public expense.

Private capital is unwilling as a rule to incur the expense of boring, even to moderate depths, on account of this uncertainty, and it is incumbent on Government in a new country to supply the required information by conducting the initial experimental bores at public expense.

The admirable system of hiring boring plant to farmers desiring to operate on their own land, as established in South Africa, might then be adopted in cases where there is a reasonable prospect of success, the rate charged for the use of the plant and staff being fixed at a figure sufficient to cover expenses.

CHAPTER III.

THE PRINCIPLES OF MODERN WATER LEGISLATION.

State control.

It has already been pointed out that practically every country of importance has already passed legislative enactments providing for the State control of water on modern lines, and made provision for investigation of its water resources, England, and to a lesser degree the Eastern States of America, being the only important countries which are behindhand in this respect.

Main principles of State control.

As regards these latter, causes which are not operative in new countries, have rendered it extremely difficult to inaugurate new legislation, and the requirements of canals and other inland water ways for navigation must be safeguarded. The main principles of modern water legislation, which underlie the recent legislation of the Dominions, the Western States of America, Italy and Spain, and which are really older in their initiation than those of Common Law, being based on the Civil Law as established under the Roman Empire, may be stated as follows:—[1]

(1) Unequivocal State ownership of all water both running and standing.

(2) The power of the State to alienate the right to interfere with, divert, abstract and use State-owned water by grant of licence.

(3) The tenure of the water right amenity or patent so granted, to be conterminous with beneficial use of the rights granted and compliance with the terms of the licence.

(4) The domestic and essential farm requirements of riparian owners safeguarded.

(5) Power of the State to grant compulsory easements to operators on, over or through lands otherwise held, for water works, on payment of compensation for the easement.

(6) Power of a high authority to expropriate water rights in the public interest, on payment of compensation.

(7) Provision for the consideration of all applications for the grant of water rights by a competent technical independent central authority, with publicity, and opportunities for objectors to file their objections.

(1) Roman Laws and Administrative Policy with respect to Waters and Water Courses, Irrigation Department, W. Ham Hall, 1886.

(8) Power of the authority to grant and record water rights on behalf of the State by licence, permit, or concession or to refuse an application.

(9) Right of appeal from the decision of the authority to a higher authority, or to the courts.

(10) Power of the State to expropriate lands and works, and to construct works of public utility on payment of compensation to the owners.

(11) Power of the State to alienate the right to develop water powers to companies or others, and to authorise the expropriation of lands required for their works on payment of compensation.

(12) Provision for the formulation, authorisation, construction, operation and maintenance, under State authority, of projects involving the beneficial use of water on their own lands by communities of landholders desiring to carry out works jointly, and the power of the State to authorise the raising of money by loan, the striking of rates, the election of trustees, the passing of bye-laws, etc., for financing and controlling such community projects.

(13) Provision for safeguarding the public and local authorities in the construction and operation of water works for townships, and the supply of water to the public.

(14) Provision for safeguarding the public interest by the adequate control by the State of public supply companies and corporations supplying water, or energy derived from moving water, to the public.

(15) Provision for a definite procedure to be followed in the case of all applications for water rights, their issue and record obligatory both on the applicant and the State.

State control in other countries

Before proceeding to consider the water laws of the Western States of America, Canada, South Africa, Rhodesia, Australia, New Zealand, Italy and Spain, it may be stated that although the details of administration and control vary a good deal, the above-mentioned principles are embodied in all modern legislation.

It is those countries which have adopted such modern legislation, which have made the best use of their waters in the interests both of the public and of riparian landholders.

California

As mentioned by the State Water Commission of California in their report of 1917:—

"The settling and establishing of water rights—all the rights—sweep the field clear of uncertainties, of costly and vexatious litigation, of obstruction, and opens the way for constructive work and development."[1]

California was practically the last of the Western States of America to retain the doctrine of English Common Law in relation to water, and it was only in 1913 that this State fell into line with the other States by fully adopting the doctrine of State ownership and control of water, after a long series of legislative measures which intermingled the two doctrines, and which were, one after the other, found unworkable.

Wyoming

Wyoming was the first of the Western States to pass legislation in this direction, in 1891, and most of the other States soon after followed Wyoming's example. The right of a riparian landholder to continue to have water flowing past his land in practically its natural condition as regards quantity, whether he has made use of it or not, and irrespective of the requirements of others who desire to, and would make use of it, has ceased to exist in the modern world, except in those few countries which have up to the present not been successful in freeing themselves from this pernicious principle.

Basis of water rights.

"The basis and limit of tenure of modern water rights are the maintenance of the beneficial use of the water for the purpose of and to the extent of the grant. Non-utilisation for a period which varies in different countries, involves forfeiture of the grant of appropriation. Equity demands this essential provision. Speaking of the Water Act, 1914 of British Columbia, Mr. W. H. Granger, the legal advisor of the Dominion of Canada Water Power Branch writes:—[2]

British Columbia

"In every Province or State that has a statutory system governing the use of water, the final step in the acquirement of a water privilege is the issuance of a document to the water user as evidence of his title. This document has been aptly termed a 'water patent.'

"It is in some respects different from a land patent, inasmuch as it is subject to cancellation, providing the holder does not comply with certain conditions laid down with respect to the use of water.

"The comparison is none the less useful in calling to mind the fact that in the issuance of these documents the Province is finally disposing of one of its most valuable natural resources. The utmost care is therefore required on the part of the officials administering the "Water Act" to grant rights in such a way as to secure the greatest possible utilisation of the waters."

[1] Report of the State Water Commission, California, 1917.
[2] Water Licensing and Administration in British Columbia. Report of the Water Rights Branch, Victoria, B.C.

California.

And quoting again from the Report of the State Water Commission of California, 1917:—

"A water right rests on the basis of beneficial use, which prevents the tying up of the water, or its holding for speculative purposes . . . Beneficial use and non-capitalization operate effectively to knock out speculation . . . The application of the principle of beneficial use logically should, and undoubtedly does mean the largest measure of beneficial use, which is the support of the largest population possible in prosperity and happiness, or, in other words, the colonization of irrigable lands, or the supplying of municipalities with water for domestic purposes." (1)

Canada.

This important limitation of tenure by insistence on beneficial use by the operator is thoroughly recognised in all modern water legislation. Quoting from the address of the Hon. W. R. Ross, Minister of Lands for British Columbia, at the Twenty-First International Irrigation Congress, in 1915:—

"The principle that beneficial use of water privileges must be made within a reasonable time by applicants is now not only thoroughly established, but it is being made effective in practice. This point has not been reached without some complaint from persons who were accustomed to loose administrative methods, and required a firm stand on the part of officers, but it is clearly in the public interest, and will undoubtedly be maintained more strongly in the future." (2)

Capitalization of water rights.

Safeguarding clauses to ensure, by legislation, that the water rights themselves shall not be capitalized, has been found very necessary in recent water laws, the provisions varying in their stringency in different countries.

The underlying principle is that the State grants a water right either free or for a merely nominal charge, and in future years, the value of the water right, as attached to the land on which it is made use of, becomes enhanced in value far beyond the anticipations of either the grantor or grantee, and apart altogether from the value of the works constructed to make beneficial use of it. When the public which granted the concession, or a public supply company, requires the use of the water for public purposes, failing control by legislative enactments, it is the same public which has to pay for this enhancement of value of a right which, in many cases, it had originally granted for nothing.

Insistence on the tenure of the water right and of beneficial use being conterminous does not adequately guard against this danger, and there are two principal methods adopted for ensuring non-capitalization of the water right.

(1) Report of the State Water Commission of California, 1917.
(2) Official Proceedings of the International Irrigation Congress, Chicago, 1915.

One of these methods is by statutory enactment of the principles on which compensation is payable for compulsory expropriation of land and works, stipulating that no compensation is payable for the water right itself—only for the land and works expropriated in accordance with their market value plus additional compensation for compulsory expropriation.

Duration of licence.

In Australia, the duration of a permit must not, according to the water laws, exceed ten years, and in practice permits are granted for a term of five years only. In addition to this, the permittee has to make a statutory declaration at the end of every year that he has diverted and used water in accordance, and only in accordance, with the terms of his permit.

Many of the earlier administrators in the Dominions and the United States granted perpetual licences, even though such licences were free gifts of the State, without conditions of development. When Governments or municipalities desired to operate, the public was required to buy back from the operators something which the same public gave to the operators gratis.

"Water Power sites and water rights have a commercial value for in excess of what is likely to be represented by the capitalization of an annual charge made solely for the purpose of defraying administration expenses . . . In a comparatively new country like all this western coast I believe that capital should secure a generous return on all legitimate investments, but in no country—new or old—do I believe that capital should be allowed to exploit the property of the people or earn an income upon their generosity." (1)

Administration of water rights. Western States of America.

There is much diversity amongst different countries regarding the official or body to whom the duty of granting and recording water rights is delegated by the State. In the Western States of America the power is vested in the State Engineer, an official specially appointed under the Water Laws for the purpose, and there is right of appeal from his decision to a Board of Control, one board of the Division Superintendents under the presidency of the State Engineer acting ex-officio.

British Columbia.

In British Columbia the power is vested in one of the Ministers who acts on the recommendation of the Comptroller of Water Rights. In other parts of Canada it is also vested in one of the Ministers, subject, in the case of Ontario, to certain powers of the Hydro-Electric Commission. In Australia and New Zealand the power is also vested in one of the Ministers, subject, in the case of New South Wales, to certain powers of the Water Conservation and Irrigation Commission, and in the case of New Zealand to certain powers of the County Councils.

(1) "Shall Water Licences be Perpetual?" by O. C. Merrill, Chief Engineer, U.S. Forestry Service. Report of Water Rights Branch, British Columbia, 1916.

South Africa

The Union of South Africa has adopted a somewhat different
procedure to other countries by the establishment of special water
courts under a High Court Judge for hearing and adjudicating
water claims, for their record, and for granting new water rights.

South Africa, however, previous to the enactment of the Act
of 1912, appears to have found herself in an unfortunate position,
owing to the confusion and muddle which was caused by ill-
advised legislation and want of legislation in the past; and special
machinery had to be devised to unravel the entanglements which
had arisen.

District Water Boards.

In some countries in the past, local district water boards have
been invested with quasi-judicial powers, and entrusted with the
duty of functioning water rights. It is believed that in every
country where this has been tried, the result has been disastrous
and has saddled future administrators with an almost endless
series of puzzles to elucidate, and the courts with a mass of
litigation.

South Africa

Referring to the River Boards created in South Africa by
the Transvaal Act of 1908, the Director of Irrigation of the Union
of South Africa states: ". . . . they were likewise given some
judicial functions which they were quite unqualified to perform
and legally powerless to enforce . . . The result was to create
bodies endowed with powers far in excess of their capacity, and
without exception every board formed in the Transvaal under the
1908 Act has been an unqualified failure." (1)

If South Africa had adopted the far-seeing legislation
suggested by Sir William Willcocks in 1901 (2), the country would
have been saved much of the trouble and litigation subsequently
experienced.

United States and Canada

In Western America and Canada the same difficulties as
those in South Africa arose. Miners made their own crude rules,
and later, bodies were formed with semi-judicial functions, grant-
ing important water rights broadcast without any co-ordinated
system under a central authority. Frequently it would appear
that valuable rights were granted without a statement in the
licence even, of the land to which the right was appurtenant.
Referring to the Gold-fields Act of British Columbia of 1859, the
Goldmining Act of 1871 and the Land Ordinance of 1870, which
contained some excellent provisions, the Acting Comptroller of
Water Rights, British Columbia, states in the Report of the Water
Rights Branch 1912: "Had the Commission insisted on the

(1) Report of the Director of Irrigation of South Africa, 1914, and Year Book of
South African Irrigation, 1914.
(2) Report on Irrigation in South Africa, Sir Wm. Willcocks, 1901 (C.S. 92,
1902).

fulfilment of these requirements before making a record, much
litigation and trouble would have been avoided. They, however,
did not do so, but granted records to some persons who were not
entitled to them, records which did not specify the stream, records
which did not state the point of diversion, records which did not
state the quantity to be diverted, and many records which did not
state definitely where the water was to be used." (1)

In British Columbia, as in South Africa and other countries,
where past unwise legislation has placed the alienation of valuable
public resources in the hands of bodies unfitted to undertake the
duties, much of the recent legislation has had to provide for the
elucidation of the confusion which has resulted.

In British Columbia, the Board of Investigation has for many
years now been engaged on the adjudication of claims, which had
their real, or pretended origin, in the vague and indefinite records
of these bodies.

In his address to the Eighth Annual Convention of the
Western Canada Irrigation Association, the Comptroller of Water
Rights, British Columbia, referring to the Board of Investigation,
mentions that reports for the Board take fully nine tenths of the
time of the District Engineers (2), and again at the Twenty-First
International Irrigation Congress, the Minister of Lands [illegible]
the vigorous public protest against the previous grant of water
rights which did not insist on and were [illegible] conditional on
beneficial usage. (3)

State water must be [illegible] by the State.

Enough has probably been said to [illegible] the [illegible] which has
already been fought out in other countries that State water rights
be administered by the State, not by unco-ordinated bodies without
technical knowledge. The particular officer of Government in
whom the power to grant and refuse water rights is vested [illegible]
Minister of Public Works in many countries, such as Australia,
New Zealand, Italy, Spain and Switzerland, while in others a
special civil engineer is appointed for the purpose, such as the
State Engineers of the Western States of America and the
Comptroller of Water Rights in British Columbia.

It is essential that the officer to whom these important duties
are delegated should be a trained hydraulic engineer, should have
administrative ability and a keen eye for the public interest.

Right of appeal to a higher authority, which should be a body
on which the engineering and legal professions are represented is
also essential.

(1) Report of the Water Rights Branch, British Columbia, 1912.
(2) Report of the Proceedings of the Eighth Annual Convention of the Western
Canada Irrigation Association, 1914.
(3) Official Proceedings of the Twenty-First International Congress, 1914.

The alienation of water rights is too important to entrust to haphazard methods, and it is only those who study the situations which have arisen in other countries who adequately realise this.

Some remarks will now be made on water power irrigation, [illegible] fees and charges for water, qualified engineers and units of measurement in relation to modern water legislation.

[illegible] THE ADMINISTRATION OF WATER POWERS.

Conservation of water powers.

The realisation of all countries that water powers are a valuable asset of the State, and that it is the bounden duty of countries to conserve their water power resources in the public [illegible] has already been commented on.

The Water Power Committee of the Conjoint Board of [illegible] Societies has stated: "The development of the Empire's [illegible] inseparably [illegible] with that of its water power." (1)

Partial development of water [illegible]

In a new country it generally takes [illegible] years before [illegible] sufficient demand arises to justify the [illegible] development of water powers to their maximum economic extent.

It is always the most attractive sites which are first selected [illegible] where [illegible] works justify the expenditure of the small [illegible] required to fulfil the demand [illegible] in operation.

The capacity of such works and [illegible] of the minimum flow are generally estimated from a consideration [illegible] inadequate data of the river during the [illegible] considered waste and all water above this minimum [illegible]

It is very seldom in the earliest history of a country that works to impound flood water on a large scale for power purposes are contemplated.

Maximum development in the future.

It is, however, [illegible] of the State [illegible] that [illegible] reservoirs at suitable [illegible] impounding flood waters in [illegible] at the head waters of [illegible] which are generally [illegible] that the full river [illegible] can be developed. In all [illegible] which the river is capable [illegible] where water powers exist or where irrigation on an extensive scale is practised, the construction of reservoirs to impound flood water comes sooner or later.

It must also be recognised that it is scarcely ever possible to store more than a fraction of the total flood discharge of a river [illegible] the presence of [illegible] sufficient suitable sites [illegible] of making [illegible] for other reasons [illegible] the year [illegible] The principle of utilising this surplus [illegible] discharge for seasonal operations is touched on by the Water Power Committee

(1) Interim Report of the Water Power Committee of the Conjoint Board of Scientific Societies 1918.

previously mentioned, in the following words:—"It has usually been understood that the usefulness of a water supply depends on the possibility of maintaining its uniformity for the whole period of the year, and that the maximum useful power is strictly limited by the minimum power which, by the aid of any suggested storage system, will be available towards the end of the longest period of drought. Where the power is utilised for the supply of some industrial centre this is undoubtedly [illegible] to be generally adopted. It would [illegible] potential power, more particularly in tropical and semi-tropical countries. The possibility of utilising flood supplies for seasonal operations in connection with mining, agriculture and forestry, or for the production of nitrates in such cases, would appear to be worthy of close consideration." (1)

Great Britain reached the stage long ago, where practically every project, designed even for water works for the supply of cities and towns, involves the storage of flood water.

Practically all the large irrigation works designed and constructed by or under the control of the Department of Irrigation in South Africa involve the construction of works to impound flood water, and all hydro-electric development of any magnitude [illegible] parts of the world [illegible] of the [illegible] of the drainage area and the design and construction of works to [illegible] the minimum discharge.

The Tata Hydro-Electric Works near Bombay generating [illegible] electrical horse-power are entirely dependent on storage reservoirs, the whole rainfall occurring [illegible] four months of the year, and the total catchment area of [illegible] reservoirs being only 22 square miles. Many river systems [illegible] practically no storage [illegible] owing either to steep gradients [illegible] others have high watertightness in otherwise suitable places [illegible] capacities.

In this connection it may be noted that storage reservoirs are extremely costly, unless unusually favourable sites exist, but when a large reservoir is established near the head of a river system, the whole river and all development on the river benefit thereby.

Strong arguments have been adduced in countries where the stage of development which requires the impounding of flood waters has been reached, that the State itself should construct and operate storage reservoirs, and so benefit the whole river.

Partial development of power reaches in early stage of a country's history.

Pending the attainment by a country of the stage of development which requires full use of available water powers to supply the demand, it is necessary [illegible] the water [illegible] to allow for partial development of the power derivable from the power reaches of rivers meantime by concessionaires.

(1) Loc. cit.

R.

Such law must, however, provide for the expropriation on equitable terms of the rights of a partial power permittee or concessionaire by an operator willing to develop not only the full economic power available from the power reach, but a greater proportion of it than the original concessionaire is developing.

To elucidate this proposition further, it is necessary to realise that a power reach of a river generally comprises a series of waterfalls, with stretches of rapids and flat reaches in between, extending perhaps for some miles, and largely limited by the nature and levels of the flanks of the valley in which the river flows.

The maximum development of a power reach involves the diversion of water at the upper limit of the reach and its return at the lower limit. When small operators are located adjacent to the waterfalls comprising a power reach, each developing a portion of the power available at each fall or rapid, maximum development is rendered impossible unless the small operators are expropriated.

Fortunately at the present day, large development of water power almost always involves the generation of electrical energy. The most equitable way of compensating small power users for the expropriation of their water power rights, is to require the expropriating operator to supply and continue to supply an equivalent amount of power in the form of electrical energy to the expropriated operator at a price not greater than the cost at which the expropriated operator formerly supplied himself with power under his water permit, and not more than that at which other consumers of electrical energy of a similar nature will be supplied by the new operator.

This system provides an equitable method of expropriation and similar provisions for compensation in power of expropriated operators are provided for in Canadian water legislation and in the water power legislation of Switzerland and Italy.

The expropriating operator is required to bear the cost of the installation and maintenance of any additional plant required.

The necessity for providing by legislation for the non-capitalization of water power rights, and other water rights, by limiting the duration of the grant and by insistence on beneficial usage of this important State resource, has been remarked on previously.

(2).—THE ADMINISTRATION OF IRRIGATION

Irrigating countries.

Before proceeding to consider the broad aspects of modern water legislation in connection with irrigation, it may be as well to remark on the position which irrigation occupies in those countries where irrigation is practised to a large extent.

Probably the most important of these irrigating countries are (1) the Western States of America; (2) Australia; (3) Canada; [illegible] South Africa; [illegible] India; (6) Spain; (7) Egypt; (8) Italy.

It is only by irrigation that [illegible] productive, and capable [illegible] population. There are [illegible] climates like Northern Europe and [illegible] America which can afford to neglect irrigation as one of the principal factors in their development.

In consequence, the study of the science of irrigation has been carried on in other countries to an extent hardly realized by the non-technical public in countries like England, and this study has resulted in the production of a vast amount of literature on irrigation ranging from pamphlets, quoting the general principles in popular form, to papers in technical journals and large technical works.

It should be realized that irrigation has now been elevated to the position of an incipient science, and that unless the general principles which have been evolved as a result of study and experience are followed, the results of irrigation are [illegible] than beneficial.

"As the necessary complement to an effective [illegible] irrigation, arrangements for disposing of the [illegible] water [illegible] essential. It will I believe [illegible] from experience [illegible] frequently [illegible] anything else."

As mentioned by Widtsoe in his "Principles of [illegible] [illegible] farmer.

Most large irrigating countries have their [illegible] West [illegible] Irrigation [illegible] South African Irrigation Association [illegible] useful work.

The [illegible] irrigation works [illegible] diversion of water [illegible] each farmer independently for use on his own land and [illegible] large irrigation [illegible] of farmers through its distribution laterals.

(1) Italian Irrigation [illegible] Vol. II.

It is only the latter method which need be considered here. There are three general systems in vogue in irrigating countries for securing the construction, operation and administration of irrigation works under the second method.

State projects.

Firstly, construction of the works by the State and the imposition of a rate as a charge on the irrigated land to cover maintenance, administration charges and sinking fund for redemption of the State [illegible] [illegible] the State [illegible] [illegible] in this case may be [illegible] by [illegible] of the State and partly of a Board composed partly of officers of the State [illegible] entirely of elected members elected by the [illegible] members.

The Irrigation Districts and Boards of South Africa, the Irrigation Areas and Trusts of Australia, the Water Race Districts and Corporations of New Zealand, and most of the State works in India and Egypt fall under the heading of State works.

Community projects.

Secondly, the financing, construction, operation and administration of the irrigation works by communities of landholders through an elected corporate body, which has power to raise loans on the security of the lands of the landholders, to levy rates on them and to construct, operate and maintain the works which are vested in them in trust for the community, and in accordance with the water laws.

The Irrigation Districts and Boards of Canada, the Irrigation Districts and Boards of Directors of the Western States of America, the Irrigation Associations and Administrative Boards of Italy, and the Irrigation Communities, Executive and Administrative Boards of Spain, are of this type.

Company projects.

Thirdly, by Irrigation Companies [illegible] for the express purpose of constructing and operating large irrigation systems for irrigating the lands of farmers on payment for the water delivered. Such irrigation companies have been a notable feature in the irrigation development of many countries, especially parts of Canada and the United States, and recent water legislation in these countries provides for a high measure of State control of their activities in the interest of the farming communities served.

Most of these companies have doubtless done excellent work in financing and operating irrigation systems for which funds could not otherwise be found, and so stimulating production, but when financial difficulties arise, the communities depending on their operations are liable to suffer through the irrigation systems becoming derelict, unless statutory enactments ensure the continued effectiveness of the irrigation systems.

Control of companies' operations.

The British Columbia Bill of 1917, to amend the Water Act 1914, was framed to safeguard such communities by making the cost of maintenance, operation and repairs a first charge against the revenue of the company; and by providing for power of the

Government to guarantee the repayment of moneys disbursed in the repair of water systems. Such charge has the effect of a first mortgage on all the assets and lands of the company, taking precedence over all other charges.

Water companies doubtless fulfil an important function in the early days of development of a new country, when private capital is available and but little money can be raised by the farmers themselves, but the tendency of irrigation law, practice and administration in the Dominions is certainly towards the encouragement of co-operative methods amongst the landholders themselves through elected Boards of Trustees.

When irrigation companies owning an irrigation system, distinct from the lands supplied, have been allowed for in recent legislation the tendency of Canadian practice appears to be to make provision for the eventual acquisition of the irrigation system by the landholders consuming the water, under State supervision, as distinct from State management and control.

Extracts from a paper on "Water Legislation and Administration" in British Columbia by Mr. O. W. Grunsky, and from an address by the Minister of Lands, British Columbia, at the Twenty-First International Irrigation Congress bearing on the subject of water companies are quoted in Appendix No. II.

One of the most important stipulations to be provided for in legislative enactments dealing with projects of this nature is that surveys, estimates, gaugings, maps showing the character, location and extent of irrigable land and all matters pertaining to the scheme shall be dealt with by a qualified engineer. Legislation regarding qualified engineers will be referred to later in this paper.

Recent tendency towards community projects.

The tendency in recent years in those countries where irrigation is largely practised, is towards the abolition of private canals, each diverting a small quantity of water from the natural source of supply, for use by one or at most a few farmers, and their absorption in a community scheme unifying the requirements of farmers by means of one large diversion canal and its distribution system.

Some of the advantages are evident. Firstly, there is greater ease of control of rotations and limitation of waste. Secondly, a farmer diverting water within the boundaries of his [illegible] or of adjacent lands by easement, for use on his land, can [illegible] only command a fraction of his irrigable land. Thirdly, multiplicity of small canals results in more loss in efficiency and waste by evaporation and absorption, before the water reaches the irrigable lands, of a greater quantity of water than is the case in one large canal.

(3)—THE ADMINISTRATION OF SWAMPS.

[illegible] swamps.

Two main classes of swamps may be recognised from an economic aspect, namely, (1) Swamps which are mainly stream regulators, (2) Swamps which are mainly stream evaporators. The former chiefly occur at the heads of streams, where they form natural reservoirs retaining flood water, and discharging it through dry seasons, so acting [illegible] is equalised of the discharge of streams. Such swamps act like lakes on river systems, and, like lakes, lose much water by evaporation and more than lakes by transpiration of vegetation, but the net effect is beneficial. The second type usually occurs on stream courses where the gradient is flat, often owing to the collection of alluvium by erosion of neighbouring hills. In tropical countries, rank vegetation grows, and a large proportion of the stream flowing into the swamp is lost by evaporation and transpiration, owing to its water being spread over wide areas highly heated by the sun.

Extreme examples of this class of swamp are the immense areas on the Albert Nile above the confluence of the Sobat and along the lower courses of the Bahr el Ghazal. Losses in the swamps on the Albert Nile are stated to reduce the flow by 59 per cent. (1)

Swamps a nuisance

Such swamps have as a rule no economic value until drained, when the land is especially valuable on account of its high percentage of humus, [illegible] where the gradient is sufficiently flat by their conversion into lakes to impound flood waters.

It is frequently the case in tropical and sub-tropical countries that in a stream above a swamp there is water in abundance for beneficial uses, but riparian landholders above the swamp have to be precluded from applying the water to these beneficial uses for if done, riparian landholders below would not have sufficient water for their domestic purposes.

Swamps in tropical countries are also a public nuisance in settled districts, on account of being breeding grounds for mosquitoes.

The drainage of a swamp serves two purposes, namely: (1) to increase the dry season flow of the stream below the swamp; (2) to render the alluvial land occupied by the swamp available for agriculture. There are two usual methods of procedure in practice for [illegible] the operations connected with the drainage of swamps. These two methods may be termed "State Procedure" and "Community Procedure," and the latter may be State-aided or constructed, and operated partly by the State and partly by the community affected.

(1) Egyptian Irrigation, Willcocks and Craig. The physiography of the River Nile and its Basin—Capt. S. G. Lyons 1906. Report on the Basin of the Upper Nile, Sir William Garstin, 1904.

Ownership of beds of swamps.

In some of the Australian States, the Crown holds possession of the beds of swamps and marshes in addition to those of lakes and watercourses; the reversion to the Crown of the ownership of the beds when on alienated land, having been provided for by the water legislation of those States. (1) This facilitates beneficial improvement by the State.

Drainage of swamps as community projects by associations of landholders is provided for in the water legislation of most important countries, the will of a majority of riparian landholders being binding on a minority and the reclaimed land becoming available to the individual landholders in proportion to the areas of their holdings in the swamp or length of frontage.

Spanish legislation regarding drainage of swamps.

The Spanish water laws in connection with the drainage of marshy lands are very full and worthy of consideration in detail.

Referring to the General Code of Spain relating to Water Courses, and Irrigation.—(2)

Article 61 provides for the case where a majority of holders of lands in a swamp desire to effect its reclamation and the power of the Minister of Public Works to compel a dissenting minority to pay their portion of cost, or failing that, to yield their area of reclaimed land to the operators.

Article 62 provides for the case where swamps are declared to be unhealthful and for their compulsory reclamation.

Article 63 provides for the majority of the owners having first refusal of the execution of the scheme to carry out the [illegible] and in the event of their refusing, the Minister of Public Works has power to authorise any person or company to carry it out. The land drained then becomes the property of the person or company which has drained it and who only pays to the original proprietor the sum corresponding to the tax valuation.

Article 64 provides for the State, Province or Municipality carrying out the drainage in the event of the owners, private persons or companies not being willing to do it. The ownership of the land drained then passes to the State, Province or Municipality whichever bore the cost of the works, subject to the payment of the sum corresponding with the tax valuation to the original proprietors.

Article 65 provides for the case where the marsh belongs to the State, the ownership then passing to the person or company who carries out the reclamation according to an approved plan.

(1) Section 6 of Act No. 19, 1911, Western Australia, Section 6 of Act No. 2, 1911, Queensland. Act No. 2,747, 1915, Victoria.
(2) Irrigation Laws of Spain, Irrigation Development, W. Ham. Hall.

(4)—LEGISLATION REGARDING FEES AND CHARGES.

Principles of charging fees and rentals.

Apart from the charges made by the State, companies, irrigation associations, and municipalities for the supply of water for irrigation, domestic purposes, etc., thereunder, adopted a by their water laws, and regulations ... most countries have system of charging fees for ... applications to divert water, and for the issue of authorisations, licences, concessions, permits and so on, and for the payment of an annual rental, royalty, tax or charge for the diversion or abstraction of water by means of works, from public waters.

The principles involved ... that water resources constitute one of the most important resources of the State, and as such are liable to a royalty or charge to be paid by the person using them in the same way that a royalty is charged for minerals mined, timber cut from State forests, or the utilisation of other State resources.

To ensure the economical, equitable and beneficial use ... water adequate knowledge of the State's water resources, and the equitable administration of the water laws are essential. The fees imposed and the rentals charged are adjusted so as to cover the expenditure on such administration and investigation, without being so large as to restrict development.

A great advantage of imposing such fees and charges is that it enables the branch of the Government entrusted with the administration of the water laws to be to a large extent independent of general revenue and to be in a position to advise non-technical operators and intending operators regarding the best method of achieving their ends to their own advantage and the advantage of the State.

The amounts of the fees and charges are generally prescribed in regulations under the Water Laws which make provision for them, so that the amounts can be adjusted from time to time as economic conditions change.

Some of the fees and rentals which have been charged in other countries will now be briefly stated. Most of these are pre-war rates and have probably been altered in some countries.

Fees for applications, licences, etc. will first be mentioned.

Fees in Saskatchewan and Alberta.

In the provinces of Saskatchewan and Alberta the fee charged for a licence to divert and use water is ten dollars ... (say S. 41.60) ... In the State of Wyoming the fee for filing an application is fixed at two dollars (say S. 8.32) and that for the issue of the certificate one dollar (say S. 4.16).(2) There are certain other small fees for copying plans and other documents.

(1) Rules, Regulations and Forms prescribed by the Minister of the Interior under section 51 of the North-west Irrigation Act.

(2) Irrigation Laws of Wyoming, Sec. 691, 1917. Regulations and Instructions ... filing applications in the office of the State Engineer, Wyoming, 1914.

Note.—The currency of Kenya is expressed in shillings and cents of a shilling.

Fees in Oregon.

In the State of Oregon, the fee for filing an application for a water permit is fixed by law at three dollars (say S. 12.48), and when the use is one of irrigation, this amount is subject to an additional fee of fifteen cents (say S. 0.62) per acre to be irrigated up to 100 acres (equivalent to S. 3.42 per litre second at a duty of 5 acres to the litre second), and a lesser amount per acre for acreages above 100 acres. If the use is one of power, the additional fee is twenty five cents (say S. 1.20) per theoretical horsepower for every horsepower up to 100 h.p., and a lesser amount per horsepower for the portion of the power above 100 horsepower.

For any other use of water including one for domestic purposes, the filing and recording fee is five dollars (say S. 20.80).

In addition to the filing and recording fee, an examination fee of three dollars (say S. 12.48) is charged on all applications.(1)

The "Rules, Regulations and Practice relative to the control, distribution and use of Water Resources of Oregon" give the following example of fees charged:—

"For example the total fees payable to the State Engineers' Office upon a permit to develop 100 horsepower are ... 3 dollar examination fee ... filing and recording fee, being at the rate of twenty five cents per horsepower. If domestic use is included in the above application, an additional fee of 5 dollars is required."

In New South Wales the fees charged by regulations vary according to the quantity of water diverted, or abstracted, and according to the nature and extent of the works constructed.

Five classes are recognised, and varying fees are charged according to whether the source of supply carries water for more or less than six months in the year.

When the river flows for more than six months in an average year (as determined by hydrometric survey), the fee is £2 per 750 gallons per minute (say S. 0.59 per litre second) for quantities up to 37,500 gallons per minute (say 2,840 litres seconds), the minimum fee being £2 (S. 40).

When the quantity diverted is above 37,500 gallons per minute (2,840 litres seconds), the fee is at the rate of £2 per 750 gallons per minute ... up to 37,500 gallons per minute, and at the rate of ... every 3,000 gallons per minute (say S. 0.28 per litre second) for the quantity in excess of 37,500 gallons per minute (2,840 litre seconds).

Fees are not charged for pumping when the power used is less than one horsepower.

(1) Rules, Regulations, Forms and Practice relative to the control, distribution and use of the Water Resources of Oregon, 1915. Irrigation District Laws of Oregon 1917. Water Laws of Oregon, 1919.

As licences are granted for a period of five years, the above fees would be payable every five years if the licence is renewed [illegible]

Fees in Victoria.

In the State of Victoria the licence fee was fixed at £1 ($. 20 [illegible] in ordinary cases, and the transfer fee the same.

The fee for servitudes and other documents and some licence fees are required to be fixed according to the circumstances of each case. (2)

Fees in British Columbia.

In British Columbia, the fees charged vary greatly (according to schedules) with the purpose for which the water is required and with the quantity required to be diverted [illegible]

The application fee for a licence to divert 1,000 gallons per [illegible] or less for domestic purposes is 1 dollar, and for quantities greater than this the fee is 50 cents for each additional 1,000 gallons or part thereof per day. [illegible] litre-second of water for domestic purposes, the fee works out at about $. 41.00, for two litre-seconds $. 81.12 and so on pro rata.

The application fee for a licence to utilise 50 acre-feet per annum or less, for private irrigation purposes, is 2 [illegible] dollars and when the quantity is greater than this, 5 cents for each additional acre-foot is charged. On the assumption that the duty is [illegible] acres to the litre-second, this fee works out at about $. 5.02 per litre second.

For ordinary private power purposes the application fee is 5 dollars (say $. 20.80) for 20 horsepower or less and for power greater than 20 horsepower 25 cents (say $. 1.04) per horsepower.

In the case of an application to develop power for sale the application fee is 50 cents (say $. 2.08) per horsepower up to 1,000 horsepower the fee per horsepower being reduced [illegible] powers above 1,000 horsepower.

Fees are charged for other services such as certificates, permits to enter on land, filing petitions, copies of documents, etc. and need not be referred to further here.

With reference to annual charges for the diversion and [illegible] of water for various purposes [illegible] to the State the following cases may be cited:—

Charges in Italy.

In Italy distinction has been drawn between diversions involving obligation to return the surplus water to the source of supply and those in which return of the water is not obligatory.

The charge which has been stipulated in the former case for irrigation is equivalent to about $. 0.32 per litre-second per annum. (4)

(1) Act No. 14 Schedule II 1912, New South Wales.
(2) Regulations under the Water Act, 1905, Victoria.
(3) Regulations under the Water Act, 1914, British Columbia.
(4) Water Legislation in Italy, Irrigation Development, W. Ham Hall.

Charges in British Columbia.

In British Columbia the annual rentals payable to the Province vary greatly with the purpose for which the license has been granted and with the quantity of water diverted under the licence. (1)

The annual charge for diversion of water for domestic purposes when the quantity is 1,000 gallons per day or less is 50 cents, and when the quantity is greater than this 25 cents for each additional 1,000 gallons per day or part thereof is charged [illegible] equivalent to about $. 20.80 per litre-second.

When the purpose is one of private irrigation on land to which the water right is appurtenant, the rental is 1 dollar per [illegible] acre-feet [illegible] to about $ [illegible] per litre-second [illegible] to the litre-second.

For ordinary private power purposes the rental for the development of 20 horsepower or less is 5 dollars (say $. 20.80) and when the power is greater than 20 horsepower the rental is 25 cents (say $. 1.04) per horsepower.

When the licence is for the development of power for sale, the rate is fixed by the Board of Investigation and is stipulated to be not less than 25 cents (say $. 1.04), or greater than 2 dollars (say $. 8.32) per horsepower. Charges are also made for available but undeveloped horsepower.

Charges in Victoria.

In the State of Victoria the charge for irrigation [illegible] has been fixed at 2 [illegible] in the case of some rivers [illegible] per acre per annum with a minimum charge of £1 and [illegible] for market gardens 6 shillings per acre. For a duty of 5 acres to [illegible] litre-second these figures work out at ten and thirty shillings [illegible] litre-second [illegible] respectively. (2)

A charge of £1 ($. 20) per horsepower appears to have been made [illegible] for certain industrial purposes was [illegible] at the rate of [illegible] per 1,000 gallons (say $. 9.08 cubic [illegible] irrespective [illegible] industrial purposes [illegible] the rate of [illegible] 1,000 cubic [illegible]

Charges in Quebec.

[illegible] horsepower, and in New Brunswick a charge of 2 [illegible] cents (say $. 1.04) has been imposed.

(1) Regulations under the Water Act 1914, British Columbia, Water [illegible] Canada, G. R. G. Conway.
(2) Regulations under Water Act, Victoria.
(3) Water Powers of Canada, Province of Quebec, Kaetz.

Charges in New Zealand and Switzerland.

In New Zealand a charge of S. 3 per horsepower per annum has been made, and in Switzerland the annual rental was fixed by law not to exceed 6 francs (say S. 5) per horsepower per annum. (1)

Charge in Tasmania.

In Tasmania the annual charge for diversion of water for mining purposes appears to have been fixed at £1 per "Sluice head"—an orifice of definite shape and size under a definite head—which works out at approximately S. 2 per litre-second per annum.

Charge in Demerara

In Demerara the charge is said to vary from 16 cents to 20 cents per acre when water is diverted and used for sugar cane cultivation, or say from S. 0.66 to S. 0.88 per litre-second calculated at a duty of 5 acres to the litre-second.

(5)—UNITS OF MEASUREMENT FOR WATER PURPOSES.

Advantage of metric system.

The advantages of adopting the metric system for all purposes in the ordinary life of communities is obvious to all who are acquainted with the system.

Diversity of opinion, however, exists regarding the desirability of abolishing the deeply-rooted but cumbrous English units of weight, measure and length which have become so firmly established in everyday life, although the time wasted in calculating in these units is apparent to every one.

Inconvenience to the public in establishing the units of the metric system for rate of flow and quantity of water, would, however, scarcely occur, as, even now, when rates and quantities of water are stated in English units, the general public have difficulty in forming a mind picture of the rate or quantity stated.

Much loss of time occurs amongst engineers, in discussions regarding rates of flow and quantities of water. One of them may have formed his ideas and mind pictures of flows of water when stated in gallons per minute or per second and is not able to form a clear idea when a figure is stated in other units, until he has calculated *it* in the units with which he is accustomed. Another's ideas may be based on such units as cubic yards per hour, gallons per day, "miners" inches, "modules" "sluice gates" "acre-feet" or other such unit.

A uniform system is necessary, and this can best be attained by establishing the metric system in all legal documents and Government papers relating to flows, quantities and measurements of water.

In this connection one cannot do better than quote from the "Report on Irrigation in South Africa" (Cd. 903, 1902) by Sir William Willcocks:—

"No reasoning man to-day disputes the superiority of the metric system to all other systems.

(1) Water Power Law, 1916, Switzerland.

"In no direction is this superiority more pronounced than in that of hydraulic engineering. To convert 9 inches of rainfall over 25 square miles of area into cubic feet is an operation as tedious as it is unnecessary.

"To convert 9 centimetres of rainfall over 25 square kilometres into cubic metres is an operation which a child could perform in a minute. A cubic foot of water weighs 62½ lb., and the calculation of the pressure of 9 feet head of water on a section of a lock gate 40 feet high and 6 feet wide is an operation demanding time and exact calculation. A cubic metre of water weighs exactly one ton or 1,000 kilogrammes, and the calculation of the pressure of three metres head of water on a section of a lockgate 12 metres wide and two metres high can be performed in ten seconds.

"I personally do all my work in the metric system and convert it with the aid of conversion tables into the ordinary English measures for the sake of those who are ignorant of the metric system.

"I find that this results in a great saving of time, although I was familiar with the English system for thirty years of my life, and have only learnt the Metric System comparatively recently. In the Transvaal the Railways and mines already use the Metric System. If the system were made universally compulsory in both colonies it would be a gain indeed to the whole community, from the children at school to the scientific men engaged in the most intricate calculations". (1)

(6) LEGISLATION REGARDING QUALIFIED ENGINEERS FOR WATER PURPOSES.

That the public should be safeguarded as far as possible in the selection and employment of civil engineers to design and supervise the construction of their works, by legislative enactment providing for the registration of those who, by training and experience can be justly termed "qualified engineers," is a principle which has been thoroughly recognised in the engineering profession for many years. In some countries it has given rise to legislation with regard to the employment of engineers for the design and construction of water conservancy and municipal works.

When it is recognised that the proper training of a civil engineer requires many years of study and experience, which are unproductive in a pecuniary sense, no less than that required in the medical and legal professions, where the public are safeguarded, it is surprising that more Governments have not insisted on remedial legislation.

(1) Report on Irrigation in South Africa, Sir Wm. Willcocks (Cd. 903, 1902).

Many persons, whose training and activities have followed many different lines, consider themselves qualified to undertake the design and construction of the most highly technical civil engineering works.

The Institution of Civil Engineers has done much to endeavour to inaugurate legislation in England, providing for the registration of qualified civil engineers in the public interest. Canada and the Western States of America are, however, in the forefront regarding their legislation to protect the public in their dealings with persons calling themselves civil engineers, in water, sewerage and municipal matters.

The enactments of the State of Wyoming in this direction are embodied in sub-sections 1 to 8 of Section 874 of the Irrigation Laws of Wyoming, and are quoted in Appendix III as an example of this type of legislation.

WATER LEGISLATION OF VARIOUS COUNTRIES.

(1)—WATER LEGISLATION IN BRITISH COLUMBIA.

British Columbia early adoption of State control.

British Columbia was fortunate in that, at a comparatively early date, the dog-in-the-manger principles of English Common Law relating to water were begun to be cut away.

British Columbia various early Acts.

As early as 1859, the Goldfields Act, and regulations there under, laid down the procedure to acquire water rights with much of the stringency of modern statutes. (1)

Beneficial usage after acquisition was the basis of tenure of the right, and if waste of water took place, the Commissioner might declare the right forfeited.

The statutes of 1871 appear to have contained the basic principles of modern State control. The right to divert any water not already recorded and appropriated could only be acquired by a person who was actually beneficially occupying the land, so ruling out the mere land speculator. Priority of record gave priority of right, and in case of dispute, the Commissioner was the deciding authority, assisted, if desired by either party to the dispute, by five jurors.

The act deals chiefly with the usage of water for agricultural purposes by riparian holders, but water privileges for mining and other purposes are allowed for, and the grant of servitudes by the Commissioner, on, over, or through lands otherwise held, after payment of compensation, is also dealt with.

The "Water Privileges Act" of 1892 declared in specific words that the right to use all water not at that time appropriated and recorded was vested in the Crown, although the Crown had assumed the right of control before. (2)

The act gave companies and persons holding water privileges a method by which they could gain entry upon the lands of others and proceed with the construction of their works. It was necessary, however, that the company should be empowered by special Act, in order to take advantage of it (3)

(1) Water Legislation and Administration in British Columbia: H. W. Gramsky: Report of the Water Rights Branch, British Columbia.
(2) Loc. cit.
(3) Loc. cit.

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(1) Water Legislation and Administration in British Columbia; H. W. Grunsky; Report of the Water Rights Branch, British Columbia.
(2) Loc. cit.
(3) Loc. cit.

The Act of 1897 consolidated former acts. The preamble states:—

"It is necessary and expedient . . . to provide for the due conservation of all water and water power . . . and to provide means whereby such water and water power may be made available to the fullest possible extent in aid of the industrial development and of the agricultural and mineral resources of the Province."

Every privilege acquired under the act was made conditional upon reasonable use for the purpose for which such privilege was conferred. Every record holder was required to take all reasonable means of utilizing the water granted to him and if he wilfully wasted or took water in excess of his requirements, the Commissioner might reduce the record or impose any necessary condition. (1)

An appeal was permitted from any decision given by a Commissioner.

The Act of 1909 was apparently designed to provide the machinery for adequately defining existing rights, laxity having prevailed in the administration of the previous acts, excellent as they were in principle. This appears to have been partly due to the officials, entrusted with the records, not realizing the value of the water privileges which it was their duty to guard.

British Columbia, Board of Investigation.

A "Board of Investigation" was created, this being a tribunal for examining old rights, and a Comptroller of Water Rights was given supervision over new grants.

Many of the officials appear not to have been engineers or otherwise qualified to undertake the new duties, and it was left for subsequent amendments to ensure that the matter was in the hands of qualified engineers.

An important requirement before the issue of the licence or certificate was the insurance of the completion of the works authorised, as it is of the utmost importance to ensure that the expressed intention to develop is *bona fide*.

British Columbia, Water Act, 1914.

The Water Act of 1914, under which water administration is now carried on in British Columbia, is the result of the experience of those who have given a lifetime to water administration in America, and of the investigation of the water laws of the Empire (2)

(1) Loc. cit.
(2) Water Act, 1914, British Columbia.
Water Administration in British Columbia by W. Young, Comptroller of Water Rights B.C.

Although not so divided in the text, the act is naturally capable of division into two parts, one part being largely the old water acts consolidated and revised, and the other part dealing with companies, associations, and other corporate bodies engaged in the storage, carriage and use of water.

The features of the act are described in an illuminating manner by Mr. W. H. Grunsky of the Water Rights Branch of British Columbia, now legal adviser to the Water Power Branch of the Department of the Interior, Canada, in an address to the Eighth Annual Convention of the Western Canada Irrigation Association in 1914. An extract from this address is quoted in Appendix IV.

British Columbia, activities of District Engineers.

District Engineers were appointed under the authority of the Water Act with specific powers, and an order of work was adopted comprising eight different activities, namely:—

(1) Systematic and continuous stream gaugings.

(2) Study of the proper duty of water.

(3) The prevention of wasteful use of water.

(4) Policing of streams.

(5) Economic distribution and delivery of water.

(6) Inspecting water systems to determine their efficiency and safety.

(7) Determination of storage possibilities.

(8) Investigation of water powers (1)

British Columbia, limitation of quantity.

In the Act of 1914, some important new principles limited the quantity of water diverted to that required for beneficial use according to established principles, and also provided for rotation in use.

The Act renders it impossible for a speculative company to procure and hold valuable water powers. Construction of works and economical regulation are necessary to enable the company to retain the water rights which it has acquired. Whenever the rights granted by a licence have not been exercised for three successive years the licence becomes null and void, and also if the water is wasted or in breach of the conditions made.

British Columbia, readjustment of quantity after hydrometric survey.

Another important provision affecting licences is that the quantity of water granted is liable to readjustment after hydrometric survey. As in previous legislation, priority of grant confers priority of right.

(1) Water Administration in British Columbia, W. Young.

British Columbia, appeals.

The appeals allowed for are as follows:—

(1) From an order of a District Engineer to the Comptroller.

(2) From the Comptroller to the Minister.

(3) In cases of amendment or cancellation of licences, or order affecting the validity of licences—from the Board of Investigation to the Court of Appeal.

British Columbia, classification of applications.

A notable feature of the 1914 Water Act, which is probably unique in water law as a fixed principle, excepting analogies in Indian Water Legislation, is the classification of applications for water licences. The method of dealing with the different classes of applications varies slightly with the class, and more publicity is required in connection with the important classes than with the others.

There are three classes, namely, classes A, B and C.

Class A includes those applications for domestic, mineral trading, steam, mining or miscellaneous purposes, where the water is to be used in quantities not exceeding one hundred thousand gallons per day, or for irrigation purposes where the power to be developed does not exceed one hundred horsepower and is to be used by the applicant only.

Class B includes those applications, treated of above, where the quantities of water to be used or power to be developed exceed the figures stated, or where the use of water is for storage, hydraulicking or fluming purposes, and when the water is to be used by the applicant only.

Class C includes applications for water works power, hydraulicking or fluming purposes, where tolls are to be charged and also for "clearing streams" and "conveying" purposes.

The Comptroller may after examination of the application place any class A application in class B or *vice versa*.

The chief additional requirements, in the case of class B and class C applicants are the submission of detail plans and surveys and in the case of class C applicants, the filing of a petition and the public hearing of the application by the Board of Investigation. In the latter case also publication in the British Columbia Gazette is required for two weeks. (1)

(1) Water Act, 1914, British Columbia.

British Columbia, Amendment Acts, 1915 and 1919.

The chief provisions of the Amendment Acts, 1915 and 1919, make the control of Public Utility Companies, supplying water to customers, more stringent.

A noteworthy section of the Amendment Act, 1919, introduces new conditions under which a licence may be cancelled, these being: (1), wilful disobedience of Government orders and (2), water rentals, due to the Crown, being two years or more in arrears.

Certain other sections provide for special agreements with Power Companies, for periods not exceeding twenty-five years, and the payment of fees and rentals for a water power right. (1)

(2) WATER LEGISLATION IN THE PRAIRIE PROVINCES OF CANADA.

Enlightened legislation in Canada.

Canadian Water Legislation has probably proceeded further along the path of enlightened progress than that of any other Dominion. This wise legislation has enabled Canada to take the foremost place amongst water users by the expedient development of her enormous water resources, both power and irrigation, and coupled with her well organised system of conducting her hydrometric surveys, may well be taken as the basis of new water legislation and administration in all colonies.

The Water Powers of the Prairie Provinces, Canada, Manitoba, Saskatchewan, Alberta and the North-West Territories, are administered by the Dominion Water Power Branch of the Department of the Interior, under the Water Power Regulations issued by the Governor-in-Council under authority of Section 35 of the Dominions Land Act, 1908 and pursuant to that section. (2)

Canada, Irrigation Act, 1906 and Amendments.

The Irrigation Act of 1906, (3) which deals with other uses of water besides irrigation, was amended in certain sections by the Amendment Acts and Regulations of 1908, 1910, and 1911, (4) and appears to be supplementary to the amendments of the North-West Irrigation Act of 1898.

The Irrigation Act of 1906, with its amendments, definitely provides for the property in, and right to, the use of all water, including that of marshes and springs, to be vested in the Crown, unless some right inconsistent with this is established. Right to use water vested in the Crown may be acquired by an applicant according to the procedure detailed in the Act and not otherwise.

(1) Water Act, 1914, Amendment Act, 1915, British Columbia Water Act, 1914, Amendment Act, 1919, British Columbia.
(2) Regulations governing the granting of Water Power Rights in Manitoba, Saskatchewan, Alberta, and the North West Territories, 1914.
(3) Irrigation Act, 1906, Dominion of Canada.
(4) Rules, Regulations and Forms prescribed by the Minister of the Interior, 1911.

The rights of person
licences under the North
by the 1908 Act. An
a memorial to the Commissioner
the Governor-in-Council for the p

Canada, acquisition of licence.

The steps leading up to the acquis
as follows:—

(1) Application accompanied by a fee of 3 do
Chief Engineer, for a licence to do the
connected with the location of works (Sec. 19).

(2) Filing of a memorial, a detail plan and a
plan on tracing linen, in duplicate, with the Commissioner (Sec. 13).

(3) Filing of certain additional plans with the Commissioner when the works are important (Secs. 12 to 16).

(4) Public Notice by the applicant of the filing of memorial and plans (Secs. 19 and 23 of Act and page 4 of instructions).

(5) [illegible] of the proposal by the Chief Engineer (Sec. 20).

(6) [illegible] of the construction of works, or rejection of the application, by the Minister.

(7) Operator proceeds to construct [illegible] authorised (Secs. 24 to 27).

(8) Operator may expropriate lands required for project by authority of the Minister (Secs. 30 to 32).

(9) Inspection of works by the Chief Engineer (Sec. 33).

(10) On receipt of the certificate of completion of the works, the Minister issues the final licence (Sec. 23).

Canada, protection of Act.

Some important provisions of this Act will now be noted. The method adopted for securing effective tenure of the privileges granted by a licence against other licensees, where the river is insufficient for all requirements, is that priority of number of licence carries with it priority of privilege (Sec. 34). The Governor in Council may take over and operate a licensee's works in the public interest, giving compensation (Sec. 46). Any person's interests in water, which are licensed under the North West Irrigation Act, 1898, or the Irrigation Act, 1906, are forfeited to the Crown (Sec. 47).

[illegible] wilfully and without authority diverts any [illegible] of water, and every licensee, who diverts a [illegible] quantity than he is entitled to divert, is guilty of an [illegible] and is liable to a fine not exceeding five dollars per day [illegible] for each unit, or fraction of a unit improperly [illegible] imprisonment not exceeding 30 days or to both [illegible].

[illegible] of the Interior is granted various powers which [illegible], amongst other powers, to define the duty of water, [illegible] for the diversion of water, regulate rates which may be charged by licensees, prescribe forms, impose penalties not exceeding two hundred dollars or three months' imprisonment or both, authorise some officer to decide finally and without appeal what constitutes surplus water, make orders and regulations, adopt measures to secure gaugings of bodies of water, and make surveys (Sec. 54).

Canada, powers of Minister.

The Chief Engineer or any person specially authorised by the Minister is empowered to take affidavits, oaths, solemn declarations or affirmations required under the Act (Sec. 56).

An irrigation company may acquire lands by purchase or lease for improvement by irrigation, but with the exception of certain areas must dispose of the same within fifteen years after acquiring them, and any lands, not so disposed of, revert to the Crown (Sec. 51).

In 1915, the Legislative Assembly of the Province of Alberta passed the Irrigation District Act, which amplifies the Irrigation Act, 1906, and provides for the establishment of irrigation districts, where a combined irrigation project is proposed by a [illegible] majority of landholders desiring to operate within the limits [illegible] wholly within the limits of their own properties. (1)

Alberta, Irrigation District Act, 1915.

The provisions of the act correspond to those of South African and British Columbian Legislation regarding similar community projects and irrigation boards.

The Act details the procedure regarding the petition to the Minister of Public Works, the election of trustees for the District, regulations and bye-laws of the board of trustees, appointment of a qualified engineer for the district, the construction of works, the assessment roll, the court of revision, bye-laws for raising loan (which has to be submitted to a vote of electors), and forms for use in various stages of the procedure.

By Section 35 of the Dominion Lands Act, any person who has received a licence from the Minister to divert take or use water for power purposes, has the powers conferred by the Railway Act upon Railway Companies for the acquisition and taking of the requisite lands.

Canada, Dominions Lands Act.

(1) Irrigation [illegible] Act [illegible] Alberta, [illegible]

By the same section all maps, plans, and books of reference shewing other than Crown Lands necessary to be acquired must be signed and certified correct by a Dominion Land Surveyor and the Minister is the sole and final judge of the area of land which may be taken without the consent of the owner.

Regulations prescribe in detail (a) the procedure to be followed by an applicant desirous of obtaining a licence, (b) the agreement with the applicant for the construction of the works, which carries with it an undertaking to grant a licence, if the conditions of the agreement are fulfilled within the time limit, (c) the terms of the licence which shall be issued to the operator if he fulfils the conditions of the agreement.

Licences for Water Powers of less than 200 horsepower, are granted for periods of 10 years, subject to such special conditions as may be considered advisable, and renewable if in the opinion of the Minister, the power has been continuously and beneficially used. (1)

(3)—WATER LEGISLATION OF THE PROVINCE OF ONTARIO.

Ontario, water power legislation.

Under the provisions of "An Act Respecting Water Powers" 1898, and regulations thereunder, water powers are the property of the Crown, and may be leased on certain conditions.

The administration of the Act is in the hands of the Minister, and of the Hydro-Electric Commission of Ontario, which is virtually a permanent Government Commission, formally created by statute in 1906, and which constructs and operates large hydro-electric installations, and supplies municipalities and other power users. The Commission has the right to acquire water powers, land, and works, without the owners' consent. Much success has attended the operations of the Commission, and the low charges for electrical energy, and extensive development of the water powers of Ontario under the Commission bear witness to the value of the methods employed.

Ontario, acquisition of licence.

The procedure to acquire a water licence involves the filing of plans and a report by a competent engineer, satisfactory to the Minister, giving the height of the fall, estimated capacity of the same in the natural condition or at the average flow stage of water, the height of the dam, if any, which it is proposed to construct, and the consequent increase in the level of the water. (2)

(1) Water Powers of Manitoba, Saskatchewan, Alberta, Yukon, and the N. W. Territories. Water Powers of Canada, 1911.
(2) Regulations of 1907 under the Act Respecting Water Powers, 1898. Water Powers of Canada, Province of Ontario, p. 6, Acres.

The applicant is required to file plans shewing his proposals to develop the water privilege, also to state the estimated cost of development, and the form in which the power is to be used or transmitted, that is, whether by direct energy, electricity, compressed air, etc. He must indicate the lands to be overflowed, or otherwise affected, and the nature and location of the plant, manufactory or other industrial establishment in connection with which he proposes to use the power; also furnish satisfactory proof that the water privilege is required for *bona fide* industrial or mechanical purposes or to supply an actual or anticipated demand for power, within transmission distance. The Hydro-Electric Commission, if required by the Minister, examines the proposals, and in such cases work must not be proceeded with without the approval of the Commission. Licensees are required to make a deposit before the commencement of the works, as a guarantee that development conditions will be carried out. (1)

Ontario, provisions of licences.

A distinction is drawn between small water powers below 150 horsepower maximum and those above that figure, the above-mentioned conditions only applying to large ones (Sec. 1).

The duration of licences is 10 years and the lessee is bound to keep his works in repair, to comply with the conditions of the lease, and to pay the charges in advance, on pain of forfeiture of the licence after 10 days' notice.

On the expiry of the term of licence, the licence may be renewed for two further successive periods of 10 years, or not, at the discretion of the Minister.

If the licence is not renewed, compensation may be paid for permanent buildings or structures (but not for machinery or other moveables), after report from the Hydro-Electric Commission, and at the discretion of the Lieutenant Governor-in-Council (Sec. 12).

A water privilege may be granted to a municipal corporation on such special terms and conditions as may be recommended by the Hydro-Electric Commission, and at a rental to be fixed by the Minister (Sec. 14).

Any water lease issued under the regulations may be cancelled by the Lieutenant-Governor-in-Council for non-payment of rental, non-fulfilment or breach of conditions, or failure to utilise the power effectually for a space of one year (Sec. 18).

(1) Loc. cit.

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Licences for Water Powers of less than 200 horsepower, are granted for periods of 10 years, subject to such special conditions as may be considered advisable, and renewable if in the opinion of the Minister, the power has been continuously and beneficially used. (1)

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The administration of the Act is in the hands of the Minister, and of the Hydro-Electric Commission of Ontario, which is virtually a permanent Government Commission, formally created by statute in 1906, and which constructs and operates large hydro-electric installations, and supplies municipalities and other power users. The Commission has the right to acquire water powers, land, and works, without the owners' consent. Much success has attended the operations of the Commission, and the low charges for electrical energy, and extensive development of the water powers of Ontario under the Commission bear witness to the value of the methods employed.

Ontario, acquisition of licence.

The procedure to acquire a water licence involves the filing of plans and a report by a competent engineer, satisfactory to the Minister, giving the height of the fall, estimated capacity of the same in the natural condition or at the average low stage of water, the height of the dam, if any, which it is proposed to construct, and the consequent increase in the level of the water. (2)

(1) Water Powers of Manitoba, Saskatchewan, Alberta, Yukon, and the N. W. Territories. Water Powers of Canada, 1911.

(2) Regulations of 1907 under the Act Respecting Water Powers, 1898. Water Powers of Canada, Province of Ontario, p. 9, Acres.

The applicant is required to file plans shewing his proposals to develop the water privilege, also to state the estimated cost of development, and the form in which the power is to be used or transmitted, that is, whether by direct energy, electricity, compressed air, etc. He must indicate the lands to be overflowed, or otherwise affected, and the nature and location of the plant, manufactory or other industrial establishment in connection with which he proposes to use the power; also furnish satisfactory proof that the water privilege is required for *bona fide* industrial or mechanical purposes or to supply an actual or anticipated demand for power, within transmission distance. The Hydro-Electric Commission, if required by the Minister, examines the proposals, and in such cases work must not be proceeded with without the approval of the Commission. Licensees are required to make a deposit before the commencement of the works, as a guarantee that development conditions will be carried out. (1)

Ontario, provisions of licences.

A distinction is drawn between small water powers below 150 horsepower maximum and those above that figure, the above-mentioned conditions only applying to large ones (Sec. 1).

The duration of licences is 20 years and the lessee is bound to keep his works in repair, to comply with the conditions of the lease, and to pay the charges in advance, on pain of forfeiture of the licence after 10 days' notice.

On the expiry of the term of licence, the licence may be renewed for two further successive periods of 10 years, or not, at the discretion of the Minister.

If the licence is not renewed, compensation may be paid for permanent buildings or structures (but not for machinery or other moveables), after report from the Hydro-Electric Commission, and at the discretion of the Lieutenant Governor-in-Council (Sec. 12).

A water privilege may be granted to a municipal corporation on such special terms and conditions as may be recommended by the Hydro-Electric Commission, and at a rental to be fixed by the Minister (Sec. 14).

Any water lease issued under the regulations may be cancelled by the Lieutenant-Governor-in-Council for non-payment of rental, non-fulfilment or breach of conditions, or failure to utilise the power effectually for a space of one year (Sec. 13).

(1) Loc. cit.

WATER LEGISLATION IN THE PROVINCE OF QUEBEC.

Prior to the enactment of the Revised Statutes of 1910, it appears to have been the custom either to sell a water power right outright, or to grant the right to develop the water power by lease for periods varying from 75 to 99 years, the licensee being required to pay to the Crown an annual royalty proportionate to the importance of the power, and furthermore to make a deposit to guarantee the said payment. Subsequent to the enactment of those statutes, the principle of selling water power outright extended only to powers of less than 200 horsepower gross. After approval of plans prepared by a Quebec land surveyor, the proprietor could proceed to expropriate immoveable properties necessary to utilise such water powers, provided industries or established water works were not interfered with. The sum payable to expropriated persons is determinable by arbitration.

When the capacity of the power reach exceeds 200 horsepower, a lease varying from 25 to 99 years in period may be granted after payment of a yearly rental varying from 10 to 35 cents per horsepower developed and this charge is revisable every 21 years.

The lessee must make a deposit in money or securities as a guarantee of good faith, and must fulfil the conditions of contract on pain of forfeiture of the licence. (1)

(5)—WATER LEGISLATION IN THE WESTERN STATES OF AMERICA.

Wyoming.

The State of Wyoming was the first of the Western States to adopt a complete system of State control of water, the first enactments being in the year 1890.

Other States

The Wyoming system was adopted by Nebraska in 1895, by Utah and Idaho in 1903, by Nevada and North Dakota, Oklahoma and South Dakota in 1905. (2)

California.

California, after attempting to operate a legal code mingling the principles of riparian rights and State control, came into line with the other States on the enactment of the Water Commission Act of 1913. (3)

In California the need for State control was recognised in early days by many people, and in 1886 Mr. Ham Hall, the State Engineer, reported on the history, customs, laws and administrative systems of France, Spain and Italy in a comprehensive volume. (4)

(1) Water Powers of Canada, Province of Quebec. T. Kaetin.
(2) Report of State Water Commission of California, 1917.
(3) California Water Commission Act, 1913.
(4) Irrigation Development, W. Ham Hall, 1886.

California, State Water Commission.

It was not until 1913 that this bore fruit after the combination of the two doctrines had been tried and found wanting. The State Water Commission then appointed consisted of five members, some of the duties of the Commission being as follows:—

(1) To declare what water may be appropriated.

(2) To declare the duties of those who desire to appropriate water.

(3) To declare the periods for which water may be appropriated and the conditions under which the appropriation may be made.

(4) To provide for payment of fees and charges by the applicants.

(5) To provide for the ascertainment and adjudication of water rights.

(6) To declare water rights forfeited under certain conditions.

Beneficial usage of water and compliance with the terms of the authorisation to construct works are insisted on in the operations of the State Water Commission according to the Water Act:—

"In issuing a permit definite dates are fixed for the beginning of construction, for the completion of construction, and for the complete application of the water appropriated to beneficial use. It is within the powers of the Commission to revoke a permit in cases where reasonable diligence is not being exercised in construction work. The idea of holding water rights without pushing construction work in a businesslike manner thus becomes a mere fiction. When the construction work has been completed and the water applied to a beneficial use, an investigation is made by a representative of the Commission, and if the conditions of the permit have been reasonably fulfilled, a licence is issued." (1)

Laws of Wyoming.

The Laws of Wyoming have been selected for examination in this paper, as typical of Western American Water Legislation, for this State has had the longest period for testing and improving its water laws. Amendments to the original Act and related acts culminated in the Irrigation Code of Wyoming which was in effect in 1917 embodying the compiled Statutes of 1910 and regulations under the Act. (2)

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When the capacity of the power reach exceeds 200 horsepower, a lease varying from 25 to 99 years in period may be granted after payment of a yearly rental varying from 10 to 85 cents per horsepower developed and this charge is revisable every 21 years.

The lessee must make a deposit in money or securities as a guarantee of good faith, and must fulfil the conditions of contract on pain of forfeiture of the licence. (1)

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After a statement in the following unequivocal terms, that all water is State property:—

"The waters of all natural streams, springs, lakes, or other collection of still water, within the boundaries of the State are hereby declared to be the property of the State" (Sec. 1), the constitutional provisions deal with the machinery for the administration of the water laws. The State is divided into four water districts, the boundaries of which in general follow watershed lines (Sec. 753).

Wyoming, administration of water laws.

Each division is under a Water Division Superintendent who is appointed by the Governor with the consent of the Senate, and selected from a list of persons passed as qualified by the State Engineer (Sec. 754).

Under each Water Division Superintendent there is one Water Commissioner, who is appointed by the Governor, and whose duties as defined would appear to be those of a water master or water warden (Secs. 800 to 805).

The Water Division Superintendents are responsible to the State Engineer, and the State Engineer together with the four Water Division Superintendents form the Board of Control, the State Engineer being president of the Board.

The State Engineer is appointed by the Governor and his duties are defined as being president of the Board of Control and having general supervision over the waters of the State, and of the officers connected with its distribution (Sec. 5).

The Board of Control is the final authority, except that appeals from its decisions in certain cases, may be made to the courts of the State.

Water rights, which are made appurtenant to the land, are clearly defined in Sec. 724.

"A water right is a right to use the water of the State when such use has been acquired by the beneficial application of water under the laws of the State relating thereto, and in conformity with the rules and regulations dependent thereon. Beneficial use shall be the basis, the measure and limit of the right to use water at all times, not exceeding in any case, the statutory limit of volume."

Wyoming, procedure to acquire a water permit.

The application for a permit to divert and use water is made to the State Engineer, and provision is made for penalties for illegal diversions, the penalty being a fine not exceeding one hundred dollars or imprisonment for a term not exceeding six months, or both (Sec. 727).

The procedure adopted for the acquisition of a water right as embodied in "Regulations and Instructions for filing applications in the office of the State Engineer of Wyoming 1919," is briefly as follows:—

(1) Survey and preparation of maps by a qualified engineer or surveyor.

(2) Filing of application and maps, and payment of a fee to the State Engineer. The priority of right, if granted, to date from the date of filing.

(3) Examination, correction or alterations, if necessary, and approval or disapproval by the State Engineer.

(4) Commencement of construction within one year from date of approval, and notice to this effect to the State Engineer.

(5) Completion of construction within the time limit allowed in the permit, and notification to the State Engineer that work has been completed.

(6) Completion of application of water to beneficial use described in the permit, within the time allowed therein.

(7) Submission to Division Superintendent of proof of beneficial use of water.

(8) Issuance by the Board of Control of a certificate of appropriation, which constitutes the water right.

On receipt of the application, the procedure at the State Engineer's Office is as follows:—

(1) Endorsement of receipt of application and record in office book.

(2) Examination of application.

(*a*) If defective, return to applicant by registered post, endorsing data of return, reasons for return and time allowed for correction—or stating the same in a letter. If the application is not returned to the State Engineer within the time limit (unless the time limit is extended) with the corrections properly made, the application is cancelled.

(*b*) If the application is in order, and if no additional information is required, and if the proposed works are in the public interest, the State Engineer endorses his approval on the application and returns it to the applicant, who may thereupon proceed with the construction of the works.

(3) If the information supplied requires amplification, the State Engineer may require such additional information as will enable him to guard properly the public interest; and, in the case of companies, full information is required. He may also require it to be demonstrated to him that the applicant has the financial ability to carry out the works, and that the application is made in good faith.

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(5) If the State Engineer has endorsed a refusal on the application, the applicant may appeal to the Board of Control within 60 days. Any person aggrieved by a decision of the Board of Control may within six months appeal to the courts.

(6) A map in duplicate on tracing linen, on a scale of not less than 2 inches to a mile, giving full information, prepared by a qualified engineer or surveyor and accompanied by a certificate from the engineer or surveyor, must accompany applications.

If the map is satisfactory, one copy is returned to the applicant approved.

(7) If required by the State Engineer, precise and complete plans, sections, specifications, and field notes must be filed

There are certain obligations on permittees, failure to observe which renders the permittee liable to have his permit cancelled or to other penalties.

(1) A headgate to a canal, capable of being locked, is compulsory.

Wyoming, measuring devices.

(2) Flumes or other measuring devices must be erected if required by the Division Superintendent.

In the case of reservoirs, the operator may be required by the Division Superintendent to construct flumes or other measuring devices in the stream both above and below the reservoir.

Failure to comply with an order of the Division Superintendent to instal a flume or other measuring device, involves the closing of the headgate of the canal, or the opening of the sluice of the reservoir as the case may be by the Water Commissioner, on the instructions of the Division Superintendent, until such order is complied with.

Wyoming, restriction of quantity.

(3) The right to divert and use water is limited and restricted to the quantity beneficially used for the purpose for which the grant has been made, and any surplus must be allowed to flow in the source of supply.

Wyoming, appeals.

There is right of appeal from an order of the Division Superintendent to the State Engineer.

Wyoming, irrigation districts.

Irrigation Districts are established, organised and administered in a similar manner to those in Canada, the differences being chiefly ones of detail (Sec. 829 *et seq.*).

Wyoming, expropriation and easements.

Compulsory expropriation of lands and easements on lands, by operators, are allowed for.

The procedure prescribed in connection with easements, requires application to a judge of the district court by filing a petition giving the necessary details.

If, on hearing the case, the matter is determined in favour of the petitioner, the judge is required to appoint three Commissioners to assess the compensation.

The award of the Commission is subject to review by the court, on written exception being filed, and the court may order a new assessment or make other order. In certain circumstances a jury trial may be demanded. Appeal may be made within 30 days to the Supreme Court by either party.

Wyoming, licensing engineers and surveyors.

The examination and licensing of engineers and surveyors is provided for by the irrigation laws (Sec. 874 *et seq.*).

The examination is carried out by a Board of Examining Engineers consisting of the State engineer and two engineers of thorough training and experience, to be appointed by the Governor and serve without remuneration.

Three classes of licences are issued, namely for:—(1) Surveyor, (2) Junior Engineer, (3) Senior Engineer. All engineers and surveyors who perform surveying or engineering work, or are engaged in the general practice of surveying or engineering relating to the preparation of applications for permits for the use of water, or otherwise relative to water, or for the design or construction of water supply or sewerage systems, or any municipal work for towns or cities, or for the survey of property lines or sub-divisions of lands, must obtain a licence from the Board of Examining Engineers.

A licence may be revoked by the Board for incompetence or misconduct.

Any person practising, or attempting to practice for hire, any form of surveying or engineering mentioned in the Act, without a licence, is subject on conviction to a penalty not exceeding 200 dollars and (or) imprisonment for not more than six months.

Junior and Senior Licensed Engineers may administer and certify oaths for applications for the use of water and other matters relevant thereto.

Oregon, water laws.

The Water Laws, Irrigation and Drainage District Laws of Oregon are characterised by administrative and statutory enactments similar to those of Wyoming. (1)

(1) Water Laws of Oregon, 1919. Rules, Regulations, Forms and Practice relative to the Control, Distribution and Use of the Water Resources of Oregon, 1916. Drainage District Laws of Oregon, 1919. Irrigation District Laws of Oregon, 1919.

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(6)—WATER LEGISLATION IN QUEENSLAND.

The control, distribution, and use of water in Australia is on the basis of State control, certain definite riparian rights being safeguarded by the water legislation, to a varying degree in the different States.

Queensland, Rights in Water and Water Conservation and Utilisation Act, 1910.

The Water Laws of Queensland are embodied in the "Right in Water and Water Conservation and Utilisation Act" of 1910, which is to be read with the "Water Authorities Act" of 1891.

Certain sections of this Act were amended in certain particulars, chiefly in relation to weirs, by the Amendment Act of 1915.

Important regulations under the 1910 Act governing the application for, and issue of, licences were issued in 1915.

Queensland, Provisions of the Water Laws.

Some of the chief features of the 1910 Act and regulations will be briefly referred to.

State control of diversion and use of water, and State ownership of the beds and banks of water courses, lakes, lagoons, swamps and marshes are provided for, and riparian rights are defined (Secs. 5 and 6).

Queensland, riparian rights.

All persons have the right to use water, to which there is public right of access, for domestic purposes including watering of stock (Sec. 7).

Riparian owners have the further right to use water for factory purposes, and also of developing water power within the boundaries of their lands provided that when the fall is over 50 feet high, the right is limited to 10 years.

They have, furthermore, the right to divert water for irrigating not more than five acres (Sec. 11).

Where a riparian owner has diverted water otherwise than in accordance with his riparian rights as above described, he may apply for a licence to continue so to divert it for a period of 10 years, and after public notices and consideration of objections, the licence may be granted on such terms as the Minister thinks fit (Sec. 13).

Queensland, obligations of licensee.

The licensee must at the end of each year of currency of his licence, lodge at the office of the Minister a statutory declaration, stating whether throughout the past year, diversion and use of water have been made, and are still being made, only in the manner sanctioned in the licence (Sec. 12/6).

At any time, during the currency of the licence, the Governor-in-Council, on the recommendation of the Minister, may revise or modify the licence in the public interest, for non-fulfilment of conditions, after opportunity has been given to the licensee to show sufficient cause why the licence should not be so revoked or modified (Sec. 12/7). When a licence is revoked in the public interest, compensation is payable according to the order of the Governor-in-Council.

Queensland, acquisition of licence.

The procedure to be followed by an applicant for a licence to divert and use water under the Act and the forms to be used in connection therewith, are detailed in regulations.

The application must be on a special form, and be accompanied by a map, plan and tracing drawn to scale and such additional plans and sections as the Hydraulic Engineer may require.

Notice of the application must be published in the *Official Gazette* and at least one issue of a newspaper in circulation in the district. Objections, together with evidence supporting the same on forms provided, must be lodged with the Hydraulic Engineer within 60 days from the first publication of the notice.

The Minister after holding an enquiry, if he thinks fit, may refuse the licence or grant it on the form prescribed, with such conditions as he deems necessary. The licensee must lodge the statutory declaration above-mentioned at the end of every year, and the licence may be modified at any time by the Minister. (1)

Queensland, water supply areas.

The Act also provides for the establishment of "Water Supply Areas", under "Water Supply Boards", which exercise authority over a defined area in accordance with the Act. The members of the Water Supply Boards may be either appointed by the Governor or elected by the ratepayers, or partly nominated and partly elected.

The Board may levy water supply rates upon the lands in the area proportionately to the amount of direct benefit derived from the water supply by the ratepayers, and Government may advance money on loan for the construction of works (Secs. 13 to 34).

(7)—WATER LEGISLATION IN VICTORIA.

The Water Laws of Victoria are embodied in the Water Acts of 1905 and 1915 and regulations thereunder. (2)

Victoria, Crown ownership.

As in other colonial legislation, the right of the Crown to the use of water is provided for, and Crown ownership of the bed and banks of all water courses and other bodies of water is included (Secs. 4 and 5).

(1) Regulations, Queensland, December, 1915, Queensland Government Gazette.
(2) Water Act, 1905, Victoria. Regulations under the Water Act, 1905 dated 6th Dec. 1910, and 9th Oct. 1912, Victoria. Tenth Annual Report State River and Water Supply Commission, 1915, Victoria.

(6)—WATER LEGISLATION IN QUEENSLAND.

The control, distribution, and use of water in Australia is on the basis of State control, certain definite riparian rights being safeguarded by the water legislation, to a varying degree in the different States.

Queensland, Rights in Water and Water Conservation and Utilisation Act, 1910.

The Water Laws of Queensland are embodied in the "Right in Water and Water Conservation and Utilisation Act" of 1910, which is to be read with the "Water Authorities Act" of 1891.

Certain sections of this Act were amended in certain particulars, chiefly in relation to wells, by the Amendment Act of 1916.

Important regulations under the 1910 Act governing the application for, and issue of, licences were issued in 1913.

Queensland, provisions of the water laws.

Some of the chief features of the 1910 Act and regulations will be briefly referred to.

State control of diversion and use of water, and State ownership of the beds and banks of water courses, lakes, lagoons, swamps and marshes are provided for, and riparian rights are defined (Secs. 5 and 6).

Queensland, riparian rights.

All persons have the right to use water, to which there is public right of access, for domestic purposes including watering of stock (Sec. 7).

Riparian owners have the further right to use water for factory purposes, and also of developing water power within the boundaries of their lands provided that when the fall is over 50 feet high, the right is limited to 10 years.

They have, furthermore, the right to divert water for irrigating not more than five acres (Sec. 11).

Where a riparian owner has diverted water otherwise than in accordance with his riparian rights as above described, he may apply for a licence to continue so to divert it for a period of 10 years, and after public notices and consideration of objections, the licence may be granted on such terms as the Minister thinks fit (Sec. 12).

Queensland, obligations of licensee.

The licensee must at the end of each year of currency of his licence, lodge at the office of the Minister a statutory declaration, stating whether throughout the past year, diversion and use of water have been made, and are still being made, only in the manner sanctioned in the licence (Sec. 12/6).

At any time, during the currency of the licence, the Governor-in-Council, on the recommendation of the Minister, may revise or modify the licence in the public interest, for non-fulfilment of conditions, after opportunity has been given to the licensee to show sufficient cause why the licence should not be so revoked or modified (Sec. 12/7). When a licence is revoked in the public interest, compensation is payable according to the order of the Governor-in-Council.

Queensland, acquisition of licence.

The procedure to be followed by an applicant for a licence to divert and use water under the Act and the forms to be used in connection therewith, are detailed in regulations.

The application must be on a special form, and be accompanied by a map, plan and tracing drawn to scale, and such additional plans and sections as the Hydraulic Engineer may require.

Notice of the application must be published in the *Official Gazette* and at least one issue of a newspaper in circulation in the district. Objections, together with evidence supporting the same on forms provided, must be lodged with the Hydraulic Engineer within 60 days from the first publication of the notice.

The Minister after holding an enquiry, if he thinks fit may refuse the licence or grant it on the form prescribed with such conditions as he deems necessary. The licensee must lodge the statutory declaration above-mentioned at the end of every year, and the licence may be modified at any time by the Ministers (1).

Queensland, water supply areas.

The Act also provides for the establishment of "Water Supply Areas", under "Water Supply Boards", which exercise authority over a defined area in accordance with the Act. The members of the Water Supply Boards may be either appointed by the Governor or elected by the ratepayers, or partly nominated and partly elected.

The Board may levy water supply rates upon the lands in the area proportionately to the amount of direct benefit derived from the water supply by the ratepayers, and Government may advance money on loan for the construction of works (Secs. 13 to 34).

(7)—WATER LEGISLATION IN VICTORIA

The Water Laws of Victoria are embodied in the Water Acts of 1905 and 1915 and regulations thereunder (2).

Victoria Crown ownership.

As in other colonial legislation, the right of the Crown to the use of water is provided for, and Crown ownership of the bed and banks of all water courses and other bodies of water is included (Secs. 4 and 5).

(1) Regulations, Queensland, December, 1913, Queensland Government Gazette.
(2) Water Act, 1905, Victoria. Regulations under the Water Act, 1905 dated 9th Dec. 1905, and 9th Oct. 1905, Victoria. Tenth Annual Report State River and Water Supply Commission, 1915, Victoria.

Riparian rights or amenities existent as a natural right without licence and without charge are not quite so liberal as in the case of Queensland legislation, these rights extending to the use of water for the domestic and ordinary use of the owner, his family and servants, and the watering of stock (Sec. 14).

Victoria, riparian amenities.

The owners of allotments of land alienated from the Crown prior to December 15th, 1886, have the further right, free of charge, to water for the irrigation of a garden not exceeding three acres in extent, being part of such land, and used in connection with a dwelling (Sec. 14).

Victoria, special licences.

The rights of special licensees under the 1905 Water Act are safeguarded, but as in Queensland, the tenure of these rights is dependent on beneficial usage, and a statutory declaration has to be made at the end of each year, stating that the diversion and usage have been, and are, in accordance with the licence. These special licences may be for a period of fifteen years and are determinable at any time by the Governor-in-Council in the same way as provided in Queensland legislation (Secs. 15 to 17).

The rights of riparian owners, after the construction of State works affecting the source of supply, are subject to limitations, as regards compensation water. Such riparian owner, subsequent to the construction of such State works, is entitled to compensation water to the extent to which he would be lawfully entitled but for the existence of such State works, and in no case is this to be greater than 4,000 gallons per day per mile of frontage (or, say, eleven-nineteenths of a litre-second per kilometre) for domestic purposes, ordinary use and watering of stock, or two hundred thousand cubic feet per annum (or, say, one and four-fifths litre-seconds) for the irrigation of a garden not exceeding three acres (Sec. 18).

Victoria, State works.

Works constructed by the State or under State authority with or without financial assistance from the State, play an important part in the Water Administration of Victoria.

The construction, administration and maintenance of the State works are under the State Rivers and Water Supply Commission, which consists of three commissioners appointed by the Governor-in-Council, and the works are vested in the Commission (Sec. 19 *et seq.*).

Victoria, Water Districts.

Water and Irrigation Districts constituted under the Act, are subject to the control of the Commission, who levy on the occupiers and owners in each district a general rate for domestic and irrigation purposes.

Any Water Works District or Trust may be placed under the jurisdiction of the Commission by order of the Governor, and on this being done, property and liabilities vest in the Commission.

It is the duty of the Commission to make surveys and collect information regarding the water resources of the State and to suggest methods for their development.

Victoria, drainage districts.

Drainage and Flood Protection Districts may be created by the Governor, and may be vested in the Commission, who may construct and maintain works and levy rates on the occupiers to meet the cost of construction, maintenance, depreciation and redemption.

The Commission may issue permits to persons to divert water from any source, not under the control of no authority under the Act, for any period not exceeding one year, and may revoke or renew any such permit.

The Governor-in-Council may, on the recommendation of the Commission, issue to any person or corporation, for a period not exceeding fifteen years, a licence to divert and use water from a river, stream, water course, lake, lagoon, swamp, or marsh.

In the case of servitudes for the construction of works on other lands, where there is disagreement regarding the amount of compensation, decision is made by a police magistrate sitting in a court of petty sessions nearest to such land, and the decision of such magistrate is final.

A large portion of the Act deals with Water Works Trusts, their activities, organisation and duties which need not be further referred to here (Sec. 50 *et seq.*).

(8)—WATER LEGISLATION IN NEW SOUTH WALES.

The water legislation of New South Wales is embodied in the Hay Irrigation Act, 1902, the Wentworth Irrigation Act, 1890, the Water Act, 1912, the Irrigation Act, 1912, the Irrigation (Amendment) Act, 1916, and Regulations under the Acts. (1)

The right to use water is vested in the Crown whether it is in rivers, lakes, lagoons, swamps, or marshes (Sec. 6).

Riparian rights or amenities, existent without licence, comprise the use of water for domestic purposes, watering stock and the irrigation of a garden not exceeding five acres in extent in connection with a dwelling house (Sec. 7).

New South Wales, water licences.

Authority to divert and use water otherwise, is conveyed by licence issued by the Minister of Public Works after public advertisement and enquiry, and after receiving a favourable report from the person who has held the enquiry, and subject to the conditions, limitations, and terms advocated in the report. The licence may not be issued for a longer period than 10 years, and is renewable on application subject to such conditions as the Minister thinks fit (Sec. 10 to 18). In practice the licences appear to be issued for periods of five years only, in order that they may come up for review at the end of that period.

(1) Water Act, 1912, New South Wales. Regulations under the Irrigation Act, 1912, dated 23rd April, 1914, New South Wales. Regulations under the Irrigation Act 1912, dated 23rd July, 1914, New South Wales. Irrigation (Amendment) Act, 1916, New South Wales. Irrigation (Amendment) Act, 1916, New South Wales. Water (Amendment) Act, 1914, New South Wales. Hay Irrigation Act, 1902, New South Wales.

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It is the duty of the Commission to make surveys and collect information regarding the water resources of the State, and to suggest methods for their development.

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The Commission may issue permits to persons to divert water from any source, not under the control of an authority under the Act, for any period not exceeding one year, and may revoke, or renew, any such permit.

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In the case of servitudes for the construction of works on other lands, where there is disagreement regarding the amount of compensation, decision is made by a police magistrate sitting in a court of petty sessions nearest to such land, and the decision of such magistrate is final.

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Authority to divert and use water otherwise, is conveyed by licence issued by the Minister of Public Works after public advertisement and enquiry, and after receiving a favourable report from the person who has held the enquiry, and subject to the conditions, limitations, and terms advocated in the report. The licence may not be issued for a longer period than 10 years, and is renewable on application subject to such conditions as the Minister thinks fit (Sec. 10 to 18). In practice the licences appear to be issued for periods of five years only, in order that they may come up for review at the end of that period.

(1) Water Act, 1912, New South Wales. Regulations under the Irrigation Act, 1912, dated 23rd April, 1914, New South Wales. Regulations under the Irrigation Act 1912, dated 23rd July, 1914, New South Wales. Irrigation (Amendment) Act, 1916, New South Wales. Irrigation (Amendment) Act, 1916, New South Wales. Water (Amendment) Act, 1914, New South Wales. Hay Irrigation Act, 1902, New South Wales.

Large water supply, irrigation and drainage works may be carried out by the Crown, if after publication of a report by a board, consisting chiefly of officers of the Department of Public Works, a petition is presented signed by two thirds of the ratepayers of the lands affected, in favour of the proposals (Secs. 19 and 20).

A trust may be formed for the purpose of maintaining, administering and extending the works, including the collection of rates, after the works have been constructed. Some of the trustees are appointed and others elected by the ratepayers (Secs. 31 *et. seq.*).

The Water Conservation and Irrigation Commission created by the 1916 Amendment Act, and consisting of three Commissioners, controls the large Irrigation Areas, such as the Hay, Wentworth, Murrumbidgee and Curlwaa Irrigation Areas.

New South Wales, duties of the Commission.

In practice, it would appear from the annual reports of the Commission that investigation of new projects, hydrometric survey, the construction of State Works, the supervision of Trusts (of which there were eleven in 1919) and the general administration of the Water and Irrigation Acts, are now carried out by the Commission which has a considerable staff for these purposes.

New South Wales, fees and charges.

By June 30th, 1919, some 1,278 licences were in force in the State, and it was found that the fees received in accordance with the schedule to the Water Act were in no way commensurate with the cost of administration. New legislation repealing the schedule and making fees and charges prescribable by Regulations was passed. (1)

(9)—WATER LEGISLATION IN WESTERN AUSTRALIA

The Water Laws of Western Australia are embodied in the "Rights in Water and Irrigations Act" 1914 and bye-laws thereunder. (2)

Western Australia, waters vested in the Crown.

All natural waters and their use are vested in the Crown.

Western Australia, riparian rights.

Riparian rights or amenities, existent without licence, are similar to those in Victoria, New South Wales and Queensland. The riparian owner has the right to use, free of charge, the water from the body of water to which his holding is riparian for domestic purposes, and for watering stock; and every riparian owner of land alienated prior to the enactment of the Act has the further right to use such water for the irrigation of a garden not exceeding five acres, in connection with a dwelling (Sec. 14).

(1) Report of the Water Conservation and Irrigation Commission, 1919.
(2) Rights in Water and Irrigation Act, No. 19 of 1914, Western Australia. Bye-laws under the above Act, April 1916.

Western Australia, special licences.

Persons who have diverted water prior to the enactment of the Act, otherwise than above, must within twelve months apply to the Minister of Water Supply, Sewerage and Drainage for a special licence giving full particulars and accompanied by a statutory declaration. The Minister after publishing the notice and appointing a time not more than six months for receiving objections, which must be accompanied by statutory evidence, may, after considering objections and holding such enquiry as he thinks fit, submit the application to the Governor, either recommending that it be granted or refused.

The Governor may either grant the special licence under such conditions as he thinks fit or may refuse it. The licence may be cancelled or modified by the Governor in the public interest or for non-fulfilment of conditions. If cancelled in the public interest, compensation may be paid as may be equitable by the Governor. At the end of each year the licensee must submit a statutory declaration stating that the diversion and use of the water have been throughout the year and still are, only as sanctioned by the licence (Sec. 15).

Western Australia, licences.

As regards licences other than special licences for the diversion and use of water, these may be granted by the Minister on the advice of the Commissioners on such terms, and subject to such conditions, and for such a period as may be prescribed (Sec. 16, *et seq.*).

Fees.

The fees to be paid are prescribed in regulations.

Western Australia, Irrigation Boards.

Irrigation Districts may be established by the Governor, on the advice of the Commissioners by Order in Council, and in a similar manner Irrigation Boards may be established or dissolved. The Minister may, either before or after the constitution of the Board, construct and maintain irrigation works in any district, provided that plans and details of the works shall be prepared and published. If a majority of the owners of the irrigable land present a petition against the proposed works, the works shall not be constructed.

If no petition is presented, the Governor may by Order in Council empower the Minister to construct the works.

The Governor may in a similar manner vest such works after construction in an Irrigation Board.

Compensation for injury on account of the work is determined by arbitration, if not determined by agreement. The measure of damage must in all cases be the direct pecuniary injury to the claimant caused by the loss of substantial benefit accrued or accruing, and must not include remote, indirect or speculative damage.

The Act deals with the levying of rates by the Board, the constitution of the Board, finance, accounts and bye-laws including penalties (Sec. 28 *et seq*.).

Powers are granted to the Governor to acquire land compulsorily. Any person committing an offence against the Act where no other penalty is imposed is liable to a penalty not exceeding £100 (Sec. 72).

(10)—WATER LEGISLATION IN NEW ZEALAND.

The Water Legislation of New Zealand is embodied in the "Consolidated Public Works Act" 1908, the "Public Works Amendment Act" 1908, the "Water Supply Act" 1908, the "Aid to Water Powers Act" 1908, the "Water Supply Act" 1908, the "Aid to Water Powers Act" 1910 and the "Electric Power Board Act" 1918. (1)

The smaller schemes would appear to be carried out by the County Councils, subject in certain respects to the authority of the Minister of Public Works, and by Water Supply Boards.

Licences are issued by the Government to operators, and when the permittee is a local governing body, no charge for the water would seem to be made by Government.

Power was taken by the Government to devote certain sums to irrigation and other purposes under the "Aid to Water Powers Act" 1910 and some large irrigation projects were carried out by Government, the expense to be defrayed by the water rates.

New Zealand, water powers vested in Crown.

The sole right to use the water power of all lakes and rivers in the Dominion was vested in the Crown by the consolidated Public Works Act 1908 and the Amendment Act of 1908, which gave the Governor the right to grant licences to companies and individuals on such conditions as he thinks fit.

Several of these licences appear to have been granted to large operators in one of which cases a charge of three shillings per horsepower per annum was made.

Licensees may enter and take lands for the purposes of their undertaking on payment of compensation, and the Crown may at any time purchase the undertaking.

For breach of conditions, the licence may be forfeited or the licensee fined.

(1) The Water Supply Act, New Zealand, 1908. The Water Supply Act, New Zealand, 1908.

On the basis of Roman Law, the separate States which now form Italy evolved a system of feudal control which varied much in the different States and was subject to wide variations according to the Government in control, but in Piedmont, Milan and what is now Lombardy, water codes were established in early days which contain much which is at present embodied in modern water legislation. When Italy was brought under one Government in 1865, the civil code of Victor Emanuel was promulgated, and as regards water, embodied much of the old Milanese, Piedmontese, and Sardinian Codes. (1)

Italy, all running waters Government property.

Under the Italian Code all running waters except those of very small streams are claimed as the property of the Government representing the people.

Under the General Regulations for Water Courses in Piedmont in 1817, the Sardinian Penal Code of 1857 as applied in Piedmont, and Regulations in Lombardy, dated 1755 and 1782, the principle of springs being appurtenant to the lands on which they rose, and the acquisition of water rights by prescription after 30 years of uninterrupted enjoyment still prevailed.

Under the 1865 Italian Code, however, the riparian proprietor was required to obtain sanction from Government to divert water from a stream.

Under the Milanese Code of 1216 and subsequent laws of the Republic of Milan, active Government control of the administration of streams is provided.

In Lombardy it appears to have been customary for the State either actually to sell a water right as absolute property, or to lease it for an annual rental, the water right reverting to the State on the termination of the lease. In Piedmont, however, absolute ownership was not given except in very early days, the procedure being the disposal of the water by lease drawn up with great detail.

The method of acquiring a water privilege or patent in Piedmont and Lombardy, even as early as 1828, was very similar in its formalities to that required under present day State controls. These methods, as embodied in the instructions to the Governors of Provinces in Piedmont in 1828, and in the Water Rights Regulations of Lombardy in 1806, were codified in a modified form in the Italian Civil Code, but these provisions were again modified and superseded by a special law in 1884.

(1) Irrigation Development, Water Legislation in Italy, W. Hare Hall, 1886.

Italy, Law of 1828.

These laws, even the one of 1828, specify in detail the mode of application for a water right including the submission of maps, plans, sections, and report prepared by a hydraulic engineer, or, when one is not available, by a civil architect or a land surveyor, and it also includes the publication of notices inviting objections to the grant.

The official engineer of the province was required to visit the site, and to report on the quantity of water to be diverted, and to examine the proposals in detail. The application was then referred to a permanent commission of engineers, who decided on the propriety of sanctioning the project.

Italy, Law of 1884.

Under the 1884 law, an annual charge was made for the diversion of water per module of 100 litres per second, the amount of the charge varying with the nature of the use and other matters.

The Minister of Public Works was required to keep a schedule of public waters, and on the passing of the Act all who claimed a right by prescription, title or grant had to prove their claim before the prefecture within two years from the passing of the Act, on pain of fine and forfeiture of water privileges if diversion of water was continued.

It is interesting to note that the insanitary effect of unregulated irrigation, especially in the case of rice culture was recognised in Italy in the 16th Century. After rice culture had been entirely prohibited in the territory of Milan in 1598, the regulation was modified by prohibiting rice cultivation within six miles of the city of Milan, and five miles from any other town.

In Lombardy similar legislation followed, and applied to meadow lands also, while in Piedmont, drainage in accordance with approved plans was insisted on, in addition.

Italy, Law of 1806.

By the law of 1806, the Kingdom of Italy embodied the main principles of sanitation regarding rice culture in legislation.

The necessity for providing a legal method by which a person desiring to divert water outside the boundaries of his own land may acquire a compulsory right of way for the water through the lands of another (which is a necessity in countries where much utilisation of water is practised, and which is provided for in all modern water legislation), was early manifested in Italian Legislation.

As early as 1216, it appeared in the Milanese Code, where the basic principles of the servitude of aqueduct are found.

Under this Code, provision regarding the right to construct a canal through private or public property, paying as compensation one-fourth more than the value of the land, and all damage according to determination by arbitration, and insistence on proper maintenance of the works, contained all the essentials of modern water legislation in connection with servitudes.

In Venice the law of 1455 prescribes that the payment by the operator to the landholder shall be twice the value of the land occupied, while the Piedmontese Code of 1770 prescribed one-eighth over the Sardinian Code one-fifth in excess of the value of the land as estimated by professional men. (1).

In the Italian Code of 1865, which abolished all preceding ones, one fifth in excess of the value of the land was allowed. The right thus required was a simple servitude on the property affected, and did not give the operator the right of ownership in the land occupied by his works.

In the case of works of public utility, whether privately or publicly operated, the right to expropriate definitely the lands required was recognised in the Sardinian Code and incorporated in the Italian Code of 1865.

Much of Italian Water legislation deals with the organisation of irrigation associations and their administration in great detail, and the will of a majority of land owners is under the Italian Code binding on a minority, a principle adopted in the water legislation of the Dominions.

The General Regulations of 1916 and the Technical Administration Regulations of 1917 modify previous laws to some extent. Operators are divided into two classes, namely, large and small.

Italy, recent water power legislation.

Large operators are those developing more than 500 h.p. or diverting more than 100 litre seconds for power purposes, 1,000 litre seconds for irrigation or 5,000 litre seconds for improvements.

Concessions for power purposes are not to exceed 50 years, and on the expiry of the concession, the generating machinery becomes State property free, while the transmitting and distributing apparatus may be acquired by the State on payment.

Allowance is made for maximum development in the future. Part of the power available may be alienated by the State for development until such greater development is required. The large concessionaire may, on receiving his concession, be required to compensate the small concessionaires whom he expropriates, by supplying them with power, and if more power can be developed by combining concessions, the largest of the concessionaires may be allowed to do so and compensate the others.

A concession may lapse at any time, if not made use of, if badly used, or for non-payment of the charge.

(1) Irrigation Development, Water Legislation in Italy, W. Ham Hall 1909.

The tax or charge to the State payable by licencees varies according to the purpose for which water is used, but persons and bodies requiring water for the domestic needs of communities receive their concession free of charge.

The procedure to be followed by an applicant for a concession or licence is, in the main, the usual procedure of modern water legislation, comprising submission of proposals, and the examination of works during construction by a Government engineer.

(12)—WATER LEGISLATION IN SPAIN.

In 1886 Mr. Ham Hall stated in his History of Spanish Irrigation Legislation ("Irrigation Development" 1886):—

"Spain to-day possesses the most complete and concise water law system of any country in the world, where irrigation is largely practised."

Spain, Law of 1879.

The General Laws of 1866, 1879, and others enacted between 1879 and 1884 (1) largely correspond, in relation to water, with the provisions of the Italian Code of 1865-66.

The law of 1879, embodied in five divisions, treats in the four chapters of the first division with ownership and control of (1), rain waters, (2), living waters—springs and streams; (3), standing waters—ponds and lakes, (4), subterranean water.

The three chapters of the second division deal with: (1), beds, banks, channels, margins of watercourses and lakes; (2), works of defence against public waters; (3), swamps and marshes.

The two chapters of the third division treat of: (1), natural servitudes of drainage; (2), legal servitudes of right of way for water, of right to abut a dam, etc.

The two chapters of the fourth division embody the principles of (1), the common or free use of water; (2), special utilisation of public waters. The four chapters of the fifth division treat of (1), the guarding of public waters; (2), irrigation associations; (3), (4), the powers and duties of the administration; (4), jurisdiction of the courts in the matter of water.

Spain, riparian amenities.

According to these laws, the rights of those who had been diverting and using water prior to the enactment of the laws were safeguarded provided actual beneficial use was made of the water.

Riparian amenities were not abrogated, but there appears not to have been any actual riparian right attaching to land as regards central river streams, but riparian proprietors have certain preferred privileges to use the waters of watercourses.

(1) General Law or Code of Spain specially relating to Water Courses, Water and Irrigation. Irrigation Development. W. Ham Hall.

The ownership of springs appears to have been retained by the owner of the lands on which they rise, so long as he made a beneficial use of them. The right was, however, liable to be lost by non-usage, and if a lower owner acquired a prior right to the use of the water emanating from the springs by usage for a year and a day, the upper owner was forestalled by the greater promptness of the lower riparian owner. The right to water is thus not a natural right like the riparian right of English Common Law, but an acquired right, and this acquired right may be lost by failure to use beneficially.

There is, however, an important limitation to this free diversion of water by riparian proprietors without authorisation, embodied in Article 6 of the Code. This prohibits the owner from diverting or using more than 10 litres per second by impeding the flow of the stream by anything except barriers of loose stones and earth, without the special authorisation of the competent governmental authority. (1)

The ordinary rights of English and Roman water law are, of course, respected in the Code as in all modern water legislation.

The principle that tenure of water right depends on efficient, continuous and beneficial use of the water, for the purposes for which the grant is made, is strongly insisted on in this Code, as it is, and should be, in all enlightened water legislation.

Article 152 of the Code provides as follows:—

"In every concession for a useful employment of public waters, its nature, the quantity of water conceded in cubic meters per second, and if it should be for irrigation, the extent of the land in hectares which may have to be irrigated, shall be fixed. If in employments previous to the present law, the quantity of water should not have been fixed, only that necessary for the object of the utilizations, is understood to be granted, which the Minister of Public Works shall determine by hearing those interested, having the power to require them to establish suitable modules."

The water user is required to construct such measuring devices as will enable the water diverted to be gauged with facility, ensuring immediate detection, if more water than the quantity conceded is being diverted.

An administrative decision under Spanish law quoted by Mr. Ham Hall emphasizes the basis of the tenure of a water right:—"The spirit of all the legislation before and since the law of August 3, 1866, is that the greatest protection and utility of the public waters shall be enforced for the general and private interest, for which reason a volume of the said waters granted

(1) Spanish Water Code, Art. 6.

The tax or charge to the State payable by licencees varies according to the purpose for which water is used, but persons and bodies requiring water for the domestic needs of communities receive their concession free of charge.

The procedure to be followed by an applicant for a concession or licence is, in the main, the usual procedure of modern water legislation, comprising submission of proposals, and the examination of works during construction by a Government engineer.

(12)—WATER LEGISLATION IN SPAIN.

In 1886 Mr. Ham Hall stated in his History of Spanish Irrigation Legislation ("Irrigation Development" 1886):—

"Spain to-day possesses the most complete and concise water law system of any country in the world, where irrigation is largely practised."

The General Laws of 1866, 1879, and others enacted between 1879 and 1884 (1) largely correspond, in relation to water, with the provisions of the Italian Code of 1865-66.

Spanish Law of 1879.

The law of 1879, embodied in five divisions, treats in the four chapters of the first division with ownership and control of (1), rain waters; (2), living waters—springs and streams; (3), standing waters—ponds and lakes; (4), subterranean water.

The three chapters of the second division deal with: (1), beds, banks, channels, margins of watercourses and lakes; (2), works of defence against public waters; (3), swamps and marshes.

The two chapters of the third division treat of: (1), natural servitudes of drainage; (2), legal servitudes of right of way for water, of right to abut a dam, etc.

The two chapters of the fourth division embody the principles of (1), the common or free use of water; (2), special utilisation of public waters. The four chapters of the fifth division treat of (1), the guarding of public waters; (2), irrigation associations; (3), the powers and duties of the administration; (4), jurisdiction of the courts in the matter of water.

Spanish riparian amenities.

According to these laws, the rights of those who had been diverting and using water prior to the enactment of the laws were safeguarded provided actual beneficial use was made of the water.

Riparian amenities were not abrogated, but there appears not to have been any actual riparian right attaching to land as regards control over streams, but riparian proprietors have certain preferred privileges to use the waters of watercourses.

(1) General Law or Code of Spain specially relating to Water Courses, Water and Irrigation. Irrigation Development, W. Ham Hall.

The ownership of springs appears to have been retained by the owner of the lands on which they rise, so long as he made a beneficial use of them. The right was, however, liable to be lost by non-usage, and if a lower owner acquired a prior right to the use of the water emanating from the springs by usage for a year and a day, the upper owner was forestalled by the greater promptness of the lower riparian owner. The right to water is thus not a natural right like the riparian right of English Common Law, but an acquired right, and this acquired right may be lost by failure to use beneficially.

There is, however, an important limitation to this free diversion of water by riparian proprietors without authorisation, embodied in Article 6 of the Code. This precludes the owner from diverting or using more than 10 litres per second impounding the flow of the stream by anything except barriers of loose stones and earth, without the special authorisation of the competent governmental authority. (1)

The ordinary rights of English and Roman water law are, of course, respected in the Code as in all modern water legislation.

The principle that tenure of water right depends on efficient, continuous and beneficial use of the water, for the purpose for which the grant is made, is strongly insisted on in this Code, as it is, and should be, in all enlightened water legislation.

Article 152 of the Code provides as follows:—

"In every concession for a useful employment of public waters, its nature, the quantity of water conceded in cubic meters per second, and if it should be for irrigation, the extent of the land in hectares which may have to be irrigated, shall be fixed. If in employments previous to the present law, the quantity of water should not have been fixed, only that necessary for the object of the utilizations, is understood to be granted, which the Minister of Public Works, shall determine by hearing those interested, having the power to require them to establish suitable modules."

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(1) Spanish Water Code, Art. 6.

cannot be monopolised, unless they are used for the purpose for which they were solicited; on which point the appellant has fallen into a gross error in supposing that by the concession, he had acquired a perpetual right to the waters without using them for the purpose for which they were intended." (1)

Spain, authority to grant licences

The powers of various government authorities to grant authorisation to divert or use water are comprised in Articles 178 to 186.

(1) Where the proposed diversion exceeds 100 litre-seconds (3.53 cusecs.), an authorisation from the Minister of Public Works is necessary.

(2) When the quantity is less than 100 litre-seconds the Governor of the Province can authorise the diversion, with right of appeal to the Minister of Public Works.

(3) Except in certain municipalities, the Mayor may authorise diversions from small streams devoted to town use.

Applications for licences or concessions are dealt with in Article 189 of the Code, and the forms of application, administrative enquiries and concessions, are embodied in regulations. The requirements of the application do not differ materially from those of other countries.

Spain, procedure during drought

As in most recent water legislation, priority of valid and recognised right to divert and use water, while beneficial use continues, is guarded (Arts. 150 and 160). New licences are intended to be granted only when they can be issued without infringing the natural and acquired rights of other parties, and in cases where there is a possibility of materially infringing established rights new concessions may only be made after gaugings have established that there is a surplus available. In times of drought, later grantees must suffer shortage, if there is a shortage, until the requirements of earlier grantees are satisfied.

The procedure for the acquisition of an enforced servitude by an operator on other lands for the purpose of aqueduct is embodied in Articles 75 to 94, while that for the abutment of a dam is found in Articles 102 to 106.

Except as regards administrative details, the procedure does not differ materially from French, Italian and Colonial legislation regarding servitudes, and is simple in the extreme.

Payment of the full cost of the land and damage is required and when special circumstances require it, the canal may be ordered to be covered, or a culvert or pipe laid in place of it.

(1) Irrigation Development, W. Ham Hall, page 463.

The acquisition of a servitude by the operator on, over, or through land can only be successfully resisted by the landholder on three counts:—(1) Existing buildings, orchards, or gardens would be penetrated; (2) The operator does not own the land on which he proposes to use the water; (3) The work can be established on other property with equal advantage to the operator, and with less damage to the lands of the landholder than the operator.

Referring to the Spanish method of acquiring a servitude for water purposes, Mr. Ham Hall states, "The proceedings to obtain these servitudes of aqueduct and abutment are so simple, expeditious and inexpensive that Spain is certainly on a good footing in this respect in Europe. Any person, company or association, having a water privilege and land to irrigate, desiring the recognised right to place the dam and canal on his land, has not a long series of lawsuits before him, but a simple proceeding to determine the compensation for them and the fair value of the land to be occupied, and extent of the damages inflicted. These points fixed, on making payment he acquires his desired privileges." (1)

Compulsory expropriation of land for works is also allowed for, and in practice it seems to be the case that servitudes are required on the land for minor works and expropriation takes place for major ones.

The procedure followed in the case of grants of water rights to communities and companies, and the extent to which they are under Government control, are not markedly dissimilar to the procedure followed in other countries, and in consequence will not be further considered here.

The Water Laws of Spain have probably been modified in recent years by further enactments, but no information is to hand regarding more recent legislation, if any.

(13)—WATER POWER LEGISLATION IN SWITZERLAND.

By the law of 1916, the Federal Government took over some of the administration of water powers formerly under the jurisdiction of the Cantonal Governments, and administration appears now to be divided between the Federal and Cantonal Governments.

The right to use water powers is vested in the Cantonal Governments, but the right may be delegated to the Communes and Corporations, who may either use it themselves or alienate the right to a third party subject to the approval of the Cantonal Government. The Federal Council has, however, supreme power

(1) Irrigation Development, Spanish Irrigation Legislation, W. Ham Hall.

cannot be monopolised, unless they are used for the purpose for which they were solicited; on which point the appellant has fallen into a gross error in supposing that by the concession, he had acquired a perpetual right to the waters without using them for the purpose for which they were intended." (4)

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Payment of the full cost of the land and damage is required, and when special circumstances require it, the canal may be ordered to be covered, or a culvert or pipe laid in place of it.

(4) Irrigation Development, W. Ham Hall, page 455.

The acquisition of a servitude by the operator on, over, or through land can only be successfully resisted by the landholder on three counts:—(1) Existing buildings, orchards, or gardens would be penetrated; (2) The operator does not own the land on which he proposes to use the water; (3) The work can be established on other property with equal advantage to the operator, and with less damage to the land of landholders other than the operator.

Spain, evidence of litigation.

Referring to the Spanish method of acquiring a servitude for water purposes, Mr. Ham Hall states: "The proceedings to enforce these servitudes of aqueduct and abutment are so very simple, expeditious and inexpensive that litigation is certainly on a good footing in this respect in Spain. A private person, company or association, having a water privilege, and has to irrigate, desiring the unquestioned right to place his dam and build his canal, has not a long series of lawsuits before him, but a simple proceeding to determine the best place for them and the fair value of the land to be occupied, and extent of the damages inflicted. These points fixed, on making payment he acquires his desired privileges." (5)

Compulsory expropriation of land for works is also allowed for, and in practice it seems to be the case that servitudes are acquired on the land for minor works and expropriation takes place for major ones.

The procedure followed in the case of grants of water rights to communities and companies, and the extent to which they are under Government control, are not markedly dissimilar to the procedure followed in other countries and in consequence will not be further considered here.

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Switzerland, right to use and alienate water powers.

The right to use water powers is vested in the Cantonal Governments, but the right may be delegated to the Communes and Corporations, who may either use it themselves or alienate the right to a third party subject to the approval of the Cantonal Government. The Federal Council has, however, supreme power

(5) Irrigation Development, Spanish Irrigation Legislation, W. Ham Hall.

regarding expropriation for public purposes of grants made, even if the Cantonal Government does not agree, on payment of compensation to the grantee and on indemnification for the loss of annual water power rental and right to repurchase.

The right of a riparian owner to a water power on or adjacent to his land, appears to be dependent on his having an authorisation to use it, and he is liable to a water power tax.

His rights may be expropriated by an authorised operator in the public interest on payment of compensation, and this compensation or part of it may be required to be paid in power or water.

When an applicant applies for a concession, public investigation is required and objectors may appear at the enquiry. The form of concession contains clauses regarding duration of the concession, concession tax, annual rental, rate of charge for power supplied, profit sharing by the public supply company, and the right of repurchase by the State.

Switzerland, charge for water power.

The annual rent charged by Government is not to exceed 6 francs per theoretical horsepower.

The grantee has the right to expropriate land and rights necessary for his undertaking under the Federal laws regarding expropriation.

The right of repurchase by the Government—Federal or Cantonal—whichever may be the grantor, appears to be embodied in all grants or licences.

A deed of concession cannot, however, stipulate repurchase before a period equal to one-third of the duration of the concession shall have elapsed, and two years' notice must be given to the concessionaire before the right of repurchase can be exercised. The tenure of a concession is dependent on effective use being made of the rights granted by the concession, and the concession may be cancelled and forfeited for breach of conditions or for non-use for a period of two years, and after warning is given to the concessionaire.

(14)—WATER LEGISLATION IN SOUTH AFRICA

South Africa, 1912 Act.

The Water Legislation of the Union of South Africa is embodied in the Irrigation and Conservation of Waters Act 1912, the Amendment Act, 1916, Regulations as to the Constitution, Procedure, etc., in Water Courts, Regulations as to Irrigation Boards 1912, Regulations as to Irrigation Loans, 1912, Regulations defining and fixing the normal flow of a stream 1912, Regulations regarding servitudes, and Regulations regarding River Boards.

South Africa, early water law.

In the Cape, up to 1906, Case Law, based on Roman-Dutch Common Law, prevailed.

This system evolved in the humid parts of Northern Europe created so many vested interests, and bound up water rights so much, that it appears to have been considered impossible to introduce radical changes, although it was recognised that these principles were totally unsuitable and hampering to the conservation and use of water in a semi-arid country.

The Cape Acts of 1906 and 1907, and the Transvaal Irrigation Act of 1908 seem to have introduced but little new law, merely consolidating the existing principles and making administration somewhat easier. The development which took place after these Acts were passed appears to have been small.

Referring to the Union Irrigation and Conservation of Waters Act of 1912 the Director of Irrigation stated —

"The framing of a law approximating even remotely to an ideal water law for the Union is no longer possible, as regard must obviously be paid to the enormous vested interests which have accrued throughout the Union during past generations. All that could be done was to make the most out of the old common law principles, which, unsuitable and hampering as they are, have controlled the situation in the past." (1)

South Africa is in fact the only large water using country which has found it impossible to break free adequately from the old common law principles, although the 1912 Act has many admirable provisions.

The Act seems to have been effective in eliminating the irrational method of dividing the public streams into perennial and intermittent ones, as aimed at by the previous Cape legislation, and drew a sharp distinction between "normal" flow and "surplus" flow (Sec. 10).

Under this differentiation, the normal flow was intended to include all water to which riparian owners were deemed to have acquired a right of user in a declared perennial stream, and provided such water was used beneficially and not conserved in storage reservoirs.

On those streams which had not been declared perennial under the Cape Acts, the Act of 1912 provided for the rights of riparian owners to be fixed on more independent lines by the Water Courts, which had been established by the earlier acts, and were provided with different or modified functions, duties, and constitution by the 1912 Act. Under the Act of 1912, only surplus water, which one may take to mean in general flood water, is available for new appropriations.

(1) Year Book of South Africa Irrigation Association, 1912. Report by the Director of Irrigation.

South Africa, Water Courts.

The Act, together with Regulations under it, provided in much detail for the constitution and procedure of the Water Courts, for adjudicating on claims to divert and use water (secs. 27 *et seq.*), and for the establishment of Irrigation Districts and Boards (Secs. 80 *et seq.*).

These water courts, as reconstituted by the Act of 1912, are presided over by an itinerant water court judge with whom sit two assessors, one a hydraulic engineer of the Irrigation Department, and the other a local person of standing nominated by the Governor-General.

South Africa, Irrigation Districts and Boards.

Irrigation Districts and Boards, as dealt with by this Act appear to be very similar to those created by the earlier acts, the object of the legislation in this respect being to promote and provide for co-operation amongst riparian holders in carrying out and raising loans for, community projects to irrigate their lands. Much success appears to have followed this legislation.

South Africa, River Boards.

River Boards, whose functions are now largely those of a water bailiff with respect to a certain stream, had their semi-judicial powers withdrawn. These had been conferred by an earlier Act, an experiment which had been found most unsatisfactory. (1) (Secs. 51 *et seq.*).

Regulations under the Act provide in much detail for the constitution, duties and procedure of water courts, Irrigation and River Boards. In general, the Act appears to have been successful in setting up adequate, but perhaps cumbrous machinery for adjudicating on water rights and securing their registration by registrars at Pretoria and Cape Town. Provision was also made for Hydrometric Survey, and for the investigation of large beneficial projects by the Irrigation Department (Sec. 6).

The raising of loans for the construction and maintenance of large irrigation works by communities of landholders, and the execution of these under the control of Government, appears to have been much stimulated by this legislation. (2)

In a country like South Africa which is arid and semi-arid over much of its territory, and where coal is cheap, irrigation is paramount as the chief use of water on a large scale, the development of power being of comparatively small importance.

South Africa, Water Courts, duties of.

The powers, duties and authorities of the water courts, as reconstituted under the Act of 1912, include the investigation of disputes regarding water and decisions on them; the investigation, definition and record of water rights; the grant of permits to use the water of public streams; the investigation, definition and record of public streams, the issuance of orders regarding unauthorised obstructions and interference with public streams; the grant of servitudes and fixation of compensation therefor (Sec. 32 *et seq.*).

(1) Year Book of South Africa Irrigation Association, 1912.
(2) Reports of the Director of Irrigation, Union of South Africa.

Unless the parties to a dispute agree beforehand that they will abide by the decision of the water court, a party to a dispute or the recipient of an order has a right of appeal to the Supreme Court (Sec. 39).

Details of procedure of water courts, the appointment of judges, assessors, registrars, the forms for oaths, affidavit and application, the summoning of witnesses and experts, fees and costs of court are dealt with in Regulations under the Act (Regulations Part I).

The Regulations also deal with the principles and considerations which should guide the members of a water court in defining and fixing what use of the flow of a public stream by a riparian proprietor shall be deemed a reasonable use and follow the general principles of English Common Law. The objectionable and hampering features of English Common Law principles appear, however, to be largely rendered innocuous by clearness of definition and insistence on beneficial use (Regulations Part II).

An important and sound provision in the Regulations requires the holder of a permit from the water court to erect, maintain, read and protect such gauges in the stream at the intake, in the feeder canal or at the storage reservoir, and in the return channel and other works, as the water court or Minister may require (Regulations II Sec. 43).

South Africa, normal flow.

The principles and considerations which shall guide a water court in determining what is the normal flow of a public stream are interesting, though, on account of their nature, they are necessarily indefinite. Wherever data are available from the Hydrographic Survey of the Department of Irrigation of a definite nature, these measurements are to be followed, but otherwise other methods may be adopted. When the water court has fixed the normal flow of a stream at a definite point, means must be adopted for the reduced level of the height of the weir or other work to be taken, and survey and section must be deposited with the water court by an engineer of the Irrigation Department or a qualified engineer (Regulations Sec. 68).

The decision of the water court regarding the normal flow when once made, cannot be altered so as to affect prejudicially the rights to store or divert surplus water except with the consent of the users (Regulations Sec. 75).

(15)—WATER LEGISLATION IN SOUTHERN RHODESIA.

Southern Rhodesia, Ordinances of 1913.

The Water Legislation of Southern Rhodesia as embodied in the Water Ordinance of 1913, follows, in general, the lines of the Irrigation and Conservation of Water Act of the Union of South Africa. The Act provides for the settlement of claims and the issue of permits by water courts, constituted on similar lines, and with similar powers, duties and obligations, to those in the Union.

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(1) Year Book of South Africa Irrigation Association, 1912.
(2) Reports of the Director of Irrigation, Union of South Africa.

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As in the Union the use of water for irrigation is pre-eminent over all other uses of water except domestic purposes.

The issue of an authorisation to divert water for power or industrial purposes, or the use of water for these purposes, is dependent on there being a surplus over and above the actual and potential requirements of lands riparian to the river capable of irrigation, and available for such purposes (Sec. 10).

The procedure regarding Irrigation Boards and Loans, the grant of servitudes, and provision for hydrographic survey are not markedly different from the procedure required by the Union Act of 1912, but one point of distinction lies in the definition of the normal flow of a public stream. This is defined in Rhodesian Law as "the average flow during the period from the first of May to the last day of September" (Sec. 3).

Southern Rhodesia, native rights.

The Water Ordinance Amendment Ordinance of 1914 deals entirely with safeguarding the rights in water of natives in Native Reserves in cases where the exercise of power conferred by the Water Ordinance would affect a Native Reserve.

It embodies the right of the Administrator to appoint a fit person to be a member of an Irrigation Board to represent the occupants of a Native Reserve, if included within the area under control of the Board (Sec. 12). It furthermore enjoins the Administrator to have due regard to the interest of the occupants of Native Reserves, and any project which would substantially affect the water supply of a Reserve, has to be approved by the High Commissioner (Secs. 1 (1) and (4)).

All applications for the use of water which might prejudicially affect natives in Reserves are required to be notified to the Chief Native Commissioner (Regulations 1915 Sec. 7).

An application for the use of water, the correctness of which has to be supported by the affidavit of the applicant, sworn before a justice of the peace, is submitted to the Water Registrar, by whom it is forwarded to the Administrator.

The Administrator may, after publication of the application and receipt of objections, decide on the application, or, if he deems it expedient, refer the application to a water court for consideration and decision (Regulations 1915 Sec. 3 *et seq.*).

(iii) WATER LEGISLATION IN KENYA.

Kenya Crown Lands Ordinances, 1902 and 1915.

Although there are certain sections of the Crown Lands Ordinances No. 21 of 1902 and No. 12 of 1915 and regulations under the latter Ordinance, relating to water, no legislation providing for the adequate control of water in the interests of the community has so far been enacted in Kenya. By Rules under the latter Ordinance, the Director of Public Works administers the sections referred to.

The result of this lack of legislation, and inadequate legislation has caused and is causing waste of the water resources of the Colony, the construction of ill-considered projects, interference of water users with one another, uncertainty regarding water privileges and rights, and an increasing tendency towards litigation. Disputes regarding water matters are, see the increase. With very little knowledge by the State of the water resources of which it has assumed control, and without adequate legislative powers, the position of those whose duty it is to guard the water resources of the country in the interests of the public is a difficult one.

It has been endeavoured to show in previous chapters, that this has been the experience of all countries where it has been attempted to mingle the principles of State Control of water with those of English Common Law relating to water, and that nothing but confusion and litigation has resulted in those countries which have attempted State Control without thoroughly comprehensive legislative enactments and their enforcement. It has also been shewn that State control is the only method of ensuring the best utilisation of water in the interests of all concerned.

A draft Water Ordinance is at present before Government which, it is considered, embodies the best principles of Colonial Water Legislation.

Kenya, proposed new water legislation.

APPENDIX No. 1.

Extract from "Report of Hydrometric Survey for the Calendar Year 1916" in its relation to the Provinces of Alberta and Saskatchewan.

"The chief features of the stream measurement work are the collection of data relating to the flow of surface waters and a study of the conditions affecting the flow. Information is also collected concerning river profiles, the duration and magnitude of floods, irrigation and water power development, storage, seepage etc., which may be of use in hydrometric studies.

"This information is obtained by a series of observations at regular gauging stations which are established at suitable points. The selection of sites for these gauging stations and their maintenance depend largely upon the physical features and needs of the locality. If water is to be used for irrigation purposes, the summer flow receives special attention; where it is required for power purposes, it becomes necessary to determine the minimum flow; if water is to be stored, information is obtained regarding the maximum flow. In all cases, the duration of the different stages of the stream is recorded. Throughout the country gauging stations are maintained for general statistical purposes to show the conditions existing through long periods. They are also used as primary stations, and their records in connection with short series of measurements will serve as bases for estimating the flow at other points in the drainage basin.

"During the open water season of 1916, records were taken at one hundred and seventy-seven (177) regular gauging stations on various streams in Alberta and Saskatchewan, at one hundred and thirty-eight (138) regular gauging stations on irrigation ditches and canals. Winter records which are so valuable for power investigations and municipal water supplies, received special attention and records were secured on almost all the important streams in the two provinces, throughout the year.

"The methods of carrying on the investigations were similar to those of previous years. Local residents were engaged to observe the gauge heights at regular stations. These observations were recorded in a book supplied by the department, and at the end of each week, the observer copied the week's records on a postal card which he forwarded to the Calgary office by the first convenient mail.

"District hydrometric engineers made regular visits to the gauging stations, usually once in every three weeks. On these visits they examined the observer's records, made discharge measurements and collected such information and data as would be of use in making estimates of the daily flow at the station. The results of the discharge measurements and all data collected were forwarded as soon as possible after being compiled, to the Calgary office, where all reports are copied on regular forms and filed.

"During the winter no records were taken at a number of the gauging stations, which made it possible to reduce the staff and have each engineer spend some time in the office, and assist in the final computations and estimates of run-off. As far as possible the same engineer that did the field work made or checked the office computations, so as to eliminate any change of error through lack of knowledge of the conditions at the gauging station.

"Gauge height-area, gauge height-mean velocity and gauge height-discharge curve were plotted and rating tables constructed. Tables of discharge measurement, daily gauge height and discharge, and monthly discharge were also compiled. These records have been collected and are embodied in this, the Eighth Annual Report of the Hydrometric Survey." (1)

APPENDIX No. II. (a).

Extract from paper entitled "Water Legislation and Administration in British Columbia," by W. H. Grunsky, 1914.

"The carrying company of British Columbia is exclusively a water company. I submit that the plan of divided ownership of land and water systems is not the best. One of the fundamental principles of the "Water Act" which as a piece of legislation is universally praised, is the inseparability of the water right and the land upon which the water is used. Wherever this principle has been adopted, water users have prospered and communities have flourished; while on the other hand, where individuals and corporations have been permitted to buy up water rights wholesale, thus coming between nature's sources of supply and the water users, unsatisfactory conditions have prevailed . . . In the State of Oregon, for instance, as shewn by the figures of the recent irrigation census, over 90 per cent of the irrigation works are either owned by the water-users or will pass into the hands of the water-users' associations when the settlers have paid for the land. Practically the same condition prevails in the States where irrigation is practised.

(1) Report of the Hydrometric Surveys for the Calendar Year 1916, Department of the Interior, Canada.

APPENDIX No. II. (b).

Extract from address by Minister of Lands British Columbia at Twenty-First International Irrigation Congress, 1914.

"The main purpose of this form of organisation is to place in the hands of those who own land and use water the management and control of their irrigation systems, and to provide a method for securing funds to construct and operate works that are too costly for the individual or small group of individuals to undertake. By means of such corporations money may be borrowed upon debentures, and taxes may be imposed which become a lien upon the lands benefited. The plan adopted is the essence of Government supervision as distinguished from Government ownership or management. The initiative in regard to every important act is on the landowners themselves, or upon trustees who are elected by them, and thus they become responsible. While this is true, the Government does not propose to permit the landowners to make any mistakes in organising or financing their enterprises, and therefore numerous safeguards are adopted. Every important step in the life of the corporation must be approved by officers of the Government. Such matters as the securing of an adequate water supply, the establishment of boundaries, the adoption of plans, the letting of contracts, and the borrowings of moneys are all subject to the approval of a Board before becoming final.

"The idea of this supervision is to protect the farmers against the very mistakes which farmers are likely to make if left to their own resources."

APPENDIX No. III.

Qualified Engineers.

Extract from Irrigation Laws of Wyoming 1917.

1. Who included—Classes—Board of examining engineers.

All engineers and surveyors, who shall hereafter perform surveying or engineering work, or be engaged in the general practice of surveying or engineering work, or be engaged in the general practice of surveying or engineering, relating to the preparation of applications for permits for the use of water, or otherwise relative to the use of water, or for design or construction of water supply or sewer systems, or any municipal work for towns or cities, or for the survey of property lines or sub-division of lands, shall satisfy a board to be known as the Board of Examining Engineers, who shall consist of the State engineer and two engineers of thorough training and experience, to be appointed by the Governor and serve without compensation, that they belong to one of the following classes:—

Surveyor. (Examination plane and topographic surveying and simple hydraulics).

Junior Engineer. (Examination plane and topographic surveying, hydraulics, design of irrigation works, and highway construction).

Senior Engineer. (Examination plane and topographic surveying, hydraulics, design of irrigation works, highway construction and irrigation law).

2. Examination and investigation of applicants. Fee.

The board of examining engineers shall satisfy itself by conducting examinations, and by investigations of the record, training and experience of those who may desire to qualify. In case the Board is satisfied with the standing of any applicant, it shall issue a licence, upon the filing of a proper bond as provided by this act, and upon the payment of a fee of five dollars ($5), which shall be applied to cover the expenses of the board. Said licence shall be signed by the president of the board, and attested by the secretary under his seal. The board of examining engineers shall in all cases make inquiry relative to the moral character of every applicant for a licence and no license shall be issued to any applicant who is incompetent, dishonest, intemperate, or addicted to any habit which would, in the judgment of the board, render him an unsafe employee of any citizen, corporation, or association of the State. Any engineer or surveyor who may qualify under one of the classes specified herein, who shall indicate by the character of the work he performs that he is not capable of carrying on such work as set forth in his licence, or becomes morally unfit to practice under any class, may be disqualified and his licence revoked by the board of examining engineers. The State engineer shall refuse to accept any and all work of those who do not avail themselves of the benefits of this section.

3. Public work by licensed engineers.

All surveying and engineering work done under the authority of the State, or any county, town, city or village within the State, must be performed by a licensed engineer. No city or town engineer, nor county surveyor or engineer, or employee of the engineer, nor county surveyor or engineer, or employee of the State of Wyoming, shall be eligible for appointment, or re-appointment, election or re-election, until he secures a license under the provisions of this act.

4. Work permitted. Classes of engineers.

The holder of a surveyor's licence is hereby permitted to do only the following classes of work:—Land surveying and laying out and applying for irrigation works for the reclamation of not more than one thousand (1,000) acres, or reservoirs where the depth of water to be stored is not more than ten (10) feet. The holder of a junior engineer's licence is hereby permitted to do all classes of engineering work, and his licence shall indicate also that he has a knowledge of irrigation law.

5. May administer oaths.

Every licensed junior engineer and senior engineer is hereby authorised to administer and certify oaths for applications for the use of water, or when it becomes necessary to take testimony to identify or establish old or lost corners, or to perpetuate a corner that is in a perishable condition, or whenever the importance of the survey makes it desirable, and to administer oaths to assistants for the faithful performance of duty, and on such oaths shall use an impression seal of a form prescribed by the Board of Examining engineers, giving name, place of residence, and license number.

6. Bond.

Before issuing a license, the board of examining engineers shall require the applicant to furnish a satisfactory surety bond in the penal sum of five hundred dollars ($500), to insure the faithful performance of any and all duties for which the engineers may be employed, and the proper distribution of any moneys with which he may be entrusted, provided that the holder of the license shall not be held liable in cases where extraordinary conditions in the field make it impossible to guarantee accurate work. The board may waive the requirements of the bond only in the case of engineers already under an equal or higher bond, each license shall be in force and its holder shall enjoy its privileges only as long as his surety bond shall remain in good standing, and the board shall cancel or revoke any license upon expiration of the bond.

7. New licenses to present license holders.

On or before May 1, 1917, the board shall issue senior engineer's licenses to all persons now holding licenses in the fifth grade, and shall issue junior engineer's licenses to all persons now holding licenses in the fourth grade, and shall issue surveyor's licenses to all persons now holding licenses in the second and third grades, upon the payment of the fees to cover only the actual cost of issuing such licenses, and upon the filing of bonds as provided in this act.

8. Penalty for practising without license.

Any person who shall practice, or attempt to practice for hire, or set himself out to practice for hire, any form of surveying or engineering mentioned in this act, or any person who shall buy, sell, or fraudulently obtain any license, shall be deemed guilty of a misdemeanour, and upon conviction thereof, shall be fined not more than two hundred dollars ($200) or be imprisoned in the county jail for not more than six (6) months or both in the discretion of the court.

APPENDIX IV

Extract from an address entitled:—"Features of the British Columbia Water Act" by W. H. Grimsky, at the Annual Convention of the Western Canada Irrigation Association.

"It can be said without fear of contradiction, that in the legislation of no single State or Province is there found a code dealing with all the various uses of water, whose parts are so well co-related or whose character stands so consistently for advanced conservation principles as the Water Act of British Columbia . . . . Under the present act there is just one chapter on the procedure for obtaining a water licence. . . . A little variation is made here and there to suit the special needs of applications for each purpose, but the main variation depends upon whether the use to be made is large or small, and upon whether the applicant is to use the water or power upon his own land or to engage in the business of sale to others.

"The steps required may be briefly summarized:—First, the applicant must post notices in conspicuous places in the locality where the water is to be taken or used; next he must without loss of time, file a similar notice in a local Government Office, and in the most cases must publish it in a newspaper circulating in the locality; then within a brief time, the application proper, accompanied by a sketch must be filed in duplicate in the local Government Office. One copy of this application and sketch goes to the Comptroller, who notifies the applicant by letter of any further information which is required to put his application in good standing. Ample time is allowed for the filing of objections by interested persons, and a hearing is held if necessary; then if detail plans are considered necessary, the Comptroller may grant an authorisation to make surveys, and within a stated time the requisite plans must be filed. The Comptroller examines the plans and, if satisfactory, approves them and issues the conditional licence.

"The conditional license is really an authorisation to construct works and licence to use water pending the time when the works shall be completed.

Suitable procedure is afforded for the taking of such lands as may be necessary for the construction of works. The applicant is held down to a definite time within which he must commence construction and bring the works to completion . . . The time given for the completion of works is usually liberal but can only be extended if the applicant satisfies the Comptroller by statutory declaration that he has begun and diligently continued the work in good faith and has been prevented by causes beyond his control from completing it and making beneficial use of the water. When the applicant makes his declaration of completion of the works (supported by the declaration of at least one credible witness), the Comptroller either in person or through one of his engineering staff, makes an inspection and if he finds everything satisfactory a final licence or water patent is issued, giving a right to the extent to which beneficial use has been made of the water and no more. . . . In no other jurisdiction, I think, is the same amount of publicity required of intending applicants for water rghts as in British Columbia. This may in some cases and for the time being, work slight hardship upon certain applicants; but it satisfies the public and makes for good administration and in consequence there is no such thing as getting away with a water licence in the dark in British Columbia. As already shown, the tendency of recent acts has been to lessen somewhat the amount of advertising required of the smaller applicants." (1)

(1) Lectures of the British Columbia Water Act. Address to Eighth Annual Convention of the Western Canada Irrigation Association.

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