

## CHAPTER XXIII.

## WATER CONSERVATION AND IRRIGATION.

## § 1. Artesian Water.

1. **General.**—In every country in which droughts are recurrent, there are few problems the solution of which is of greater importance than that of an adequate system of water conservation. Much has been done in Australia so far as the supply of water to centres of population is concerned, and a description of several of the metropolitan water-works will be found in the chapter dealing with Local Government. Interstate Conferences on artesian water were held in 1912, 1914, 1921, 1924, and 1928, when combined Governmental action was agreed upon with reference to delimitation of the artesian basins, hydrographic surveys, reason for decrease in flow, analyses and utilization of artesian water, etc. (See map on page 649.)

2. **The Great Australian Artesian Basin.**—In speaking of the "Great Australian Artesian Basin," the area is understood which includes (a) considerably more than one-half of Queensland, taking in practically all that State lying west of the Great Dividing Range, with the exception of an area in the north-west contiguous to the Northern Territory; (b) a considerable strip of New South Wales along its northern boundary and west of the Great Dividing Range; and (c) the north-eastern part of South Australia proper, together with the extreme south-eastern corner of the Northern Territory. This basin (shown approximately by the map on page 649) is said to be the largest yet discovered, and measures about 600,000 square miles, of which 376,000 square miles are in Queensland, 118,000 square miles in South Australia, 80,000 square miles in New South Wales, and 25,000 square miles in the Northern Territory. The area of the intake beds is estimated at 60,010 square miles, viz., 50,000 square miles in Queensland and 10,010 square miles in New South Wales. A description of the basin and its geological formation will be found in previous issues of the Year Book (see No. 6, p. 569).

3. **The Western Australian Basins.**—The Western Australian Basins fall naturally within five distinct groups, viz., the Eucla Basin, in the extreme south-east of the State, extending well into South Australia along the shores of the Great Australian Bight; the Coastal Plain Basin, west of the Darling Range; the North-West Basin, between the Murchison and Ashburton Rivers; the Gulf Basin, between Cambridge Gulf and Queen's Channel; and the Desert Basin, between the De Grey and Fitzroy Rivers.

The Recent and Tertiary strata which enter Western Australia at its eastern border, and which have a prevailing dip towards the Great Australian Bight, form the Eucla artesian water area. Where boring operations have been undertaken, the water has been found to be salt or brackish, and there are other conditions affecting the supply, such as local variations in the thickness of the beds, their relative porosity, and the unevenness of the floor upon which they rest, which, so far, have not been examined with sufficient thoroughness to enable many particulars to be given in regard to this basin.

In the Coastal Plain Basin to the west of the Darling Ranges artesian boring has, on the other hand, been carried on successfully for many years.

4. **The Murray River Basin.**—The Murray River basin extends over south-western New South Wales, north-western Victoria, and south-eastern South Australia. It is bounded on the west by the azoic and palaeozoic rocks of the Mount Lofty and other ranges extending northwards from near the mouth of the Murray to the Barrier Range, and on the east and north-east by the ranges of Victoria and New South Wales. This tertiary water-basin is occupied by a succession of sedimentary formations, both porous and impervious. It is of interest to note that the waters of the Murray River are partly

supplied by influx from the water-bearing beds of this basin; this is proved by the fact that, at low water, springs are observed at certain places flowing into it from beneath the limestone cliffs from Pyap Bend downwards. Similar springs exist along the courses of other branches of the River Murray system, where they cut through the tertiary formation. On the Victorian side bores have been put down, and water has been struck at various levels.

5. *Plutonic or Meteoric Waters.*—In previous Year Books will be found a statement of the theory of Professor Gregory\* as to the origin of the water in the Australian artesian basins, together with the objections held thereto by a former Government Geologist of New South Wales † (See Official Year Book No. 6, p. 570).

6. *Artesian and Sub-Artesian Bores.*—(i) *General.* The following table gives particulars of artesian and sub-artesian bores in each State and in the Northern Territory :—

ARTESIAN AND SUB-ARTESIAN BORES, 1929-30.

Particulars.	N.S.W.	Vic.	Q'land.	S. Aust. (c)	W. Aust.	N. Ter.	Total.
Bores existing .. No.	575	380	4,713	209	245	191	6,318
Total depth of existing bores .. feet	940,484	101,200	4,133,481	122,794	224,849	62,375	5,585,183
Daily flow .. 1,000 gals.	275,795	(b)	289,022	12,971	72,142	7,723	2457,653
Depth at which artesian water was struck—							
Maximum .. feet	4,338	800	6,000	4,851	3,325	1,760	6,000
Minimum .. feet	100	125	10	233	39	42	10
Temperature of flow—							
Maximum .. °Fahr.	142	(b)	212	208	140	(b)	212
Minimum .. °Fahr.	73	(b)	78	82	75	(b)	78

(a) Flowing bores only. (b) Not available. (c) Government bores only. (d) Total depth of all bores. (e) Incomplete.

(ii) *Details for States.*—Considerations of space preclude the insertion of separate particulars of operations in the States during the year 1929-30. Details for earlier years will, however, be found in previous issues of the Official Year Book.

## § 2. Irrigation.

1. *General.*—Australia's first experiments in irrigation were made with the object of bringing under cultivation areas in which an inadequate rainfall rendered agricultural and even pastoral occupations precarious and intermittent, and, although these original settlements have generally proved fairly successful, most of the States, instead of promoting new settlement in unoccupied regions, are adopting the policy of making existing settlements closer, by repurchasing large estates, subdividing them into holdings of suitable sizes for cultivation, and selling the land upon easy terms of payment. It is in connexion with this Closer Settlement policy that the special value of irrigation is recognized. Information regarding the various irrigation schemes in operation was given in some detail in preceding issues of the Official Year Book (See No. 23, pages 637 to 661), but owing to considerations of economy it was decided to omit this matter in the present volume.

\* See J. W. Gregory, *F.R.S., D.Sc.*: "The Dead Heart of Australia," London, John Murray, 1906; and "The Flowing Wells of Central Australia," *Geogr. Journ.*, July and August, 1911.

† E. F. Pittman, *A.R.S.M., formerly Government Geologist of New South Wales*: "Problems of the Artesian Water Supply of Australia, with special reference to Professor Gregory's Theory." (Clarke Memorial Lecture, delivered before the Royal Society of New South Wales, 31st October, 1907); "The Great Australian Artesian Basin," Sydney, 1914; and "The Composition and Porosity of the Intake Beds of the Great Australian Artesian Basin," Sydney, 1915.

2. Areas Irrigated.—The following table gives the area irrigated in each State during the years 1919–20 to 1929–30. Victoria shows the largest irrigated acreage, the area so returned in 1929–30 amounting to 566,577 acres, or 73.5 per cent. of the total for Australia. New South Wales for the same year returned an area of 126,321 acres, or 16.5 per cent. of the total. The areas under irrigation in the remaining States are relatively very small.

## IRRIGATION.—AREAS IRRIGATED, 1919–20 TO 1929–30.

Season.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1919–20 ..	20,814	371,248	9,267	17,301	2,039	..	420,669
1920–21 ..	31,065	282,534	9,803	19,631	3,225	(a)6,966	353,224
1921–22 ..	35,451	287,907	11,264	22,636	2,535	10,500	370,323
1922–23 ..	46,273	350,727	14,314	26,307	2,772	7,059	447,452
1923–24 ..	57,242	324,558	18,417	27,866	3,035	7,402	438,520
1924–25 ..	73,432	375,503	18,235	35,313	3,126	7,267	512,876
1925–26 ..	83,795	343,685	21,669	36,409	3,551	7,361	496,470
1926–27 ..	89,528	406,532	38,044	35,443	3,756	7,882	581,185
1927–28 ..	102,533	477,500	21,411	38,379	4,292	7,016	651,131
1928–29 ..	123,129	471,695	25,344	39,236	4,907	7,054	(b)671,475
1929–30 ..	126,321	566,577	26,282	40,002	4,943	6,693	770,818

(a) Particulars not available for previous years.

(b) Including 100 acres, Northern Territory and 10 acres, Federal Capital Territory.

3. Crops on Irrigated Areas.—A classification of the crops grown on the irrigated areas in each State during the year 1929–30, together with the averages for Australia during the quinquennium 1925–26 to 1929–30, will be found in the table hereunder. Lucerne, grasses and green forage accounted for 55 per cent., cereals for 22 per cent., orchards and vineyards for 16 per cent., and root crops, market gardens, &c., for about 6 per cent. of the total area under irrigation in 1929–30.

## IRRIGATION.—CROPS ON IRRIGATED AREAS, 1929–30 AND 1925–26 TO 1929–30.

Crop.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Total.	Average 1925–26 to 1929–30.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Cereals ..	64,151	106,399	163	..	83	..	170,796	131,383
Lucerne, Grasses and Green Forage	28,280	380,761	378	10,333	1,753	4,666	426,171	333,959
Orchards and Vineyards ..	25,256	70,265	3,466	26,581	1,924	804	128,296	125,077
Root Crops, Market Gardens and other Crops	8,634	9,152	(b)22,275	3,088	1,183	c)1,223	45,555	43,796
Total ..	126,321	566,577	26,282	40,002	4,943	6,693	770,818	634,215

(a) Including Fallow, 12,596 acres.

(b) Including Sugar Cane, 20,280 acres, and Cotton 1,085 acres.

(c) Including Hops, 1,063 acres.