

## CHAPTER XXV.

## WATER CONSERVATION AND IRRIGATION.

## § 1. Artesian Water.

1. **General.**—In every country subject to droughts, the provision of adequate systems of water conservation is a matter of prime importance. Much has been done in Australia so far as the supply of water to centres of population is concerned, and a description of the principal water-works in each State will be found in Chapter IV.—Local Government.

Interstate Conferences on the subject of 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. A map showing the extent of the known artesian basins will be found on pages 821–22.

2. **The Great Australian Artesian Basin.**—The area known as the “Great Australian Artesian Basin,” 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 pages 821–22) 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 Official 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 variation 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 palæozoic 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 the river bed 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 regarding artesian and sub-artesian bores in each State and in the Northern Territory:—

ARTESIAN AND SUB-ARTESIAN BORES, 1936-37.

Particulars.	N.S.W.	Vic.	Q'land.	S. Aust. (c)	W. Aust.	N. Ter.	Australia.
Bores existing . . . No.	699	386	5,607	162	356	191	(e)7,401
Total depth of existing bores . . . feet	61,087,880	110,000	(d)	115,598	241,468	63,375	1,618,321
Daily flow . . . 1,000 gals.	(d)66,399	(c)800	251,052	12,971	(d)	7,723	(e)338,945
Depth at which artesian water was struck—							
Maximum . . . feet	4,348	2,930	6,000	4,851	4,006	1,760	6,000
Minimum . . . feet	10c	22	10	233	30	42	10
Temperature of flow—							
Maximum . . . °Fabr.	141	147	212	208	(d)	(d)	(e) 212
Minimum . . . °Fabr.	75	70	78	82	(d)	(d)	(e) 70

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

(ii) *Details for States.*—Considerations of space preclude the insertion of separate particulars of operations in the States during the year 1936-37. Details for earlier years will, however, be found in issues of the Official Year Book prior to No. 24, 1931.

## § 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, sub-dividing them into holdings of suitable sizes for cultivation, and selling the land upon easy terms of payments. 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).

\* 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. Journal.*, July and August, 1911.

† *E. P. 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 areas irrigated in each State in the years 1927-28 to 1936-37. Victoria shows the largest irrigated acreage, the area so returned in 1936-37 amounting to 518,827 acres, or 65.7 per cent of the total for Australia. New South Wales for the same year returned an area of 151,683 acres, or 19.2 per cent. of the total. The areas under irrigation in the remaining States are relatively very small:—

## IRRIGATION.—AREAS IRRIGATED.

Season.	New South Wales. (e)	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1927-28 ..	102,533	477,500	21,411	38,379	4,292	7,016	651,131
1929-29 ..	123,429	471,695	25,344	39,236	4,907	7,054	(a)671,475
1929-30 ..	126,321	566,577	26,282	40,002	4,943	6,693	770,818
1930-31 ..	135,121	463,098	26,947	43,538	5,661	6,488	680,853
1931-32 ..	114,777	418,415	28,414	42,813	6,101	7,768	618,291
1932-33 ..	139,977	474,716	31,409	42,556	6,434	7,605	693,697
1933-34 ..	131,772	435,324	29,363	42,898	7,640	9,194	656,191
1934-35 ..	125,423	494,226	34,138	39,594	8,861	7,786	(b)710,054
1935-36 ..	138,016	495,835	44,283	42,672	11,396	8,987	(c)741,312
1936-37 ..	151,683	518,827	54,095	42,292	13,295	9,987	(d)790,179

(a) Including 100 acres Northern Territory and 10 acres Australian Capital Territory. (b) Including 26 acres Australian Capital Territory. (c) Including 123 acres Australian Capital Territory. (d) Including 70 acres Australian Capital Territory. (e) Not including pasture and fallow lands.

3. **Crops on Irrigated Areas.**—A classification of the crops grown on the irrigated areas in each State during the year 1936-37, together with the averages for Australia during the quinquennium 1932-33 to 1936-37, will be found in the table hereunder. Lucerne, grasses and green forage accounted for 34 per cent., cereals for 24 per cent., orchards and vineyards for 27 per cent., and root crops, market gardens, etc., for about 15 per cent. of the total area under irrigation in 1936-37. It should be noted, however, that the area under crop in Victoria does not include 300,094 acres of pasture land and fallow land which was irrigated in 1936-37. Likewise 7,345 acres of pasture land are also omitted from the Tasmanian figures for the same year.

## IRRIGATION.—CROPS ON IRRIGATED AREAS, 1936-37, AND 1932-33 TO 1936-37.

Crop.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Total	Average 1932-33 to 1936-37.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Cereals ..	76,272	38,328	150	..	..	..	114,750	117,138
Lucerne, Grasses and Green Forage	36,516	106,321	3,099	9,264	9,464	84	164,748	297,593
Orchards and Vineyards ..	27,841	66,526	5,630	28,095	2,477	1,304	131,873	127,527
Root Crops, Market Gardens and other Crops	11,054	7,558	(a)45,216	4,933	1,354	(b)1,254	71,369	61,473
Total ..	151,683	218,733	54,095	42,292	13,295	2,642	482,740	603,731

(a) Including Sugar Cane, 43,723 acres; Cotton, 460 acres; and Tobacco, 1,033 acres. (b) Including Hops, 962 acres.