

From Renmark to Lake Victoria the country passed through was covered with mallee scrub, and extremely desolate. In moderate

Plate 12.



AVENUE AT COLONEL MORANT'S. RENMARK, S.A.

seasons the rabbits infest the district, but at that time the vegetation had so withered up that not a sign of the prolific rodents could be discovered.

Between Renmark and Mildura, Lake Victoria was passed. It contains an area of about 30,000 acres, and its maximum storage capacity is about 22,000,000,000 cubic feet. The lake is fed from the Murray in time of high river

Plate 13.

through the Frenchman's and Rufus Creeks, and the overflow has been known to keep the Murray navigable for four weeks after it has closed above the Rufus. A proposal has been made to construct a weir across the Murray below the



CONCRETE CHANNEL, RENMARK IRRIGATION COLONY, S.A.

Frenchman's Creek offtake, and divert the water through Frenchman's Creek into Lake Victoria. The scheme includes the construction of regulating gates at Rufus Creek to control the outflow of the impounded waters. It is estimated that the works could be carried out for about £90,000, and this will confer an immense benefit on the navigation interests of the Lower Murray, as it would provide a supply of 100,000 cubic feet per minute for four months.

Wentworth was next visited, and here an irrigation settlement has been formed, but very little success has attended the efforts of those who have taken up land. The soil is of a clayey nature, not adapted to irrigation, and as Mildura is only 15 miles distant, where better and more suitable land for intense culture is available, it is not surprising that settlement at Wentworth has not increased.

**Wentworth
Irrigation
Settlement.**

Plate 14.



MILDURA PUMPING STATION.

The Mildura irrigation colony was founded by the Chaffey Bros. in 1887, the total area of the concession being 250,000 acres. The land in its virgin state was practically valueless, consisting of red sandy loam covered with mallee and blue bush, and having an average annual rainfall of about 10 inches.

In the early history of the settlement considerable dissatisfaction arose from the inability of the Messrs. Chaffey to fulfil the covenants into which they had entered; till at length, in consequence of their financial difficulties, the Government took over the works and constituted a trust, with jurisdiction over 45,070 acres of the original concession. The settlers, profiting by the mistakes of the past, are now

utilising the soil to advantage and obtaining excellent results. Water is pumped (Plate 14) from the Murray into channels at various levels

Plate 15.



IRRIGATION CHANNEL, MILDURA.

commanding an irrigable area of about 35,000 acres, whereof 9,000 are

Crops raised. under intense culture. The crops raised include raisins, sultanas, currants, apricots, peaches, and citrus fruits, representing an annual value of about £114,000. A considerable loss of water from soakage occurred from the 169 miles of channels when

Plate 16.



EAGLE CREEK CUTTING AND REGULATOR, N.S.W.

first constructed. This has now been in great part remedied by lining 69 miles in the manner shown in Plate 15 at an expenditure of £29,000.

Mildura at present contains a population of about 4,000, and is in a fairly prosperous condition. The railway from Melbourne will be completed to the town by the end of November next, and will give command of the markets, not only of the metropolis, but of several large provincial towns. The capital value of the improved lands is given as £500,000, which fact, seeing that they were practically valueless without irrigation, affords an excellent object lesson of what can be accomplished by skilful cultivation and judicious application of water. Mildura and Renmark

**Increased value
of irrigated lands.**

Plate 17.



GAP AT TALMALMO, UPPER MURRAY, N.S.W.

are notable as the only settlements in Australia which, as a consequence of the concentration rendered practicable by irrigation, can afford the advantages of town life.

Plate 16 shows the Eagle Creek cutting and regulator on the New South Wales side of the river opposite the town of Koondrook. The creek, which is an effluent of the Murray, has been widened, and diversion takes place at a slightly lower level than under natural conditions.

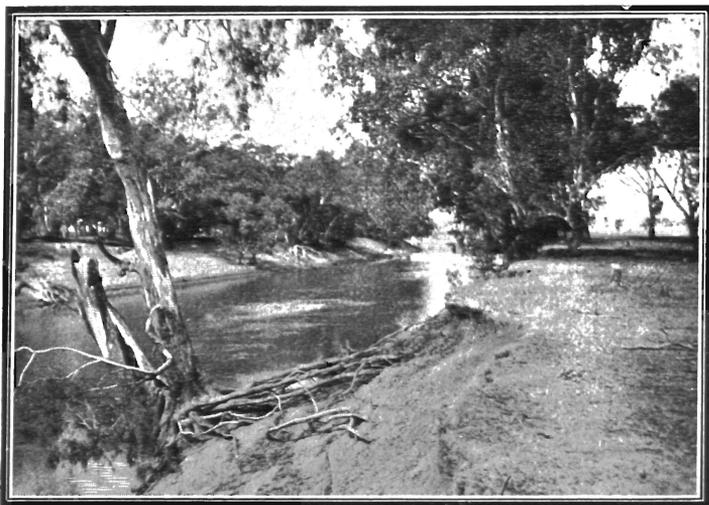
Talmalmo (Plate 17), about 50 miles above Albury, was one of the spots inspected by Colonel Home with a view to the construction of a storage reservoir. The Murray passes through a comparatively narrow gap at Talmalmo, and it was thought that a dam could be constructed at a reasonable cost. The investigations carried out, however, show that such a work at this point is impracticable, owing to the unsatisfactory foundations.

Upper Murray.

THE MURRUMBIDGEE.

In regularity of flow and volume of discharge the Murrumbidgee, or "Beautiful River," as its native name implies, ranks next in importance to the Murray among the rivers of New South Wales. Like the Murray, its head waters are in high mountainous country, its source being near Kiandra, and it receives great accessions of volume through the melting of the snows in spring and early summer. The most important of the numerous affluents in the upper course is the Tumut, which joins it near Gundagai, and which, like the main stream, has its source among the lofty ranges of the Snowy Mountains where snow remains for many months of the year. The soil in the valleys along the upper portion of the river and its affluent, the Tumut—which comprises some of the richest land in Australia—is of excellent quality and well adapted to farming, while the plain country on the lower river is good pasture land and only lacks water to make it very suitable for agriculture. For the greater part of its course the banks of the river are high, and flooding of the surrounding country

Plate 18.



THE MURRUMBIDGEE AT GUM CREEK, NEAR MAUDE.

rarely takes place. West of Hay the banks become lower and there are practically three zones of flooding in ordinary years. The first flooding takes place where the banks are very low, between Balranald and the junction of the Lachlan; the next zone where the banks are slightly higher, between the Lachlan and the Maude; the very highest zone, which is only covered in exceptional floods, is above Maude.

**Lower
Murrumbidgee.
Benefits of
Flooding.**

The lower zone, between Balranald and the junction of the Lachlan, would be flooded to a certain extent probably two years out of three. The natural flooding of these areas is of great benefit, for without

Plate 19.



GUM CREEK.

flooding the country practically carries nothing, but after a flood it would carry about two sheep to the acre. Plate 19 shows Gum Creek, where a diversion channel is proposed from the Murrumbidgee.

The accompanying illustrations indicate what has been done in the way of irrigation at North Yanco on the Murrumbidgee.

North Yanco. Plate 20 shows one of the main channels. **Mr. McCaughey's** irrigation area at North Yanco is the most extensive in New South Wales. He has about 60 miles of channels, which are supplied in time of high river with water gravitating from an offtake on the Cudgell Creek, an anabranch of the Murrumbidgee. The river, however, did not rise sufficiently last year to provide a drop of water by gravitation, and Mr. McCaughey had to resort to pumping. By this means he has been able to irrigate 750 acres of lucerne and 250 acres of sorghum. He has an additional area of 1,500 acres under lucerne which he has not watered for over twelve months, yet he was able to graze fifteen sheep to the acre on this area for two months of last year. During a visit to North Yanco in March last the writer had an opportunity of seeing the irrigated areas there, and it reminded one of an oasis in the desert, the surrounding land being parched and dry and almost denuded of vegetation, while the lucerne crop was a waving field of green. The sorghum was a particularly fine crop from 6 to 10 feet high, and Mr. McCaughey states

that he fed 15,000 sheep for a period of three months from this small area of 250 acres of sorghum. He also contemplates extensive fodder cultivation by laying down a large area under lucerne, and hopes by irrigating this area to raise and store sufficient fodder to avoid the necessity—generally attended with heavy losses—of sending sheep to the mountains. Plate 21 is a view of the North Yanco homestead from across the waters of the artificial lake supplied by the irrigation channels. The house as pictured is just completed, and the willows to the right and left are upon islands in the midst of the artificial lake. The willows showing

Plate 20.



IRRIGATION CHANNEL AT NORTH YANCO.

such vigorous growth were planted about eight months before the picture was taken. There can be no question that what has been done at North Yanco can be accomplished with equal success on a great portion of the area between Narrandera and Balranald, as the land is similar in character and the levels are such as will permit of the economical carrying out of large gravitation schemes. A portion of the land also is eminently suitable for intense culture, and, with proper tilth and a judicious application of water, summer fruits, olives, currants, sultanas, and citrus fruits would grow to perfection. The volume of the Murrumbidgee during 1902 was so small that the river fell considerably

below summer level at Hay, and the discharge at Balranald was very low indeed. It is therefore apparent that it would be unwise to carry out any extensive irrigation projects on the Murrumbidgee plains without constructing, in the first instance, reservoirs at the head of the river to impound the immense volumes of flood waters which under present conditions find their way to the ocean

Plate 22 shows the famous Yanco cutting, at which so much hostile criticism has been levelled by the residents of Hay and **Yanco Cutting.** Balranald. The channel only commences to run when there is a considerable volume passing down the main river ; and even

Plate 21.



[NORTH YANCO HOMESTEAD AND ARTIFICIAL LAKE.

at its maximum capacity it does not divert sufficient water to cause much concern to the Lower Murrumbidgee residents.

THE DARLING RIVER.

The Darling, from Mungundi to its junction with the Murray at Wentworth (Plate 23), has a length of about 1,350 miles. It is the longest affluent of the Murray, and has its source in the Dividing Range in Queensland, where it is known as the MacIntyre. The

MacIntyre is joined by the Dumaresq in New South Wales, and a little lower down by a New South Wales stream, which also bears the name of MacIntyre. From this junction with the latter the river is known as the Barwon, and flows south-westerly until it meets the Namoi, at Walgett. Still retaining the name of Barwon, it flows thence westerly to Bourke, receiving on the left bank the Castlereagh River, Marthaguy and Marra Creeks, and the Bogan River ; on the

Plate 22.



YANCO CUTTING.

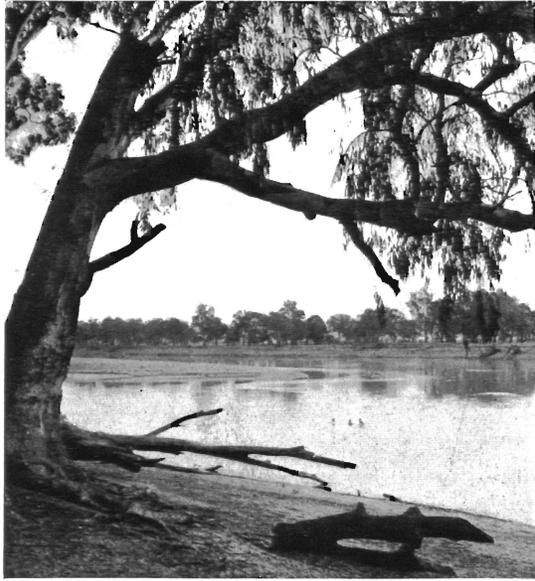
right bank, the Narran, Bokhara, and Culgoa Rivers. The three latter affluents rise in Queensland. From Bourke downwards the river is known as the Darling. Its course is south-westerly to Menindie, thence south to its junction with the Murray at Wentworth. Throughout the whole course the channel is clearly defined, with high banks of from 30 to 40 feet, and it is only in the high floods that the river overflows. In 1890, owing to the tropical rains in the Queensland catchment area, the flood waters reached a great height, and extended over the plains for many miles ; the discharge at Wilcannia that year reached the enormous volume of 700,000,000,000 cubic feet. Captain George Ritchie, M.P., of South

**The Darling an
Inland Sea.**

Australia, stated recently at Goolwa that in 1890, between Wentworth and Bourke, he had steamed for hours without seeing any land, and in one instance discharged a cargo 25 miles back from the river channel. Mr. John Wright recollects that, in the great flood of 1870, a steamer went from the Darling along the course of the Paroo to beyond the Queensland border, a distance of 180 miles, the spread of the water being about 60 miles wide.

Owing to the comparatively light rainfall, combined with the absence of snow on the mountains, and the large portion of non-effective catchment area in the shape of plain country, the discharge is not sustained, but is generally low and uncertain, and during the 1902-1903 drought the river ceased to flow for a longer period than any previously known record, viz., from February, 1902, to January, 1903. It is now, however, in good volume, and the river is navigable as far as Bourke. Of the Queensland tributaries the Culgoa is the most important; the Paroo and Warrego contribute very rarely, and merge into basins before reaching the Darling.

Plate 23.



JUNCTION OF MURRAY AND DARLING RIVERS.

LACHLAN RIVER.

The Lachlan, which is a tributary of the Murrumbidgee, rises in the Cullarin Range, a short distance from the town of Gunning, on the main railway line between Melbourne and Sydney. After a course of about 80 miles it is joined by the Abercrombie, which receives its supply from the Blue Mountains. It then flows north-westerly through hilly country until the town of Forbes is reached (Plate 24). Below Forbes the country is flat, and the river receives very little accession of volume, except in times of extreme rainfall. Towards the town of Hillston there is a large tract of deltaic country, and the Willandra Billabong, Middle Creek Billabong, and Marrowie Creeks leave the river and flow west and south-west. The Lachlan itself, below the town of Oxley, has no clearly-defined channel, and loses itself in the reed beds below that town. It is only in times of high flood that the waters of the Lachlan reach the Murrumbidgee. The upper portion of

the river has an effective catchment area of 20,159 square miles, with a fair average rainfall, but in dry years it receives very little water, and during the year 1902, it ceased to flow below Condobolin for a period of nine months. In flood time the water of the Lachlan (through Lake Creek) flows into Lake Cudgellico,

**Lake Cudgellico
a Natural
Reservoir.**

which is a great natural reservoir. Improvements have been effected by a cutting from the river to the lake, and a regulator provided, so that the flood waters might be impounded. The estimated capacity of this storage basin, when filled is, 1,185,000,000 cubic feet. The Willandra Billabong, the

Plate 24.



WEIR ACROSS LACHLAN RIVER AT FORBES.

largest effluent of the Lachlan, leaves the river about 30 miles above Hillston, and in times of high flood flows due west as far as Mossgiel, a distance of about 100 miles. The tributaries on the right bank are the Abercrombie and Belubula Rivers, and Mandagery and Goobang Creeks; on the left bank the Burrowa River, Crowther and Bland Creeks. On the upper portion of the river the surrounding country is used to a considerable

extent for agriculture, but, generally speaking, it may be said that the land along the Lachlan is pastoral country. In good seasons much of the Lachlan country is among the best pastoral lands in New South Wales, but the lower parts of the river are seriously affected by recurring droughts.

**Fertility of
Lachlan Country.**

As the Lachlan has been placed by the Murray River Commission entirely at the disposal of New South Wales, and as no Inter-State problems are involved, much might be done by impounding the flood waters and thereby making irrigation possible over a considerable area of fertile country. The success that has attended Mr. Gatenby's efforts at Jemalong should induce the pastoralists to irrigate lucerne and other fodder crops.

The largest and most important Victorian tributary of the Murray is the Goulburn. The description of the Upper Murray is, in many respects, applicable to this river. It takes its rise in the Dividing Range, near Wood's Point, where the summits reach an elevation of 5,000 feet. The drainage area is about 9,000 square miles, about 1,500 square miles being in mountainous country of considerable elevation. This portion of the catchment area is rocky and precipitous, and a large proportion of the rainfall is discharged. The winter volume of the river is large, and the melting

Plate 25.



HUNTHAWONG WEIR, LACHLAN RIVER, N.S.W.; DROUGHT OF 1902.

snows maintain the discharge far into the summer. About 5,200 square miles of the total catchment is effective, the balance being non-contributing. At no great distance from Melbourne the Acheron and Yea Rivers, King Parrot, Kur Kuruc and Mollison Creeks rise in the Dividing Range, north of the Black Spur, and are valuable affluents of the Goulburn. The term Goulburn Valley is, by popular usage, limited to the plain that extends from the town of Murchison northwards to the Murray.

The Campaspe rises in the Dividing Range, which separates the northern from the southern watershed of Victoria, between Maldon and Trentham, and flows almost due north to the Murray. The total drainage area is 1,650 square miles, of which 680 square miles, consisting of plain country, rarely supplements the flow of the river and is regarded as a non-contributing