

APPENDIX C.

NOTES OF AN OFFICIAL VISIT TO MILDURA.*

(By Mr. STUART MURRAY, Chief Engineer of Water Supply.)

THE WORK DONE BY MESSRS. CHAFFEY.

The agreement between the Government and the Messrs. Chaffey sets out that they are to obtain the fee-simple of two-blocks, each of 25,000 acres, by their expending thereon a sum of not less than £5 per acre; and that the Government may concede to them a further area of 200,000 acres, by their expending a sum equal to £1 per acre, and paying £1 per acre purchase-money. To date the company have expended at Mildura a sum of £183,000, as shown by vouchers submitted to the Water Supply Department, and they have obtained Crown grants for 13,200 acres, and are now applying for further grants for 2,800, all forming part of the first of the two 25,000-acre blocks before referred to. Of the land granted to them, they have sold (exclusive of the township of Mildura) 10,500 acres in agricultural and horticultural lots. Of the sold area, 6,500 acres have been cleared and brought under tillage, whereof 6,000 acres have been, or are in process of being, planted with vines or fruit trees, and 500 acres are under forage or grain crops. The most extensive plantations are of raisin vines, next to which come oranges and lemons. There are also considerable areas under apricots and peaches, figs, and some olives. As yet not more than 50 acres have been planted with wine grapes. The plantations are of course too young yet to have yielded any returns of commercial value, but it is anticipated that during the forthcoming summer they will give 10 tons of marketable raisins, and 4,000 or 5,000 gallons of wine, besides a quantity of green fruit that will be consumed locally. The entire present population of the Mildura settlement numbers, as nearly as could be ascertained, somewhat over 3,000 persons, who may be described as follows:—

Men employed by the Messrs. Chaffey	...	...	...	300
Contractors and their employés	...	...	...	100
Resident agricultural settlers	...	...	...	950
Shopkeepers and business people	...	...	...	450
Women, mostly married	...	...	...	600
Children of school age	...	...	...	420
Other children	...	...	...	200
Sundries, unclassified	...	...	...	130
Total	...	...	...	3,150

Of these about 750 are resident within the township; the remaining 2,400 are scattered throughout the rural district.

THE POPULATION

differs considerably in character from that to be found in any other country district in Victoria, its most striking feature being a new element that seems everywhere prevalent. The large proportion of men whose appearance, language, manners, and even dress denote their origin as being from the wealthier class of society, is indeed surprising. And let it not be supposed that these men evince any disinclination for hard work. Many of them were to be seen employed on their allotments, and not a few in the day-labour gangs, content to earn from 6s. 6d. to 8s. per day while their own trees were growing, and doing as hard and as honest a day's work as any navvy or farm labourer in the country. The settlers of this class are almost all young men.

* See Fourth Annual General Report by the Secretary for Water Supply, page 70, Parliamentary Paper No. 147, Session 1890. The date of the visit was about the middle of September, 1890.

Some of them are Victorians, and a few from the adjoining colonies; but many, probably the majority, have emigrated to Mildura direct from Great Britain; so that we have here represented many of the well-known public schools and colleges of England and Scotland. The Mildura settlement has recently been created a shire under the provisions of the *Local Government Act*; and the annual rateable value of the property within the municipality is £30,000, a fact which, to those who have been connected with local government business, will convey more information than a volume of statistics.

THE PRINCIPAL BUILDINGS

in the township are of brick, several of two stories; others are of wood or of galvanized iron. The architectural features, as well as the surroundings of the place, are much superior to those of the ordinary bush township, and are quite equal to the better portions of provincial towns. Among the more important public buildings may be mentioned the Post and Telegraph Office, the Custom House, the State School, the Assembly Hall, the Wesleyan Church; and among private buildings the offices of Chaffey and Co. Limited, the Coffee Palace (with accommodation for 40 guests), the store and residence of Messrs. Williams and Co. in Deakin Avenue, Messrs. Neville's store, and the foundry and workshops of the company. In course of erection near the landing place are extensive joinery works for the manufacture of fruit cases, and cool stores for the safe bestowal of fresh fruit and other perishable products awaiting transport.

THE WATER SUPPLY

to the township is supplied by a powerful steam-pumping plant, erected on the river bank just below the landing place; and it is distributed through wrought-iron pipes laid along each street, the tappings for the services being made through solid wrought-iron collars, which are riveted on at frequent intervals. It has been suggested that a brick tower and wrought-iron service tank should be erected on an elevated site in the town so as to provide a constant and uniform pressure in the street mains, and to obviate the necessity for keeping the pumps running during the night. The needs of the irrigators are supplied from a system of open earthen channels, differing in no respect from those now existing in many of the water trust districts of the colony, and which are themselves supplied from the Murray by pumps, the raising of the water to the higher levels being in three separate lifts. The station for the first lift is at a point on the river known as Psyche Bend, about five miles by road above the township. Here the water is to be thrown into the head of a lagoon, which, being separated from the river by a substantial embankment, will form a convenient reservoir. The works at this station had made considerable progress prior to Mr. Deakin's former visit to Mildura, fifteen months ago. Little has been done to them since, the floods of the past two winters having been sufficient to fill the lagoon without the aid of pumping, and the sites of the engine beds and works being at the present moment submerged to such a depth that even coffer-damming would be a work of some difficulty. The lift from the summer level of the Murray to the top water level of the lagoon is 24 feet; but, although the water surface frequently falls below summer level, and so remains for several months during some dry seasons, the actual lift will rarely be so great, because the water surface in the lagoon will not, as a rule, be maintained at its full height. In fact the pumps at the next station are designed to lift from as low as 15 feet above summer level—that is, 9 feet below the top water surface of the lagoon. The next, or No. 3 pumping station, is on the lagoon, and about two miles nearer to the township than Psyche Bend. The plant, which has just been completed, is a very powerful and perfect one. It consists of four 20-inch centrifugal pumps, driven by a triple expansion four-cylindrical engine, of 1,000 indicated horse-power, and supplied with steam by two pairs of multitubular steel boilers, each 3 feet 6 inches by 14 feet. The housing is of brickwork, both substantial and ornamental, finished internally and externally in a style not generally seen in engine-houses; and the boiler house has room for another pair of multitubular boilers, which will make, with those in position, six in all. The rising main that delivers the water from the lagoon into the 50 feet channel—that is, the channel whose water surface is 50 feet above the summer level of the river—is 48 inches diameter, of wrought riveted boiler plate. This plant having just been finished, and not yet at work, the service is

being performed temporarily by a 20-inch centrifugal pump driven by a Tangye engine. The next pumping station is at a place known as Nichol's Point, about a mile above the township; and here the water is raised from the 50 feet into the 70 feet and 85 feet channels, the latter being probably the highest level main that will be constructed on the settlement. The pumping machinery at this station has been completed some time, and the party had an opportunity of seeing it at work. It consists of two 20-inch Allen's centrifugal pumps, driven by a triple-expansion engine of 450 indicated horse-power, supplied with steam from a pair of multitubular steam boilers of the same pattern as those at the station on the lagoon. These boilers are capable of working up to a pressure of 160 lbs. of steam. The whole of the plant is housed in substantial and elegant brick buildings; the walls plastered inside and ornamented with painted dados, and the ceilings lined with varnished pine. The designs of some of the machinery, notably of the four-cylindered engine at the No. 3 station, and the arrangement of the whole of the plant, is the work of Mr. George Chaffey. Several novel features have been introduced, which, it is claimed, conduce to economy of fuel and general efficiency. As to the workmanship and execution generally, suffice it to say that better was never turned out. Basins lined with cement concrete, and fitted with cast-iron sluice-gates, are constructed on the channels at the inlets and the outlets of the suction and delivery-pipes. The three lines of main channel above referred to, the 50 feet, the 70 feet, and the 85 feet levels, have already been constructed to a total aggregate length of 70 miles, and there are connected with them 140 miles of distributary channels. Extensions are being pushed rapidly forward to provide for the service of the further areas of land that are being constantly laid out and prepared for settlement. The pumping plant at the three stations referred to, with the three lines of main channel and their dependent system of distributaries, will, when completed, provide for the irrigation of the whole of the lands of one 25,000-acre block. All the allotments at present under tillage are supplied from these channels, the extensions keeping pace with the progress of settlement, excepting only the estate of Lord Ranfurley's party. This property is situated down the river, some miles below Mildura township; and is supplied by a separate pumping plant, of one 8-inch centrifugal, driven by a small steam engine. It has also a separate system of channels, which are lined throughout with cement concrete, to avoid waste of water by soakage, and fitted at short intervals with iron outlets to the service ditches, closed by plugs that can be readily removed and replaced by hand.

THE CLEARING AND BREAKING UP OF LAND

in preparation for planting is for the most part carried out by the firm at contract rates, though a few of the settlers have elected to clear and break up their own. The firm also arranged to provide young trees for those who choose to buy from them, and in some cases do the planting as well. There are, however, several private nurseries already established at the settlement; so that the Messrs. Chaffey have not a monopoly, and the prices of stock are likely to be kept down by competition to reasonable limits. Powerful traction engines are employed in the work of clearing; and the great bulbous roots of the mallee, after being slightly loosened from the ground by the pick and shovel, have a steel wire cable passed round them, and are torn bodily from the earth by sheer force. They are then cut up into convenient pieces for fuel for the engines. Roots of as much as half a ton weight, and even more, are thus disposed of without apparent difficulty. For the breaking up of the ground, cultivators, which are in effect simply gigantic scarifiers, with a steering wheel and hand gear, and a seat for the driver, are employed. The tines of these machines tear up the soil, without, however, turning it over, to a depth of 18 inches. In the preparation of land for planting it is twice scarified by the cultivator, the second working being at right angles to the first. The implement is drawn across the field by traction-engines, one placed at each side, and connected to it by steel wire ropes, running on winding drums. Each pair of traction-engines and cultivator can get over ten acres per day, scarifying it twice to 18 inches depth, that is, twenty acres per day once worked. There are at present eight powerful traction-engines and two of those huge cultivators employed in the work of clearing and breaking up. After the second cultivation the surface of the land is graded—that is, reduced to a series of uniform slopes. This is accomplished by removing the earth from the high

places, and depositing it in the hollows, scoops being employed for the purpose. The finishing touches are given with an implement known as the buck-scraper, which leaves the land as smooth almost as the surface of a bowling green. The buck-scraper now in use at Mildura, it may be mentioned by way of parenthesis, differs considerably from that of which the pattern was sent from California by Mr. Derry, when he accompanied Mr. Deakin on his visit to America. The old buck-scraper, which is now in common use in the colony, is in effect a beam with a cutting edge, with a projecting arm behind for regulating the angle of the cut. The improved scraper, on the other hand, is a scoop with a cutting edge in front, the blade being horizontal when the scoop is in its normal position. Those seen in use were 7 feet long, 2 feet wide, including the cutter, and 8 inches deep at the back, the bed being perfectly flat. They have a short projecting arm behind, by means of which the driver regulates the depth of cut, causes the scoop to tip and deposit its load where required, spread it out with any required degree of thinness, and smooth it down to a fine, compact surface. These scrapers were usually drawn by four horses. The final operations consist in picking up and burning off the sticks and roots torn up and left on the surface by the cultivators, and reducing the land to a fine tilth by means of the disc harrows. To aid in the operations of grading and finishing a little water is used. It helps the eye to determine the lay of the surface, and it mellows the soil, and renders it more amenable to treatment. This description applies to the preparation of land for planting with fruit trees or vines. The preparation for lucerne, hay crops, or pastures, is similarly performed, except that the surface, instead of being laid out in a succession of slopes, is divided into level, or nearly level, terraces, separated by shallow ditches with low embankments, called checks. The irrigation of young vines and fruit trees is performed by drawing a light plough furrow down each side of each row of trees or vines, running the water down the furrows from the service channel, and checking it where necessary with the spade or hoe, so that it soaks into the roots of each plant. After each watering, when the ground has sufficiently dried, the whole of the surface is lightly stirred by a horse hoe or small scarifier, an operation which restrains evaporation from the soil, and checks the growth of weeds. Great importance is attached to the cultivation of the ground after watering. It is even said that, if the subsoil be well saturated in the winter, established plantations, where the roots have got well down, may be pulled through a severe summer by means of frequent cultivation alone. No exact information could be obtained as to the actual quantity of water used, or expected to be used, on any given area of land.

THE DISTRIBUTARY CHANNELS,

however, are designed so as to be able to carry a volume of 60 cubic feet of water per minute, for 24 hours once in each month, for every 10 acres commanded by them. If the channels are kept constantly running, with a full supply, this would be equivalent to 24-inch acres per month for every 10-acre block, the inch-acre being a volume equal to a depth of 1 inch over an area of 1 acre. Or, to put it in another way, it would be equal to a gross depth of 12 inches over all the land commanded during a full summer season of five months. In practice this might mean a net depth of 10 inches applied to the land, in the same time, after allowing for inevitable waste in conveyance and distribution. Besides the more practical business of cultivating fruit and other crops for sale, many of the settlers have devoted considerable attention to the adornment of their dwellings and homesteads. There were hardly to be seen any such miserable erections of weatherboards and galvanized iron as everywhere disfigure the northern plains, even in districts that have been settled for fifteen or eighteen years. On the contrary, most of the houses had some pretensions to merit, from an architectural point of view; while several might fairly be described as artistic in design and surroundings. Flower gardens were frequent, and a few of the better homesteads were surrounded by infant shrubberies, in which in a few years they will be completely embowered.

In an official report on the condition and progress of the Mildura settlement, presented by the Chief Engineer of Water Supply about two years and a half ago, attention was called to what then seemed the necessity for reserving strips of land for

THE GROWTH OF TIMBER,

both for climatic reasons and to maintain a supply of fuel. It was suggested in

that report that a reservation for these purposes of about one acre in sixteen of the total handed over would probably prove sufficient. The Messrs. Chaffey now explain that there are numerous strips, ridges, and low dunes lying above the level of the channels, which could not be economically supplied with water. These amount in the aggregate to more than one-sixteenth of the total area. It is stated to be the intention to have them permanently set apart for timber plantations; and if this be so, the difficulty pointed out will be satisfactorily disposed of. Another question that will demand early and serious attention is that of

SANITATION.

The water supply for the town is pumped from the river at a point immediately below where the boats lie when delivering or taking in cargo. During the two days that the "*Ellen*" lay at the Mildura landing, there were two others of considerable size also moored there, with their crews on board, and boats are at all times coming and going. This may not give rise to any trouble while the river is in flood, but it is likely soon to prove otherwise when it is low, unless proper steps be taken. When the town shall have grown sufficiently to warrant such a course, probably the best way will be to subject the water intended for its supply to precipitation by lime. Experience in Europe has shown this to be a very efficient means of purifying water intended for human consumption. Dr. Katz's analysis of that supplied from the Coliban system confirms the results of this experience. The method is, moreover, one that involves comparatively little cost, and is simple and easy of application. Regulations might, however, be framed with a view to minimize the pollution of the river by boats lying at the wharves. The agricultural settlers would do well to provide themselves with house tanks, when they might collect from their roofs sufficient rain-water to meet demands for drinking; the water from the channels being used for cleansing, and for all such purposes as involve boiling and the consequent destruction of dangerous germs. Other sanitary measures will readily suggest themselves that could be easily given effect to in a country where the soil is generally dry and sandy, and where lime can be procured almost anywhere, at shallow depths, for the mere labour of digging and burning.

THE QUANTITY OF WATER AVAILABLE.

The fear that has been expressed in some quarters that the waters of the Murray River would be depleted by the withdrawal of the volumes required for the use of the irrigation settlements is one that does not seem likely to be soon realized. The surface of water in the river at Mildura is at present 22 feet above the ordinary summer level. The mean width of the river channel is not less than 400 feet, and the mean depth of this width above summer level not less than 16 feet. There are, therefore, in every mile of the river channel, in round numbers, 34,000,000 cubic feet of water over and above the summer level; that is, in every mile, 7,000 inch-acres of surplus or flood water, after making the most liberal allowance for loss by percolation, evaporation, and waste in the using. The distance by the river from Mildura to Swan Hill is about 460 miles; so that the volume of flood water at any moment in this section of the river alone, in its present state, is equal to 2,820,000 effective inch-acres. The area of that entire block set apart for settlement at Mildura is 250,000 acres, whereof probably 200,000 will be the maximum at any time irrigated. The block of flood water in the section referred to, therefore, would be equal to putting a depth of 14 inches of water over the entire irrigable surface of the Mildura settlement. But the mean current of the river is not less than $1\frac{1}{2}$ mile per hour, so that the block of 460 miles would be renewed by displacement every thirteen days. That is to say, in

THE PRESENT CONDITION OF THE RIVER,

the flood water in this length alone would be sufficient to put 14 inches of water over the whole Mildura settlement rather oftener than once a fortnight, while a total depth of 10 inches in an entire summer is the maximum proposed to be used. The river has been in high flood for the past three or four months, and is likely

to remain pretty high for some months yet to come. It was also in a still higher condition of flood during the whole of the winter of 1889. Reflection on these facts should convince the most sceptical that we are very far from having mortgaged the available water of the Murray. On the contrary, it should enable us to see that, to permit these vast volumes of fertilizing fluid to pass on unused to the ocean, instead of turning them to account for the sustenance and delectation of man, is to commit a crime. Another reflection that forces itself upon one, when looking at the progress of the irrigation settlements on the Murray River and elsewhere in Victoria, is the opportunity here offered to the disinherited of fortune, and those who have been worsted in the struggle to establish a footing for themselves, or have wearied of maintaining the fight, to commence life afresh under new and promising conditions. To make a start here does not demand any great amount of capital, especially if the settler be willing and able to labour with his own hands. He can buy land on credit by the payment of a very moderate deposit. He may also obtain employment at fair wages, the balance of which, after providing for his own maintenance, he may invest in the clearing, cultivation, and planting of his land. Or if he has enough money to buy, prepare, and plant his selection, and to keep him until his trees begin to bear a marketable crop, he may at once assume the position of an owner of the most valuable kind of property, without encumbrances.
