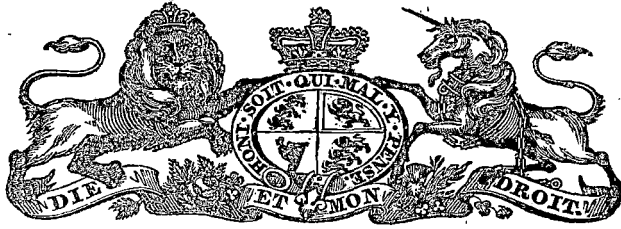


(No. 43.)



1861.

TASMANIA.

IRRIGATION.

REPORT OF SIGNOR MARTELLI, *C. E.*

Laid upon the Table by Mr. Chapman, and ordered by the House to be printed,
10 September, 1861.



To the Honorable the Members of the Commission on IRRIGATION.

GENTLEMEN,

IN accordance with the instructions received from you, at the Meeting held on the 24th of December last, I proceeded to New Norfolk, where I had an opportunity on the property of Dr. Officer, of seeing Irrigation, on the principle of gravitation, scientifically and successfully applied, though on a small scale.

New Norfolk.
(Dr. Officer, M.H.A.)

From New Norfolk, by the directions of Dr. Officer, I proceeded to Redlands, the estate of Mr. R. C. Read. On this property the water is taken from the Plenty Creek by means of a temporary dam across the bed of the stream; the channel does not take the water by a regulation sluice, but simply by gravitation; it is about six feet in width by two in depth, and discharges about six cubic feet per second, and the water is distributed through a good portion of ground; but I remarked that, from the inequalities and imperfections of the channel, only about one-half of the water received at the mouth was distributed over the land. At a comparatively small expense, and under the present proprietor's management, the same supply of water would be sufficient to irrigate five to six hundred acres, and to fertilize one of the most profitable estates in this part of the Island.

Redlands.
(Robert C. Read, Esq.)

Leaving Redlands, I visited Fenton Forest, the property of the Honorable Captain Fenton, on whose fine estate Irrigation has been commenced on an extensive scale. The water is taken from Russell's Falls Rivulet by a channel of about three miles in length; but the dam across the stream is constructed from the trunks of trees, and allows much of the water to escape, thereby lessening the utility of the dam; it is still, however, sufficiently water-tight to send six cubic feet of water per second into the channel. The channel is partly cut through the rock, but being imperfect in some parts allows a great proportion of the water to filter through and become absorbed. This, however, is only a matter of detail. The original conception is magnificent, and worthy of the intelligent and spirited owner of this fine estate; under whose supervision the present works might be made to irrigate about twelve times the present quantity,—say about six hundred acres,—thereby producing a great amount of benefit.

Fenton Forest.
(Hon. Capt. Fenton.)

From this delightful and hospitable spot I proceeded to Clarendon, the residence of Mr. John Walker, where Irrigation has been carried out on the principle of the well-known Mr. Mechi, of Tiptree Hall. The sluice-gate, escape channel, and hydraulic pump necessary for this system are the most perfect and efficient I have seen; but, it is to be regretted that it should have been attempted, as it is one by which only small results are obtained by a large outlay. When it is considered that, with the machinery in perfect order, the pump can only be worked up to thirty-two strokes to the minute, and only sufficient water supplied to fill a pipe of three inch diameter, it will be easily seen that the land irrigated would not pay for the expenditure when worked on an extensive scale.

Clarendon.
(John Walker, Esq.)

After leaving Clarendon my next stage was Hamilton, and, directed by Dr. Sharland, I then went on to the Lawrenny estate, a magnificent property of thirteen thousand acres watered by the Derwent and Ouse, and including about four thousand acres of level land. I was here shown by Mr. Hood, manager of this estate, where Irrigation had been commenced twenty years since by Mr. Lord. Could that gentleman have carried out his original plan no doubt it would have been successful; he was, however, thwarted by not being allowed to place the dam in the right locality through the refusal of Mr. Marzetti, then owner of the estate, now occupied by Mr. H. Nicholas. In consequence of which Mr. Lord was compelled to construct the dam on a principle not approved of by hydraulic engineers, and it was destroyed by the winter floods.

Lawrenny.
(Mr Hood, Agent.)

I then visited the works of Mr. H. Nicholas, and found that, through the dam not being placed on the right spot, the pump could not be worked to supply the land with water when most required, namely when the river is low.

Cawood.
(H. Nicholas, Esq.)

*Sherwood & Hatton
Field.*
(Isaac Sherwin, Esq.,
M.H.A.)

In my excursion to the valley of the Upper Clyde I had the advantage of having for my companion, the accomplished owner of Montacute, in whose company I visited the estates of Sherwood and Hatton Field. I there found the water taken from the River Clyde, a well constructed and substantial dam being placed across the river. The water flows into a tunnelled channel 115 yards long, cut in the solid rock, and the flow is regulated by a sluice-gate. The water runs into the channel at the rate of six cubic feet per second: this channel is divided into two streams, each irrigating about fifty acres, an area utterly disproportionate to the quantity of water expended, a great part of which is absorbed in the earth.

Ann Vale, Bielston.
(Mr. Sherwin.)

At Ann Vale Mr. Sherwin has seventy acres irrigated, and the same quantity at Bielston. The water is taken from the river by means of a temporary dam, and is distributed over the land by channels cut in the surface. Mr. Sherwin has about two hundred and forty acres of land under Irrigation.

Meadsfield.
(E. Nicholas, Esq.)

Mr. E. Nicholas at Meadsfield, irrigates about one hundred and twenty acres, and takes about three cubic feet of water per second from the river.

Rathc.
(A. Reid, Esq.)

Mr. A. Reid had about one hundred and twenty acres under Irrigation, but now confines his operations to the garden ground, in consequence of the dam not being so placed as to afford a supply of water during the dry season.

Nant.
(G. Nicholas, Esq.)

Mr. G. Nicholas is commencing works to render available the waters of the Clyde.

Dennistoun.
(W. B. Wood, Esq.)

On the estate of Mr. Wood, Irrigation might be carried out on a large scale; but in consequence of the water flowing at a wrong level, and in some parts lodging and forming stagnant pools, foot-rot has been caused amongst the sheep.

The Upper Valley of the Clyde is very available for the purpose of Irrigation, and under proper regulations more than three thousand acres of land might be irrigated. The chief difficulties are;—

1st. In placing dams in eligible localities.

2nd. In regulating the supply of water to the different proprietors, so that one may not take an undue quantity to the detriment of others.

*Lake Crescent, Lake
Sorell, Lake Arthur,
Great Lake.*

From the Valley of the Clyde I proceeded to the region of the Lakes. I visited the sources of the Clyde, Crescent Lake, and Lake Sorell, passed between Arthur's Lakes, and arrived at the Great Lake. I am convinced, from my inspection, that this magnificent body of water, comprising twenty-eight thousand acres in surface, is the grand reservoir of nature for supplying this part of the Colony with water for the purpose of Irrigation; it pours its supply of water into the Shannon, Ouse, and Derwent Rivers.

Hunterston.
(John Maddock, Esq.)

In consequence of my impressions respecting the Great Lake, I followed down the course of the Shannon River, and at the junction of the Tea Tree Creek came on the estate of Hunterston, now the property of Mr. Maddock. Twenty years since Mr. Patterson irrigated on a large scale. Water was procured from the river by means of a temporary dam, and a channel without a sluice-gate, and was carried by a wooden aqueduct for about half a mile, and continued for nearly three miles through stone and earth; the work was originally well executed, but being out of repair much water is now absorbed. It might readily, however, be put into condition to irrigate upwards of one thousand acres.

On my road to Bothwell I visited several properties, amongst others that of Mr. Clark, now occupied by Mr. Brown, and found great capabilities for Irrigation upon them. I would remark that the water of the Great Lake is peculiarly adapted for the purposes of Irrigation from its high temperature, the thermometer, when standing at 78 degrees in the open air, showing 69 degrees when immersed in the water of the Shannon.

Remarks on the neces-
sity of proper regu-
lations for Water-
courses.

During my journey I remarked that water is taken from the river without any control as to quantity. As the bed of the river is the property of the Crown, I consider the Crown has a right to regulate the distribution of the water flowing in such bed, according to equity and justice.

As the success of Agriculture is essential to the public good, so it demands the intervention of Government for the protection of all measures calculated to promote its success. In the event of a comprehensive system of Irrigation being determined on, it will be necessary that the attention of Parliament should be called to frame such an Act as will protect the interest of all parties, providing for the settlement of all questions respecting the occupation of land for construction of channels, distribution of water, &c., by arbitration.

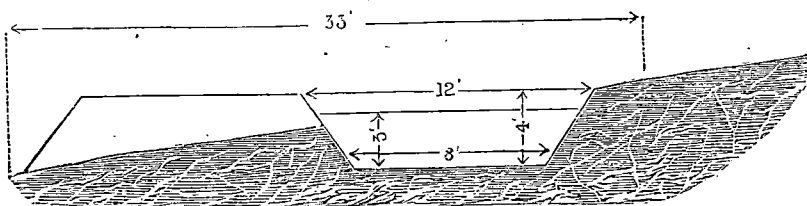
I think, Gentlemen, it is my duty to make some practical remarks on the places I have visited, and to submit to you such proposals as I deem most certain to carry out Irrigation on a large scale, and with the most profitable results. The astonishing increase of produce arising from Irrigation is too important to be passed over. With regard to its application to horticulture, the increase is about from one to ten,—that is to say, one acre under Irrigation will produce as much as ten under ordinary tillage,—while on pastoral lands, the ground which would only support eight sheep to ten acres, I find by my own observations can be made to carry on an average about eight sheep to each acre,—making an increase from one to seven. The addition to the industrial resources of this Colony, would be immense. I hope, therefore, for the benefit of the Colony that my proposals may meet with a favourable reception, and be adopted and carried out by some company of intelligent and enterprising men.

PROPOSITIONS AND PLAN.

1. Weasel Plains Channel, length about 15 miles, commencing at the junction of the Tea Tree Scrub with the Shannon River;—to irrigate 4000 acres of ground and to supply Water to the Township of Bothwell.

SHANNON RIVER CHANNEL.

Hunterston and Cluny.



$10 \times 3 = 30 \times 66 = 1960$ cubic feet = 73 cubic yards. $73 \times 80 \text{ ch.} = 5840 \times 15 = 87,600$ cubic yards; at $1s.$ = £4380. Land $1200 \text{ chains} \times \frac{1}{2} = 60$ acres.

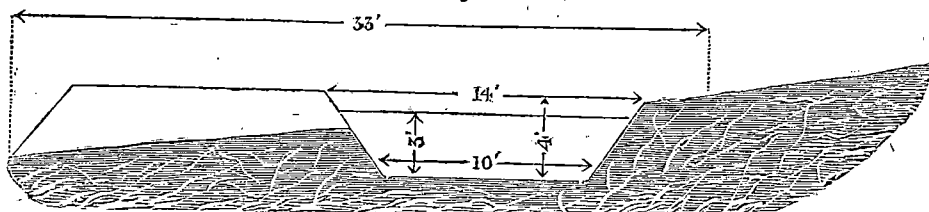
	£
Dam across River.....	150
Double-effect Regulator	120
Excavation of Channel.....	4380
Rubble Masonry	250
Bridges	210
Distribution Sluices	180
Timber for Aqueduct	310
Incidental Expenses.....	220
Land, 60 acres at 60s.....	180
	£6,000

When it is considered that a portion of this sum might be deducted for the supply of Water to the population and gardens of the Township of Bothwell,—that the land proposed to be irrigated is of the best description,—and that the return will be as seven to one,—there will be no difficulty in realizing a lucrative return for capital, either by disposing of the Water-right by sale in perpetuity or by annual rental.

2. High Plains Channel, length about 10 miles, commencing on the left bank of the River Ouse, three miles above Cawood and opposite Arthur's Seat;—to irrigate 6000 acres of ground running along the sides of the hills between the Valley of the Ouse and the Valley of the Clyde, in the direction of North West and South East: continuing the direction indicated, it would, in addition to the Irrigation of the land, supply Water to the Township of Hamilton.

OUSE RIVER CHANNEL.

(Lawrenny Estate.)



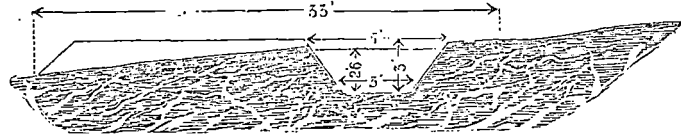
$12 \times 3 = 36 \times 66 = 2376$ cubic feet = 82 cubic yards. $82 \times 80 \text{ chains} = 6560 \times 10 = 65,600$ cubic yards; at $1s.$ = £3280. Land $800 \text{ chains} \times \frac{1}{2} = 40$ acres.

	£
Dam across River.....	200
Double-effect Regulator	220
Excavation of Channel.....	3280
Masonry Work.....	300
Bridges.....	120
Timber Aqueduct.....	670
Water Distribution Sluices	72
Land, 40 acres at £5.....	200
Incidental Expenses.....	340
	<hr/>
Total.....	£5,402
	<hr/> <hr/>

A part would be defrayed by supplying the Township of Hamilton with water; leaving the remainder for the Irrigation of 6000 acres,—being only at the rate of about eighteen shillings an acre. The magnificent area of country proposed to be irrigated at this small cost, is now only able to support about 4800 sheep; under Irrigation it would support about 36,000. The advantages to be derived are too apparent to require further comment.

3. Derwent Channel length about 8 miles, to supply water to the Plains opposite the Township of New Norfolk. To commence on the left bank of the Derwent about a mile above the junction of the Plenty Creek, where the bed of the river is highly favourable to hydraulic engineering; to irrigate about 800 acres on the banks of the Derwent, close to the Township and abutting on navigable water. The discharge of the waters of this Channel into the Derwent will furnish a motive power for working flour, sawing and other mills, and for various industrial purposes.

DERWENT RIVER CHANNEL.
(New Norfolk.)



$$4' \times 2:6' = 10 \times 66 = 660 \text{ cubic feet} = 25 \text{ cubic yards. } 25 \times 80 \text{ ch.} = 2000 \times 8 \\ = 16,000 \text{ cubic yards; at 2s.} = \text{£}1600. \text{ Land } 640 \text{ chains} \times \frac{1}{2} = 32 \text{ acres.}$$

	£
Dam across River.....	150
Sluice Gate	100
Excavation of Earth and Rock	1600
Masonry	600
Bridges	200
Distributing Sluices	80
Land, 32 acres at £5	160
Incidental expenses	310
	<hr/>
	£3,200
	<hr/> <hr/>

Some part of the cost may fairly be deducted for the use of motive power. Taking into consideration the proximity to the Township, the facility afforded by water-carriage for the export of produce to all parts of the Colonies, I shall not be far out when I state my belief, that this will be the first of my proposals to be carried out.

In concluding this *preliminary* Report, it may be satisfactory to recapitulate the Properties and Number of Acres that can be brought under Irrigation by the present proposals:—

	ACRES.
R. C. Read, Esquire	500
The Honorable Captain Fenton	600
Upper Valley of Clyde.....	3000

Shannon and Clyde	4000
Ouse and Clyde.....	6000
New Norfolk	800
	<hr/>
Total.....	14900
	<hr/>

making about Fifteen Thousand Acres, which under this system will produce a quantity equivalent to One Hundred Thousand Acres under the old system of tillage without Irrigation.

I have now only to express my acknowledgments to the owners and occupiers of the Estates I have visited for the hospitable reception I have invariably met with, and for the facilities which have been afforded me in pursuing my investigations.

A. MARTELLI, C.E.

Hobart Town, 15th January, 1861.



To the Honorable Members of the Commission on IRRIGATION.

GENTLEMEN,

IN accordance with your instructions received at the meeting on the 15th January last, and assuming that the valley of the Macquarie was the principal object of my excursion, I proceeded to Tunbridge, and from thence to Mona Vale, where, by the attention of Mr. Kermode, I received the necessary instructions to follow up the course of the Macquarie. I first proceeded up the South valley of this River to the Reservoir of water known as Tooms' Lake. This is an artificial lake, that is to say, a Reservoir which, in case of necessity, could be made to contain more water, and, by means of double regulating sluice-gates and some modifications in the construction of the dam, a supply of water could be obtained for an important surface of ground.

Valley of the Macquarie River.

Tooms' Lake.

From this place I directed my steps to the North valley of the Macquarie, where I saw with great pleasure the locality of Long Marsh, a place adapted by nature for extensive operations for the storage of water for the fertilization of the lower part of the valley. Some operations have been commenced, and the spot is well chosen for the dam; and it being my opinion that the time is not far distant when the attention of the public will be directed to this spot, I shall, in another part of this Report, give an estimate of the probable cost of works necessary for this purpose, and also of the quantity of land suitable for Irrigation.

Mounting the valley of the Macquarie, I next came on the vale of the Elizabeth River, and so on to Kearney's Bogs. At the foot of Snow Hill are two places remarkably adapted for Reservoirs, which will not only store a sufficient supply of water for the Irrigation of a very important surface of land, but, in regulating the bed of the River for the Irrigation of the valley, a double benefit will be obtained, as the channels which will be required will also act as drains, thereby rendering available Kearney's Bogs, a fine piece of ground of more than two thousand acres, now covered with water, and totally useless. Proceeding up the valley of the Elizabeth, traversing a fine tract of land, through Campbell Town, and crossing the River at its junction with the Macquarie, I arrived at Morning Side, on the left-hand bank of that River. At this place I was convinced of the necessity for the Reservoirs; the amount of water contained in the River being only about 15 or 16 cubic feet per second, a quantity almost useless for the immense tract of land required to be irrigated.

Valley of the Elizabeth River.

Leaving Morning Side, with directions from the Honorable Mr. Gell, I continued my journey through the valley of the Macquarie, and found a very considerable quantity of land suitable for Irrigation. Proceeding to Lake River valley, I found the quantity of water in the River to be running about 25 or 30 cubic feet per second: this is a fair proportion, but it cannot always be depended upon, the dry summers greatly diminishing its bulk. But, as I stated in my first expedition to the Lakes, and especially to Arthur's Lake, the necessity of uniting the two Lakes by a deep drainage channel. While regulating the bed of the Upper Lake River, a more perfect communication can be formed with Wood's Lake; and, through the consequent drainage of the surrounding country, a very large quantity of land will be reclaimed, highly suitable for pastoral purposes. By deepening the bed of the Lake River from its mouth at Wood's Lake, and placing there a good regulating sluice-gate, enough water can always be commanded from these three Lakes for the Irrigation of the lower valley of the Lake River.

Valley of the Lake River.

Leaving the Lake River valley, I directed my steps towards Longford, and from there to the fertile and beautiful valley of the Meander. At Quamby I received fresh directions from the Honorable Sir Richard Dry, and proceeded to Deloraine, Elizabeth Town, and the valley of the Mersey; passing through the beautiful lands of this River, I arrived at the township of Latrobe. The land in this valley is adapted for every kind of cultivation, and the quantity of water contained in the bed of the River, with the good natural position, render this locality remarkably well adapted to the purposes of Irrigation. The facility enjoyed by this fine district of water-carriage, by way of Port Frederick, thus giving an easy means of exportation, combined with its other advantages, will, no doubt, cause it to become ultimately a place of great importance. I returned through Deloraine and Westbury to Launceston, and remarked the great capability of Irrigation, not only by means of the River, but also by Springs in different places on my route along the valley of the Meander.

The Valleys of the Meander and Mersey Rivers.

The Valleys of the North Esk, South Esk, and Nile Rivers.

From Launceston, following the course of the North Esk, passing the White Hills, I arrived at Evandale; leaving which place I passed through the spacious and magnificent plains extending along the banks of the South Esk and the Nile River. The quantity of water running in the bed of the River and the fine natural position of the land combine to render this splendid country highly adapted to the purposes of Irrigation. Crossing the Nile I kept the right-hand bank of the River to the village of Llewellyn. It was my original intention to have proceeded to Avoca, but seeing from the increased rapidity of the River that it ran from an elevated country where Irrigation would not be so much required, I retraced my steps when about half-way from Llewellyn to Avoca; the weather being most inclement and the rivers flooded, returned to Campbell Town. From thence I passed through Ross, where, at Beaufront and Somercotes, by the attention of Captain Horton, I was shown some works constructed for Irrigation, for which the land is well adapted. From there through Ross to Hobart Town, remarking on the road several small spots where Irrigation could be advantageously employed.

Quantity of Land where Irrigation can be easily applied.

During my journey I have seen many localities where large surfaces of ground could be irrigated with great facility, from the regularity of the ground and the possibility of procuring a supply of water either from the bed of the rivers or by constructing dams across the hills for the storage of water, and in some places from natural springs.

I shall now give a list of the different localities, premising, that the quantity of acres named is not to be taken as absolutely correct, but as a rough calculation of the distance passed over, taken by practical means.

	<i>Acres.</i>
No. 1. Country around Tunbridge	4,000
No. 2. Ross and Campbell Town, and adjacent country	6,000
No. 3. Banks on the left-hand side of the Macquarie	9,000
No. 4. Banks of the Macquarie, right-hand side	11,000
No. 5. Both banks of the Lake River, before joining the Macquarie	3,000
No. 6. Environs of Longford, to the junction of the South Esk River with the Meander, left-hand side	5,000
No. 7. Plains opposite Longford, right-hand side of the River	3,000
No. 8. Plains of Westbury, Deloraine, &c. &c., Meander Valley, right-hand side, and Quamby's Brook on both sides	12,000
No. 9. Valley of the Mersey, from the Native Plains on both sides of the River	4,000
No. 10. Plains from Evandale to Nile River on both sides and Ben Lomond Rivulet, that is to say, all the right-hand side banks of the South Esk	12,000
No. 11. Plains of Cleveland, that is to say, banks of the South Esk, left-hand side from Stony Creek	10,000
No. 12. Partial Plains, that is to say, North Esk near Launceston, Cornwallis, Oatlands, Quoin, Serpentine Rivulet, &c. &c.	4,000
Total	<u>83,000</u>

This quantity of 83,000 acres only comprises such land as I have considered, from its natural position and advantages, could be most easily and economically irrigated. I have seen besides a large proportion of good land which will, no doubt, be ultimately fertilized by the use of water; but I think it will be agreed that in a country where labour is high, in carrying out a work of public utility, such as a comprehensive scheme of Irrigation, every facility afforded by nature should be taken advantage of in preference to expending large means on more difficult positions, or undertaking to irrigate localities presenting difficult and expensive solutions of hydraulic problems.

Different Systems of Water Supply for Irrigation.

In carrying out Irrigation in this country four different systems will be employed, viz:—

1. By taking water direct from the River and supplying the ground by cutting channels. For example, take the Lake River and Mersey Valley, &c. &c.
2. From the Reservoirs, as on the ground adjoining Elizabeth River, near Campbell Town.
3. A combined supply from the Rivers and Reservoirs, as on the left-hand side of the Macquarie.
4. A combined system from Springs, Reservoirs, and Rivers; as, for example, the country at Meander Valley.

Quantity of Water required for Irrigation.

From Rivers.

The quantity of water required for Irrigation is greatly modified by different causes, viz:—The different modes of culture to which the land is to be subjected; the quality and position of the soil; and, also, the diversity of the seasons. During my journies of investigation through this Island I have never been able to gain the smallest information as to the quantity of water used in the Irrigation already effected. I have, therefore, endeavoured to solve that question by a comparison between this climate and that of my own country; also, to further assist me in

coming to a tolerably accurate conclusion, I have carefully studied the different characters of soil, position, &c. &c. I trust I have obtained as results, which experience will prove to be not far from the truth. One cubic foot of water per second will irrigate as follows:—

	<i>Acres.</i>
1. Artificial Meadows and Horticultural Land.....	60
2. Agricultural Land.....	80
3. Pastoral Land in primitive state, but sown with imported grass seeds	160
	<hr style="width: 100%;"/>
	300
	<hr style="width: 100%;"/>

I consider that Irrigation upon native grasses would not prove to be sufficiently remunerative.

Allowing, however, for land occupied by roads, paths, &c., it may safely be calculated that one cubic foot of water per second will irrigate 100 acres of land.

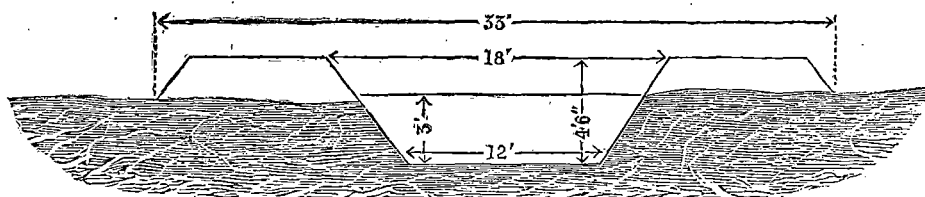
But in the employment of water stored in Reservoirs, a system altogether different must be observed from that taken direct from running streams. Water kept in Reservoirs is only distributed over the surface of the earth at the time when the exigencies of agriculture require it; at all other times the sluice-gate of the Reservoir must be kept shut. For the distribution of these waters a Time Bill must be kept, stating on what days and hours the water will be allowed to the several proprietors or lessees, according to their respective rights; so that the water may never be wastefully expended. Basing upon this system my calculations, and, also, taking the chance of a very dry summer, I have come to the conclusion that 30,000 cubic feet will be necessary storage for each acre of land. Taking also into consideration the quantity soaking through the bed of the Reservoir, and the evaporation ensuing from the exposure of a surface of water, I have further added 15,000 cubic feet of water per acre allowance for the unavoidable waste: the quantity, therefore, required to be kept in store will be about 45,000 cubic feet per acre. This may appear a very liberal and, perhaps, over-abundant supply. I will admit such may be the case in ordinary seasons; but if there is an error, it is on the right side, since it will only leave a supply of water on hand to meet any exigencies that may occur.

From Reservoirs.

My next consideration must be the probable cost of water, a very important clause in all undertakings. Of course, the price will vary according to the nature of the soil, declivities of the land, and the sources from whence the supply is to be taken.

Cost of Water.

I will give as a specimen a calculation which, in my estimation, will be about a very fair average of what the cost of water would be under existing circumstances. I will take the left-hand side of the Macquarie after its junction with the Elizabeth River. In that locality there are about 9,000 acres available for Irrigation; but for the present subscribers could, perhaps, only be found for 5,000 acres. It will be necessary to cut a channel along the foot of the hills and put a dam across the river; sluice-gates, regulators, masonry, bridges, aqueducts, where required, will, by my calculations, amount to about £16,500, about £330 per cubic foot and £3. 6s. 0d. per acre.



$15' \times 3' = 45' \times 66' = 2,970$ cubic feet = 110 cubic yards; $110 \times 80 = 8,800 \times 30 = 261,000$ cubic yards of excavation at 1s.; £13,200. Area of land— $2,240$ chains $\times \frac{1}{2} = 112$ acres.

The works required for such irrigating channel, supposed to be 30 miles in length, will cost as follows:—

1. Dam across the River.....	£200
2. Double-effect Regulator.....	250
3. Excavation (as above).....	13,200
4. Masonry.....	500
5. Water-works.....	575
6. Bridges—18, at £30.....	540
7. Distribution Sluices—20, at £12.....	264
8. Land—about 112 Acres, at £5.....	560
9. Contingency.....	411
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Total.....	£16,500

River Water.

Reservoir Water.

But the body of water that could be taken from the stream of the Macquarie without interfering with other people would only be sufficient to irrigate 1,000 acres. A Reservoir will, therefore, be required for the storage of a supply of water sufficient for 4,000 acres, viz., 180 millions of cubic feet. At the foot of Snow Hill is a spot well adapted by its position for such a purpose, being at the foot of a mountain more than 3,000 feet in height. The works required for such a Reservoir will cost about

Average length at the Dam, 300ft. \times 77'6" \times 30 = 697,500 cubic feet = 25,834 cubic yards, at 1s. 3d. in average prices, £1614. Yards cubic—1620.

Dam across Hills.....	1620
Rubble Stone for ditto.....	150
Clearing Bed of Reservoir.....	350
Flood Gates and Distributors	250
Brick Work, &c.	400
House for Water Bailiff	60
Regulation of Bed of River and Drainage of Bog	800
Contingencies	350
	<hr/>
	£3,980
Cost of River Work and Channel.....	£16,500
	<hr/>
Total	£20,480

Being about £4 per acre, which, at six per cent., will be four shillings and ten-pence (4s. 10d.) per annum for rent of water. To this amount may be added a moderate annual charge for Water Bailiff and Assistant, giving altogether the annual average rent of water in this country at six shillings (6s.) per acre. This plan, should inducement be held out in the shape of additional subscribers, can easily be extended to the Irrigation of 9,000 acres with only the small additional expense of another Reservoir; thereby greatly reducing the annual rent to the subscribers. I have not given the locality of Long Marsh as an example, in consequence of its being so favourably situated for the storage of water that a calculation based on that locality would not give a fair average of the general cost of other less favoured places. To show how highly I estimate its capabilities I have made a rough sketch of the amount to be expended for the Irrigation of about Fifteen Thousand Acres.

Dam lined with Rubble Stone and properly puddled Flood Gate	1950
Regulator and Masonry	690
Clearing and regulating Bed of Reservoir, &c. and Water Bailiff's Residence	550
Works to Bed of River and Contingencies.....	1200
	<hr/>
Total.....	£4,390

Being less than seven shillings per acre for storage of water.

Water of Springs.

The Springs that I have seen issuing forth from the earth in the valleys of Deloraine and Westbury have given me the idea that they may be made available for the supplementary irrigation of land. This water *strata*, which shows itself on the surface of the earth, is certainly produced by filtration between the bed and the alluvial soil, and can be rendered very available for Irrigation on a small scale. But to ascertain the cost of works required and amount of water to be drawn from this source would demand a particular study. Yet, as in Piedmont and Lombardy, advantage is taken of these Springs (there termed *Fontanili*) for the irrigation of land, I feel convinced the same result could be obtained from them in this country.

Benefit to be derived from Irrigation.

It is not my intention to expatiate very fully on the question of the material benefits to be derived from Irrigation, having already spoken on the subject in my first Report. The beneficial effects of this measure will soon show themselves directly and indirectly in any country where it is carried out with vigour and judgment. I think it is not necessary to speak of the five or six crops of hay per annum that we can have on irrigated land, or of the seven or eight sheep per acre that can be fed upon it, because that benefit is easily seen and sufficiently known; but I wish the attention of the public to be drawn to the indirect benefits, that is to say, by rendering this Colony independent of the other Colonies, and thereby putting a stop to the exportation of money; by taking advantage of the natural resources of the country to the benefit of agriculture and production, especially in a country like this, where the resources are large and the labour dear.

When it is considered that there is a great extent of country between Launceston and Port Frederick where, sooner or later, the whistle of the Railway will be heard, facilitating the transit of produce, and that, by means of the use of water, all the productions of this locality can be put directly in communication with foreign markets;—when we also consider that we shall not only be producing four crops a-year, but, also, that those crops can be produced at

seasons when neighbouring Colonies cannot possibly produce them, and that, consequently, a considerable increase of price is obtained,—we shall see that in this competition the Colony of Tasmania will always be victorious ; and the result will be exportation of produce and importation of money.

Having spoken of the quantity of land that can be irrigated ; of the probable cost, and having also touched upon some of the benefits to be derived—it now remains to be shown by what means the system is to be carried out. Financial Measures
for carrying out Irrigation.

There are three ways in which it may be done, namely :—

1. By the direct action of Government.
2. By Associations of individuals interested in the undertaking. (*Consortii*).
3. By the general system of Private Companies.

With regard to the first method, namely,—by direct action of the Government,—I do not think that I could recommend it to be carried out, it being objectionable on two grounds, viz.,—the risk of its causing financial embarrassments, and the chance of creating jealousy by the different localities not being undertaken simultaneously. With one exception,—in a case where there is suitable land unsold by Government and a good supply of water obtainable from running streams,—in such a case the Government, if desirous of promoting the settlement of small farmers, could perform the necessary works for a supply of water—say at the rate of one cubic foot per second to every hundred acres, more or less, according to quality of soil—the land could then be sold in small allotments, with water-right to each proprietor. The direct result would be a quick return to the country, with interest, of capital expended ; and, indirectly, by increased production and consequent utilization of your natural resources.

2. The second system is by associations of individuals interested in the undertaking. As this system can only be carried out by the aid of coercive measures of the majority against the minority, I do not think it would be applicable to this country, where the freedom of the subject is so carefully respected by the law.

3. Now, I have nothing further to recommend but the adoption of the system of Private Companies. I must explain my ideas on this subject.—Private Companies can be composed of landholders, merchants, &c. If you leave the shareholders to their own resources, you subtract the capital from their stock, from the improvement of agriculture and from commercial enterprise. To obtain a benefit on the one part, you have to contend with a difficulty on the other. How is this to be remedied?—By the application of foreign capital to the enterprise.

Supposing a Company formed for the purpose of irrigating a large surface of land under very favourable auspices, with proposed channel passing through fertile land, where proprietors have already subscribed for a large supply of water, the annual amount of rent for which would give interest for a great part of the capital required. If, to enable such a Company to make their shares marketable, they apply to Government for a guarantee for a moderate rate of interest,—would it be right for the Government in such a case to refuse their moral assistance? Moral Assistance
necessary from the
Government.

Not only, in my opinion, ought the Government, after ascertaining the utility of the scheme and possibility of execution, to give every material assistance, in the shape of ground required for dams, channels, flood gates, reservoirs, &c. &c., without compensation ; but, also, to take water from the adjacent supplies without prejudice to public claims and at a small amount of rent ; but, also, guarantee an amount of interest that shall put the Company in a position of procuring foreign capital to stimulate the development of the resources of this Colony.

In conclusion,—

1. By regulating the subtraction of water from rivers, creeks, lakes, &c., so as to stimulate private enterprise, and, at the same time, protect the public interests ;
2. By declaring all Irrigation works to be works of public utility, and placing them on the same footing as Railway works ;
3. By giving to such works assistance, whether pecuniary or otherwise, as may be required,—I am convinced that a fresh source of prosperity will be opened for this Colony by the rapid development of the resources nature has so bountifully bestowed on it.

A. MARTELLI, C.E.

Hobart Town, 15th February, 1861.