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[Tide Land Reclamation Co.]

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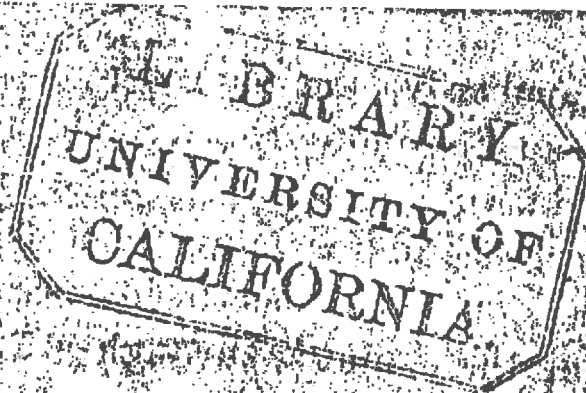
1872.

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FRESH WATER

TIDE LANDS

OF CALIFORNIA.



## REMARKS.

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THE reclamation of swamp and overflowed land is not, as many suppose, a problem to be solved.

The splendid sugar plantations of the lower Mississippi, and the rice fields of Georgia and South Carolina, fully attest what labor and engineering skill have accomplished in our own country, in transforming malarious swamps to useful fertility and pleasant homes.

The value of land that could be cheaply and effectually irrigated, and land enriched by overflow, as on the Ganges and Nile, has been appreciated for many centuries by the husbandry of all civilized nations. Sacred history informs us that the Egyptian granaries, insured by irrigation, were overflowing with corn when their neighbors were famishing for bread. Sesostris, who lived sixteen centuries before the Christian era, added much to the wealth of his people by constructing canals for that purpose. Italy, the "mother of the arts," has the most perfect system of irrigation in all Europe. The great canal of the

Ticeno, in Lombardy, was constructed in the 12th century, and, to quote from a modern writer, "it has carried a volume of water equal to 1800 cubic feet per second for more than 600 years. This great mass of water has been spread over the surface of the country through a thousand channels, stimulating the productiveness to such an extent as to make the country through which it passes one of the richest and most densely populated which the world has ever seen." Since the famine in India over 11,000,000 acres of malarious lands have been subjugated by drainage and irrigation, and now sustain a population of 500 to the square mile. Holland has wrested from the ocean the most valuable portion of her kingdom, and is now planning a gigantic scheme to encroach on the waters of the raging Zuyder Zee. The old Romans drained the marshes of the Tiber, "and fed the armies that ruled the world." Over one-half the best meadow lands in England were, not many years since, a valueless swamp.

The uncertainty of rain-fall in California in sufficient quantity to insure a fair crop more than *three* out of *five* years, on the average, detracts much from the general prosperity of the State. Add to this the gradual decrease in productiveness of the soil, especially under the one crop system, adopted as a matter of necessity, from the utter impossibility of *resting* the land as in the Eastern States, by cultivating domestic grasses for hay and pasturage, and there would



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be sufficient reasons for unpleasant forebodings, as to our future prosperity, if we did not to some extent appreciate the vast field of agricultural wealth embraced in the tide and overflowed lands, located on the margins of our navigable rivers.

The importance of the subject and the great prospect of success, stimulated the formation of the Tide Land Reclamation Company, which has purchased 120,000 acres of fresh water tide lands. We refer to the accompanying map which designates the Company's property.

Although there are several million acres of swamp and overflowed land, generally designated "tule," in California there is not to exceed 200,000 acres of what can properly be termed *fresh water tide lands*, as favorably located, and as valuable when reclaimed, as Sherman or Twitchell Island. By drawing a line on the map across the San Joaquin at Stockton, and five or six miles above the head of Steamboat slough, on the Sacramento River, and just below Sherman Island, where both rivers meet, and the within area will embrace all the land of that character in the State.

By the action of the tides, which rise and fall from four to six feet every twelve hours, the water is kept pure, and self-acting tide-gates can be used for drainage or irrigation, at pleasure. The trade winds during the summer months are pleasantly modified, but always invigorating; and these beautiful islands, with the charm of per-

petual verdure, are exempt from fevers and malarious diseases generally, and are destined in a few years to be the most densely populated and valuable agricultural lands on the Pacific Coast. Being free from roots or stones, and generally on a uniform plain, they are admirably adapted for steam cultivation.

The character of the soil is peculiarly adapted for levees, and should they be covered by water during an extraordinary flood, (as in '61 and '62) little or no damage would be sustained. Within a few years, our markets will be supplied from these fresh water tide lands, with fine clover and timothy hay, which can be placed in San Francisco, owing to advantage of cheap water transportation, and three or four crops yearly, at greatly reduced rates from what is generally paid for the poor article of straw hay that we are now compelled to use.

The question is, what products from these lands, when reclaimed, will be the most profitable? Will it be wheat, which matures in one hundred days, and yields from sixty to eighty bushels per acre? Barley, that in less time reaches one hundred bushels per acre? or timothy or clover that will crop eight to ten tons of hay annually? Vegetables and fruits grow in such abundance, that the market might be overstocked. It is believed by those familiar with the subject, that rice would find it a congenial soil. Madder, sugar-cane and cotton will probably be tested in a small way next year. As pasturage, either

for stock or dairy purposes, these lands have unequalled advantages.

That the fresh water tide lands are peculiarly adapted to the production of the Ramie plant, has been demonstrated, and in consideration of the great climatic advantage of this region, of all crops, it promises to be the most profitable. Roots for propagation may be readily obtained from the few nurseries recently established in Alameda county, or to any extent from the older ones of Louisiana, in the vicinity of New Orleans. The culture of Ramie is very simple. The roots are planted in furrows six feet apart, when the plants have grown to the height of five feet, they are bent over in the spaces between the rows and covered with earth; each bud of the buried plant will produce a shoot: this process is continued with a view to cover the field as equally as possible. As the Ramie is a perennial plant, when a field is once set, there is no further trouble. Nothing is left but to cut with a mowing machine, the two or three crops that may grow during the season, and at once from the green stalk dress the lint for market. Allowing for great variations in price, Ramie will yield a profit of from four to six hundred dollars per acre. The manufacturing world is literally clamoring for the fibre of Ramie, as, in short, there is nothing comparable to it, to mix with other textiles, and for the production of strength, fineness and finish. Nothing has prevented its widespread growth, but the want of a proper

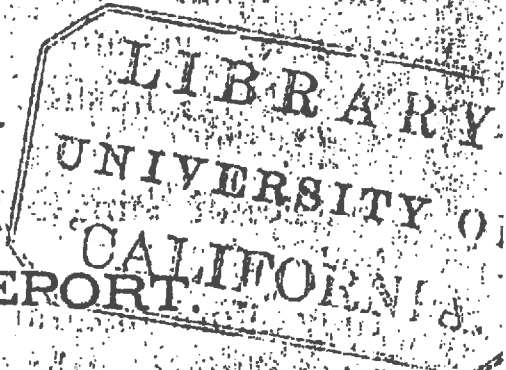
machine to separate the woody matter from the lint. This obstacle is now triumphantly overcome by an invention of Mr. W. M. Hughes, just completed in this city, at the Miner's foundry. The Hughes machine saves all the lint, and can dress a ton or more of clean fibre per day. This machine is to Ramie, what gin is to cotton.

Immunity against drouth, healthful and pleasant climate, inexhaustible productive powers of soil, and cheap transportation, are sufficient inducements to secure their reclamation, and in a few years they will be pointed to with pride, as constituting a great portion of the agricultural wealth of the State.

The following table, showing the rain-fall in San Francisco and the valleys of California, for twenty consecutive years, will demonstrate the fact that we have, on an average, three comparatively dry to one extremely wet winter. The fresh water tide lands were not overflowed by floods since '49—except in '62, and '68. During that time there has been three years of drouth—'50, '63 and '64; and eleven years when there has been an insufficiency of rain to insure a full crop on the uplands, and eighteen years that these tide lands were not subject to any serious overflow:



1849.....	33.80	1861.....	49.29
1850.....	7.60	1862.....	13.62
1851.....	19.25	1863.....	10.08
1852.....	33.20	1864.....	24.78
1853.....	23.87	1865.....	22.93
1854.....	23.68	1866.....	34.92
1855.....	21.66	1867.....	38.83
1856.....	19.88	1868.....	21.25
1857.....	21.81	1869.....	19.81
1858.....	22.22	1870.....	14.10
1859.....	22.27	1871.....	34.71
1860.....	19.72		



ENGINEER'S REPORT

SAN FRANCISCO, CAL.,  
September 18th, 1869.

A. C. PEACHY, ESQ.,  
*President Tide Land Reclamation Co.:*

Dear Sir: In presenting a report of an examination of the tide lands of your Company, and of the enterprise upon which it is engaged, in reclaiming them, it is perhaps proper for me to offer a few remarks in reference to these lands, of an introductory character.

1st. The Company may rest assured that all their lands are in fresh water. The line of brackish water is at the lower end of Sherman Island, at the confluence of the Sacramento and San Joaquin rivers, and the head of Suisun bay. This point is about six miles below Twitchell Island, which is lower down the river than any other

land of your Company. The water in the rivers and sloughs above this point rises and falls with the tide and is always fresh.

The natural productions of these lands are a convincing proof of this fact. We find tules, flags, grasses and wild clover. The margins of the sloughs being covered, in many places, by willow, sycamore, ash, alder, grapevines and blackberry bushes.

2d. The sloughs which intersect these lands, instead of being objectionable, as they are popularly regarded, are a positive benefit, because they afford natural drainage. By damming them near their mouths, and putting in drainage gates, we are enabled to convert the channels by which the land was formerly overflowed, into *channels* by which it can be drained; thereby making the drainage, so far as they are concerned, natural instead of artificial; and thus greatly reducing its cost.

3d. The lands of your Company being between high and low water of the tides, the facilities for irrigation, when the land is reclaimed, will be as nearly perfect as it is possible to make them, because irrigation can then be effected without cost, by merely opening the drainage gates, which for this purpose may be called flood-gates, and letting the flood tide into the drainage ditches, exactly to the height that may be wanted, and then closing them. Fresh water, in any quantity, can thus be brought over these lands, or to within an inch or a foot or two feet

of the surface, as may be wanted, every day of the year, by merely attending to the opening and shutting of the tide-gates.

Irrigation will not probably be much wanted on these lands for the cultivation of grain, but for vegetable gardens, for grasses and for rice, it will become of the first importance, particularly during dry seasons. The importance of this irrigation, and the certainty of a crop from these lands every year, deserves to be duly considered. If properly reclaimed, the tide lands of the lower Sacramento and San Joaquin rivers would feed this whole State, even when its population amounts to millions, and the production would be certain without regard to the rain-fall on the plains and valleys. The snows of the Sierra Nevada mountains are an independent and unfailing source of supply to the waters of the rivers, which have only to be appropriated in the manner proposed to make the production of the land certain, and secure unfailing crops even in the driest seasons. For this reason, if for no other, your Company as well as others engaged in similar enterprises, may safely ask the patronage of the public, if not the fostering care of a State where the average rain-fall is only about half the average of Eastern or European States.

4th. It will be seen from my more elaborate engineering report that the expense of securing these lands against extraordinary inundation is not great when compared with the increased value of the lands; and when we consider that

the most productive and valuable lands in Europe are the reclaimed lands which were once overflowed, it does not require much imagination to foresee the day when these lands will call for *absolute protection* against all floods. In the meantime such protection is not necessary to the productiveness of the land. Partial protection, however, will be desirable for farm houses and barns, and for the security of stock. This protection will not be very costly, for it will be a simple matter to throw up artificial mounds upon which to erect houses and barns, and where stock may be kept in entire security during the few weeks of floods.

5th. When such mounds are made, and the land even partially reclaimed, it will present great advantages for homes.

The whole lower country of the Sacramento and San Joaquin is fanned by a gentle breeze during the day, and the nights are cool.

There will be no local cause of disease, at least after a few years of cultivation; it will be free from mosquitos; the air will be pure, and the country clothed in eternal verdure.

6th. One other matter which the farmer will examine with great satisfaction, will be the advantages of freighting.

The lower San Joaquin river and most of its sloughs are fine navigable waters, leading directly along side of, and in many cases into, the future farms.

If we assume the product of an acre to be ten



tons, such product could be delivered on the wharf in San Francisco for about ten dollars, whereas, if the same product had to be hauled, say ten miles on a wagon, an addition of four dollars per ton would become necessary, or on such a product of ten tons; an addition of *forty dollars*.

This difference in the profits of the product of an acre of these lands situated alongside of fine navigable waters; and lands situated ten miles distant from such waters, becomes therefore of the *first* importance to the producer as well as to the consumer.

7th. Referring to my detailed report as to the proper method of reclaiming the lands of your Company, you will observe that, I estimate the expense of partial reclamation at, from \$3 to \$6 per acre, depending on the size, and form of the particular reclamation district.

This is with common day labor. By the introduction of steam or horse power I am of opinion that even this expense may be considerably reduced. I would recommend the latter power.

I have no doubt of its practicability, and as its first cost is less than steam machinery, and as it is more portable and does not require skilled labor, I think it will be found preferable.

Very respectfully,

Your ob't servant,

B. S. ALEXANDER,

Lt. Col. of Engineers, Brevet Brig. Gen. U. S. A.

**Report of Sherman Day, Surveyor-General.**

SAN FRANCISCO, 16th Sept. 1869.

HON. A. C. PEACHY,

*President of the Tide Land Reclamation Co.:*

SIR: I have been requested to give my opinion as to the practicability and profit of reclaiming the swamp and overflowed lands of the Sacramento and San Joaquin rivers, more especially those near the mouths of those rivers, which are subject to the daily ebb and flow of the tides, but whose waters are mainly fresh.

My attention has for many years been directed to that subject as a problem in civil engineering, but I have not, thus far, embarked in it practically because I knew it was not to be done safely on a small capital. I have occasionally visited different localities among the tule lands, in order to study the subject in its practical bearings, and to enable me to judge how far the problem in California might differ from that which has been tested for many years successfully in China and India, in Italy, and Holland, and England, and on the deltas of the Nile and the Mississippi.

Our late visit to Sherman Island did not add largely to my stock of ideas on the subject; but the *results* which I then saw, in the way of reclamation and cultivation tended greatly to confirm my opinions previously formed of the actual fertility of these lands, and the practicability of

reclaiming them from the action of floods, and of cultivating them profitably.

The lands to which I would limit my remarks at present are those on the Sacramento river below the mouth of Elkhorn slough, and those on the San Joaquin river below a line drawn across it from Stockton, or perhaps I might say below the railroad crossing. A line across the mouths of both rivers, a little below Sherman Island would form the lower limit.

There are no "salt marshes" within these limits. The ordinary tides wet the lands when not leveed, but do not overflow them except at the spring tides, and then only a foot or so on the lower portions, in hollows, and along the bayous. The width of the delta and the expanse of Suisun bay permit the waters of the up-country floods here to spread out, and limit themselves to an extreme height of about five feet above ordinary high tide, or ten feet above low tide. At Sacramento the official guage is marked at twenty-three feet above low water, showing a marked contrast to the moderate heights of the tide lands.

It has been ascertained by the experience of the inhabitants of the lower Islands, such as Sherman's, Twichell's, Bolding's and Andrew's islands, that a levee of three feet above the natural surface will keep out the tides and ordinary floods. For the overwhelming floods, like those of the winters of 1861-62, and of 1867-68, when the mountain floods combined with unusual tides

and heavy winds to shut up the waters above the Straits of Carquinez, an embankment two or three feet higher is required; and not only higher, but wider on the top and at the base.

There is an advantage to be derived from the daily influx and efflux of the tide, combined with the freshness of the water on these lower islands, which is not shared by the lands further up the rivers. Rice and other plants needing irrigation can be cultivated here and be irrigated by the tidal flow.

I have noticed four different varieties of soil among these lands: 1st. The coarse peat formed by the large roots of the tule, decomposing into a rich, black vegetable mould of unsurpassed fertility. 2d. A stiff blue clay, with more or less alkali in its composition derived mainly from the wash of the hills of the cretaceous formation, and usually found in the marshes nearest the uplands, it forms a strong, durable soil for permanent grasses. 3d. A yellowish brown clay, the product of the rivers when muddy. This is a strong and very productive soil, as may be seen by the growth of tules and rank grasses, willows and alders. 4th. A light, loose sandy soil, deposited here and there by the eddies of all rivers, and especially adapted to the growth of garden vegetables, Indian corn, broom corn, and fruit trees.

There is no room for doubt as to the superabundant fertility of the tule soil when reclaimed and subjected to one or two years' cultivation.



Its rank growth without cultivation, testifies to that. I scarcely know of any vegetable production belonging to temperate climates, which will not grow there.

Wheat, barley, oats, timothy, clover and alfalfa are all successful crops. The native grasses are coarse, but easily give place to more choice varieties. And to enumerate the garden vegetables which I have seen growing there, would be merely to copy a seedman's catalogue. In visiting a friend's family, I was surprised to see how many of all the luxuries that graced the table, were the products of the farm. Drought is unknown. Fruits, large and small, of many kinds, I saw growing luxuriantly. The sycamore, oak, alder, willow and hazlenut are natives along the banks of the sloughs; and the elm, the locust and other trees suitable for fencing, can be easily introduced. As for flowers and ornamental vines, the main difficulty is to prevent their superabundant growth.

Of pasturage, there is no end. Neat cattle, horses, hogs, and fowls of all kinds, do well upon these lands, if properly cared for in wet weather, and floods. Sheep also are easily fattened, but they require more especial care here than on dryer lands.

Notwithstanding some of the inconveniences of so moist a soil, and the necessary isolation from a large circle of neighbors, I have generally found the people living on these islands contented with their residence, so far as enjoyment

of health and cheerfulness was concerned, and their confidence in the productiveness of their lands, and the superabundance of the supplies of life. A refreshing breeze, which promotes health, sweeps every day over these open plains, and after close inquiry, I could not find that the people were more subject to bilious diseases than those dwelling in any newly opened upland district.

The main source of discouragement among them is the want of sufficient capital to contend, single handed, with the floods, in addition to the usual cost of stocking and improving any new farm; and the difficulty of acting harmoniously in carrying out any extensive system of engineering, either under the State law, which is utterly inadequate, or under any plan of private association. Various causes of disagreement will arise. Some will insist always on their own way or none. Some will let others pay the money and hang back themselves, but still expect to enjoy the benefit of the work of others; and some will eternally shove in legal quibbles to block the way. Some will be poor but willing, and have their lands mortgaged to creditors who are rich but unwilling, until they can foreclose.

The only efficient way of dealing with these lands seems to be by the ownership of a whole island or levee district by one man, or by an association. This man, or association, must have capital fully sufficient to master the engineering problems of the enterprise; and common sense

and confidence enough in the ultimate result not to be discouraged by occasional failures in details. Some well devised, carefully studied plan of engineering must be adopted; cheap labor must be had; probably Chinese, and energy and economy must pervade the management. The work may be greatly aided by machinery for excavating and ploughing. Whether steam power or horse power shall be used, is for your engineer to determine. To supply fuel for steam you have the coal mines of Black Diamond and Pittsburg within sight of your lands, and cheap transportation by water.

In short, I know of no soil more productive; none more easily watered, or less subject to drought. The cost per acre of reclaiming the land is slight, compared with its intrinsic value. The title is derived from the State. The lands lie in the very heart of the State; at no place more than 30 miles from a railroad, and generally within 15 or 18; by steam navigation, averaging about 60 miles from San Francisco. The sloughs which penetrate the lands give facilities for navigation, for drainage, and for flooding—if provided with gates.

I see no reason why the lands, if wisely engineered and managed, should not greatly augment in value and produce a steady income on the investment.

I have read the general report of Gen. B. S. Alexander on these lands, and fully concur with the substance of his remarks. His large profes-

sional experience, and his native sagacity, give great value to his views.

Very respectfully,

Your ob't servant,

SHERMAN DAY,

*Civil Engineer.*

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## EXTRACTS FROM THE CALIFORNIA PRESS,

### On the Importance of Reclaiming our Overflowed and Tide Lands.

[From the Daily Herald, July 10, 1869.]

The results of the reclamation of the tract of land known as Sherman Island, have stimulated the enterprise of some of our most public spirited citizens to embark in a large enterprise of a similar character, and, in consequence, a company has been formed, entitled the "Tide Land Reclamation Company," with the view of solving the problem of the practicability of reclaiming overflowed lands on a large scale.

The Tide Land Reclamation Company own about one hundred thousand acres of land, situated on the lower San Joaquin River, and about twenty thousand acres on the lower Sacramento, making in all one hundred and twenty thousand acres, with a perfect title to all, derived from the State under the Swamp and Overflowed Land Act.

It was all selected by agents thoroughly conversant with this section, as the best land in it. It lies adjacent and is entirely similar to Sherman Island, which may be considered as a sample of the entire tract.

Sherman Island is situated at the junction of the Sacramento and San Joaquin Rivers, and contains about fourteen thousand acres. Up to spring of last year it was covered with tule, except some small tracts which had been partially reclaimed before. Last August the owners decided to reclaim the Island, for which purpose an assessment of five dollars per acre was levied. A ditch six feet wide by four deep was dug entirely around the Island; the earth was removed, and from this was



made a levee from three to five feet high, between the ditch and the river bank. In this, at proper distances, self-working tide gates were placed. In April this work was successfully completed. Although the high tide rises about half a foot above the surface level of the soil, yet the water, on the inside of the ditch, is from three to four, and can be made six feet below it. In fact, the water can be kept so low as to make it necessary to let it in at times for irrigation.

The soil—a fine loam—intermixed with vegetable matter, more or less decomposed, is so light and ashy that it does not bake after being irrigated superficially. Its fertility is astonishing, having yielded, to the acre, sixty-seven bushels of wheat, one hundred and ten bushels of barley, nineteen thousand pounds of Irish potatoes, eight thousand pounds of clover and timothy hay, at one cutting. It produces all kinds of fruits, and vegetables in the greatest abundance. The summers being long and warm, several successive crops can be raised yearly.

Persons of experience in the cultivation of rice, sugar cane, sugar beet, Indian corn, and ramie, are sanguine that these will grow to great perfection, and will yield very profitable crops.

All the lands of the Land Reclamation Company are intersected by numerous navigable streams and sloughs, which offer so great facility for cheap transportation, the cost of freight from any part of the land to San Francisco will be less than \$1.50 per ton on ordinary cargo.

As these lands are situated near the mouths of the rivers, where they are wide, and have no current except that caused by the tide, the usual expense of reclaiming lands, namely, of making a levee to resist a strong current, will be saved.

The surface of the land is perfectly level, being about six inches below high, and from three to six feet above low tide, thus offering unusual facilities for cheap drainage and irrigation. By leaving the flood gates open the land can be thoroughly irrigated by water that is always fresh.

A bank or levee three feet high, with a ditch on the inside, and proper tide or flood-gates, is sufficient to drain, and also to protect the land from anything except extraordinary floods. This work will not cost over four dollars per acre average, which is less than that of fencing ordinary uplands.

If the floods should overflow the levees, the damage would be trifling, as there is no current to wash away the banks or to deposit sand upon the land; the high water in the San Joaquin being caused by back water from the Sacramento.

The great fertility of the Valley of the Nile is owing to its annual overflow, which the inhabitants regard as a great blessing, and not a misfortune. In Peru the lands that are annually overflowed by the rivers are considered the most valuable.

Those who have not seen the practical benefits derived from irriga-

tion cannot appreciate its great profit. In no place has it been so long and so thoroughly tried as in Northern Italy. The climate there is very similar to that of Central California, except in the rain-fall, which averages from thirty-six to forty inches annually, with an average monthly fall of 3.5 inches during the months the crops are growing and maturing. Notwithstanding the large fall of equally distributed rain, the land that is irrigated rents for over seventy-five per cent. more than the unirrigated of the same quality. The average increased profit of farming irrigated, over similar lands not irrigated, without charging for the water, is, for light sandy soil, eighty-one per cent.; good strong land, ninety-one per cent.

The marcite (Italian rye grass), when properly irrigated, pays an average profit of sixty-two dollars per acre. Near Milan, and near other large cities, it pays much more.

It is estimated that there has been expended in the present works for the supply and distribution of water on 500,000 acres of land near Milan, \$200,000,000, or \$400 per acre. The average cost for doing the same in all Northern Italy is \$359 per acre. [These facts have been taken from "Italian Irrigation," by R. Baird Smith, Captain of Engineers, made by order of the English Government.]

The irrigated meadows near Edinburgh rent for from twenty to thirty pounds annually.

Lord Weston, the best English authority on the subject, says: "One winter's floods will do more in many cases, I may say in most, than thirty loads of the best rotten dung manure."

Mr. Pusey, another high English authority, says: "In England, the superiority for grazing purposes of moderate lands irrigated over superior unwatered lands, is as thirty-six to fourteen."

Professor Liebeg says: "In the vicinity of Liegena—town in Nassau—from three to five perfect crops are obtained from one meadow, and this is effected by covering the fields with river water, which is conducted over the meadows in the spring by numerous small canals. This is found to be of such advantage that, supposing a meadow not so treated to yield 1,000 pounds of hay, then, from one thus watered, 4,500 pounds will be produced."

The country around Liegena is considered to be the best in all Germany."

A large part of the reclaimed portion of Holland is more than twelve feet below the level of low tide—the water from Haarlem Lake being pumped sixteen feet, which at some seasons is 1,000,000 tons daily. Some of the levees being thirty feet high, and where exposed to the action of the ocean waves are protected by walls of masonry, the stone of which was brought from Norway, and at other places by a heavy thatch of fascines, or brushwood. However, the principal danger to which they are exposed is the ice jamming and damming up the rivers in the spring.

Notwithstanding the enormous first cost of reclamation, and the large annual expenses of repairs and pumping, these are considered the most valuable lands in the Kingdom. They are almost entirely devoted to grazing and dairy purposes; their rich soil and facility for irrigation giving them great advantages over lands less favorably situated.

The total cost of reclaiming Holland is over \$1,500,000,000. Reclaiming Haarlem Lake will cost \$3,742,225, or \$90 per acre; the land reclaimed selling for enough to pay all the cost.

All are familiar with the immense size of the levees of Louisiana, and how successfully they have resisted the torrents and floods of the Mississippi, and the great fertility of their swamp lands after reclamation.

If irrigated and reclaimed land is found to be so valuable and profitable in Italy, Holland, Germany, England, and Louisiana, where there is so much rain, and that so equally distributed during the months in which the crops grow, what ought to be its value here, where our rain-fall is so little, and all that during a short season, with none during the rest of the year; and where superior lands can be thoroughly irrigated, and reclaimed at such small comparative cost.

The cheapness with which these lands can be reclaimed, their fertile and inexhaustible soil, their facility of cheap irrigation, their warm and long summer, and the low freight on their produce to market, will soon make them the most valuable lands in the State.

[From the San Francisco Times, May 14th, 1869]

Sherman Island, containing 14,000 acres of rich alluvial land situated in the triangle between Antioch, Collinsville and Rio Vista, has undergone a most remarkable change during the last year, and the rapid rise in the value of land has surprised the most sanguine of the settlers.

Less than a year ago the election for Trustees took place, and resulted in the choice of Messrs. Upham, Little and McCall, for the easterly division of the Island [district 54] and Messrs. Biglow, Boggs, and Clark, for the westerly division [known as District No. 50.]

The land was then subject to overflow at all high tides, excepting a few spots where local reclamation had been attempted.

The Trustees adopted a plan, and constructed the necessary flood-gates and embankments, which have just been finished, at a cost of about \$80,000, and the present condition and price of the land only need to be mentioned to prove how successful they have been.

The following table shows the principal sales of this land during the past year:

DATE OF SALE.	ACRES.	PRICE PAID PER ACRE.	DUES THE STATE PER ACRE.	RECLAMATION TAX, PER ACRE.	TOTAL COST PER ACRE.
May, 1868.....	200	3 .00	80c	\$5 00	\$ 8 40
May, 1868.....	300	.80	80	5 00	6 40
May, 1868.....	300	.80	80	5 00	6 40
September, 1868.....	360	4 00	80	5 00	9 80
September, 1868.....	200	4 00	paid	5 00	9 00
October, 1868.....	502	1 60	80	5 00	7 60
October, 1868.....	404	7 50	paid	5 00	12 50
October, 1868.....	320	11 00	paid	5 00	16 00
November, 1868.....	420	8 00	80	5 00	13 00
November, 1868.....	400	4 00	80	5 00	9 80
March, 1869.....	640	14 00	paid	paid	14 80
April, 1869.....	40	15 00	paid	paid	15 00
May, 1869.....	650	25 00	paid	paid	25 00

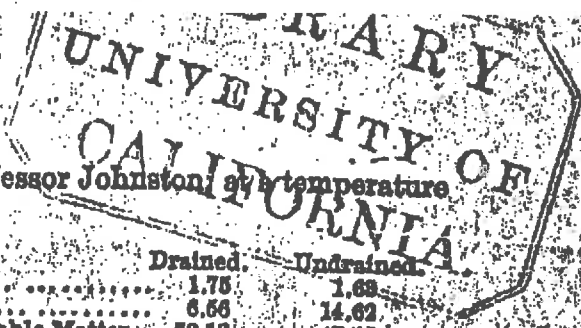
There may have been other sales, which I have been unable to obtain, as my stay on the island was necessarily short.

There is very little land offered for sale on the island now, and as the Savings Banks have granted loans of ten dollars per acre, it is not likely that much can be purchased at any figure near those which have hitherto ruled. Most of the land sold during the past year has been forced into the market by the pressure of the reclamation tax. Under yearly leases portions of this land have yielded from \$10 to \$20 per acre, at the current rate of one quarter of the crop per year; and Mr. John McCall one year received for his rent—being one-fourth of the crop—forty nine sacks of potatoes per acre.—[*Pacific*.]

We take the following letter from the *San Francisco Times*, June 22d, 1869:

Burning the land is the cheapest and quickest method of reduction, and is thus described: Watch the land after drainage, until it becomes dry enough to burn to ten or twelve inches deep (not dryer, lest too much land be consumed and the level reduced). The growth will still be green and very heavy; ignite fires in a multitude of places in the sod; and, the wind helping, and the fires being well tended, ten acres a day may be reduced. The hay will fall as the roots are burned, and in a few days be dry enough to be consumed by fire. This process leaves a bed of ashes and burned soil some six inches deep, free from seeds of weeds, and in fine tilth for the sower. Grain may be covered, in this culture, by a brush harrow, or by driving a flock of sheep over it; the last process costs only thirty-five cents per acre. One cultivator, who worked his land a few years ago, got seventy-five bushels of wheat to





An analysis of swamp soil by Professor Johnston, at a temperature of 212 degrees Far., shows as follows:

	Drained.	Undrained.
Wax and resin.....	1.75	1.63
Humic and Umic Acid.....	6.66	14.62
Humic and Insoluble Undecayed Vegetable Matter.....	78.18	47.15
Earthy Matter or Ash.....	13.61	36.60
	100.00	100.00

From these figures it appears that drainage alone changes the composition as well as the condition of the sod. Therefore it is concluded that some delay in bringing all the land into culture will rather assist the husbandman.

Irrigation is considered by good authors to be an insurance of one-fourth to one-third more than the usual average crop. On these lands the irrigation is abundant, under perfect control, and, better still, highly charged with valuable manure. Phosphates and other most valuable ingredients of cultivated soil are highly soluble; but, while carried away by flood and rains, as well as gold washings, from the hills and valleys of the interior, they are carried to these swamp lands, where they will obey the order of the husbandman to tarry. The Ganges carries to the sea, per hour, 2,500,000,000 cubic feet of solid matter, being 1-200 of its volume. The Nile carries 1-140 of its volume, or 14,000,000 cubic feet; the Mississippi, 8,000,000 cubic feet. The Sacramento, on account of gold washing, etc., probably carries a greater proportion of its volume. By its powerful agency it places irrigation and manure under the complete control of the farmers on the islands and bottoms along its course.

Productions, climate and fisheries will be described in a future article.

FARMER.

[From the Daily Examiner of Saturday March 12, 1870.]

We publish below the report of General Alexander, touching the reclamation of two large bodies of swamp land lying near the mouth of the San Joaquin. These are Union and Roberts Islands, the first of which contains 40,000 acres, and the last-named 57,920. The former tract can be reclaimed by machinery for the low sum of \$1.67 per acre, and the latter for \$2.14. About the practicability of such reclamation there can be no doubt. General Alexander is one of the ablest and most scientific engineers in the service, and has surveyed the ground with especial reference thereto.

These swamp lands, now so apparently worthless, have grown of late into great favor. They are well understood to be the most valuable lands in the State. The difficulty heretofore has been an absence of a combination of capital and interest to reduce them to an agricultural

condition. Such as have been reclaimed are found to be of inexhaustible fertility. Their crops cannot be affected deleteriously by the worst droughts.

The conclusion of General A.'s report is especially noticeable. We refer to his opinion, emphatically expressed, of the suitability of these lands for rice culture. We believe that the experiment of raising rice has never been fairly made in our State. Much has been written on the subject, and but little done. If the opinion referred to be well founded, a new source of wealth will be opened up to our people, and the value of the lands greatly enhanced. We do not know that any of the lands of this company are now obtainable, but if so, no such opportunity for remunerative investment of a few thousand dollars is likely to be offered again.

## TIDE LAND REPORT.

SAN FRANCISCO, March 4, 1870.

GEO. D. ROBERTS, Esq.,

DEAR SIR: I have carefully examined the map of the lower San Joaquin River, showing Union and Roberts Islands in San Joaquin County, and the lands belonging to your Company on these islands, as compiled from the records of the County Surveyor of that County.

I have computed the distances around these Islands and the number of acres in each of them, and have made estimates of the cost of their reclamation, by a levee which is to be five feet high and four feet wide on the top, with a base of fifteen feet, and which is to contain forty-eight cubic feet of earth for each foot in length.

I suppose all the sloughs to be dammed and to be provided with large drainage gates, and, independently of this, that there is to be one drainage gate for every two miles in length of the levee.

I send you with this quite an elaborate paper on the subject, showing the details of the calculations, and the processes I have followed in arriving at my conclusions, so that, by inspection you can easily understand the whole question, and in case I have made any mistakes in my calculations, you may be able to correct them. The following are the results:

### UNION ISLAND.

Length of levee around Union Island, 50 miles 66-36-100 rods.  
Number of acres in this island 40,000. Total cost of reclamation of this island by common labor, \$91,048.62—\$2.28 per acre. By machinery, \$68,949.08—\$1.67 per acre.

## ROBERTS' ISLAND.

Length of levee around this island, on the supposition that Black Slough, Whisky Slough and Latham Slough are leveed as high up as the survey extends, 104 miles, 33 44-100 rods. Number of acres in this island, 57,920. Total cost of reclamation in this case, by common labor, \$173,710.48—\$3.00 per acre. By machinery, \$123,740.32—\$2.14 per acre.

In case these sloughs can be dammed at their middle points, the cost is reduced, by common labor to \$2.56 per acre; by machinery to \$1.84.

## PLAN OF RECLAMATION.

I suppose these two islands will have to be kept in separate Reclamation Districts, and that Old river and Middle river levied throughout their entire length on both banks, before the complete reclamation of this country is effected, in order that sufficient water way may be provided for the flood water of the San Joaquin river.

If, however, an ample water way could be provided for these flood waters, near the base of the foothills on one or both sides of this basin, then Old river might be closed a short distance above Moore's Landing, and Middle river at a point where the Mount Diablo Base line intersects the meridian between Range IV East, and Range V East, thereby effecting a great saving in the length of the levees required for this distance of country.

If you have not already done so, it might be well for your Company, and in fact for all parties interested, to look carefully into this matter before any work is begun to effect reclamation.

## QUALITIES OF THE LAND.

I was very favorably impressed with the quality of land on these islands when I visited them last Fall; much more so than I had expected to be before I saw them.

My observations were confined to the banks of the Old river and to some of its sloughs, as high up as Moore's Landing, and to Middle river, to within six or seven miles of its head. The banks of these rivers, even at their mouths, appeared to me to be higher than the shores of Sherman and Twitchell Islands; the soil is firmer, and it is covered with a better quality of grass. There will certainly be less trouble from water in building the levees at the mouths of these rivers, than had to be encountered at Sherman and Twitchell Islands. As we ascend these rivers, their banks become higher and firmer, being covered to a considerable extent with willow and other bushes, and appearing in many places as though they had never been overflowed.

### CHEAP RECLAMATION.

As these banks are several feet above high tide, they are very favorable for leveeing; for the work can be done with the plow and scraper, and without any trouble from water.

From the character of the banks of the rivers around these two islands, I was led to believe that a very cheap reclamation for stock could be made by merely damming the sloughs and putting in drainage gates, with perhaps short stretches of levee in certain places.

This could be done on either island for less than one-fourth of the estimate I have made in the paper which I hand you with this letter.

For cultivation and settlement, the levee I have sketched will, I think, be necessary, and the estimate I have made for its cost will be ample, at least for those portions of the rivers which I have seen, and sufficient for the whole work, unless greater difficulties are met with in those parts which I have not examined.

### RICE CULTURE.

Having lived several years in the midst of the finest rice region on the Atlantic seaboard of the United States, and carefully observed its cultivation, I feel quite sure that these islands, when reclaimed, will be well adapted to rice culture.

All the conditions necessary for such cultivation appear to be united, at least in the interior or middle portions of these Islands. The water is fresh, and the rise and fall of the tides is sufficient to enable the lands to be drained or flooded at will; the climate and soil are certainly favorable to vegetation, and so far as the cultivation of rice, (or, in fact, any cultivation) is concerned, I do not see what more could be desired, except reclamation.

Very Respectfully,

Your obedient servant,

B. S. ALEXANDER,

Lieut. Col. Engineers,

Brevet Brigadier General U. S. A.

[From Oakland Daily News of Oct. 23, 1871.]

### EXCURSION TO THE TULE LANDS

It is well known, but not so generally known as it ought to be, that several associations have been formed within the past few years, for the reclamation of the tule lands of California, a vast tract of lands more or less submerged, lying on and about the Sacramento and San Joaquin rivers, estimated at a million acres, and formerly thought to be unreclaimable, and utterly waste and useless. The great projector in this

reclamation enterprise is George D. Roberts, Esq., who among other estimable qualities, has that of being a citizen of Oakland. We had the pleasure of being one of a party of guests who spent Friday and Saturday on a visit to the tule lands, on the invitation of this gentleman.

#### THE START.

The party, consisting of ninety, had their rendezvous at Sacramento on Friday morning. They were breakfasted by Mr. Roberts at the Orleans House, and then he took them prisoners, confined them in coaches and sent them on board the stern wheel steamer Victor. When the party was assembled there, it was found to comprise Governor Haight and several members of the present State administration, as well as the incoming one, General Alexander, U. S. A., ex-Mayors of our principal cities, ex-judges, bankers, capitalists, literary gentlemen, and gentlemen of the press. Governor Booth came on board and exchanged courtesies with his personal friends, including those of all parties, but could not accompany the excursion. Oakland was represented by Colonel John C. Hayes, H. D. Bacon, Hermann Day, John W. Dwinelle, Colonel A. J. Coffee, Dr. Nicholson, J. W. Roberts, W. J. Patigrew, W. H. Raymond, Theodore Bagge, and Messrs Hyde, Walker and others, whose names we cannot now recall, as we took no notes, and indeed did not think of writing any account of the excursion. Hornblower, of the Orleans Hotel at Sacramento, was the caterer; and we can assure him that there are ninety gentlemen vastly accustomed to public speaking, who will "blow his horn" as long as they live. We set out at half past eight A. M. steaming down the Sacramento on one of those lovely mornings:

"Sweet day, so bright, so pure, so fair,  
The bridal of the earth and sky."

#### HOLLISTER'S.

About two hours brought us to Hollister's, on the left bank of the river. Mr. Hollister was one of the first who undertook to reclaim these waste lands; but his plantation does not properly belong to the class of submerged lands, as it was overflowed only by the annual rise of the Sacramento, and not daily or monthly by the tide. But he has been very successful, as shown by his fine fruits and other products, including a magnificent new mansion in the French mansard style, now in progress of construction.

#### GRAND ISLAND.

Was the next point at which we touched at its head, at the junction of the steambot slough with the main Sacramento river. We were here let loose into a vineyard of the mission grape, whose immense ripe



clusters did not suffer any perceptible diminution from the large quantities devoured, and the great mass taken away by the party. There was a great abundance of the ripest and most luscious figs; a large cask of two year old delicious sherry, made from the Mission grape, which the party "sampled" with great gusto; and new wine running from the wine press, most agreeable to the taste. Proceeding down the "Old river" to the Sacramento, between Grand Island and Andrus Island, we next landed at the lower end of Grand Island, where a most substantial dike is being constructed on a large scale. This is done by hand, and not by machinery; it is some eight or nine feet in height. We then left the Sacramento, and passing through a slough sailed into the San Joaquin, and night coming on, "tied up" at Kimball's, a noted pioneer in reclamation, at the head of "Webb's Tract," not, however, without having partaken of a sumptuous lunch, and a most profuse and luxurious dinner. The only objection to the dinner in point of taste, was, that wine was more plentiful than water. In fact, water was the only scarce commodity on the excursion. It looks like a joke, but is a fact, that Kimball actually pumps up water from the river with a wind-mill to irrigate his garden, out of which he keeps the river by a dike!

#### AN OLD FOGY'S PRIVILEGE.

Here we experienced what Thackery calls "the advantage of being an old foggy." There were only sixty berths, and ninety guests. What should be done? It was finally decided that the oldest should be first served, and have the berths by seniority. It was astonishing how old some of our Oaklanders became on a sudden. We ourselves secured a berth only by owning up to sixty-five, or *thereabouts*. These seniors were laid away upon their respective shelves, and carefully tucked up for the night, while the juniors betook themselves to mattresses and blankets, of which there was an abundant supply, and of the best quality.

#### THE GRAY DAWN.

Seemed to be about to break overcast and misty when we awoke, and found the steamer in motion. But we got out in time to see the sun rise, a great blood-red globe, ushering in a pleasant day. We would like to describe a sunrise to our readers, as most of them have probably never seen one, but we have neither time nor space. We soon reached a point opposite "Venice" at which we landed. We have forgotten its name; Col. Hayes, Mr. H. D. Bacon, and other Oaklanders have a tract here, which is not yet reclaimed, as have others at "Venice" opposite, a famous "city of the seas," consisting at present of one house. We saw there "a bridge of size" sufficient to answer for a landing. This tract is partially reclaimed—enough to serve as a ranch for cattle, with

which it is covered. Turning southward we came into Connection slough, and through it westwardly into the west channel, to the Webb tract again, where they are constructing a dike with the steam ditching machine. This "ditcher" is in a boat; makes its own ditch in which it floats, swallows up the tule as it advances in great mouthfulls of a cubic yard, which it discharges in the shape of a dike; in short it is a "steam paddy" applied to the tules. I believe it makes about 350 feet of five-foot dike a day, in a very substantial manner. We saw another of these machines at another point, working on drier land, and on wheels, instead of being in a scow.

TWITCHELL ISLAND.

Turning northward we soon regained the main San Joaquin river, and came to Twitchell Island. This was reclaimed only last year, and was sold at \$20 an acre, to Messrs. Prather, Minor, Roberts, and others, chiefly of Oakland. They first burnt over the tule, so far as it would burn, after being set on fire. Then they sowed wheat, broad cast, in the ashes, and trampled it in by driving sheep over it; then they reaped 10,000 sacks of wheat, being about twenty sacks (135 lbs each) to the acre. The results have been wonderful and profitable, beyond all expectation. The soil is now ready for the next year's volunteer crop, which certainly will not fail for want of water, which can be let on at every tide. The soil is rapidly becoming firm, and the peaklike tule fast disintegrating.

BOULDIN AND BRANNAN'S ISLANDS

Were passed in their turn. We did not stop at either, but could see from the pilot deck that they were in progress of successful reclamation. Passing through "three mile slough" we re-entered the Sacramento, going down between the Toland tract on our right, and Sherman Island on our left. Dr. Toland, of San Francisco, owns the former, which lies between the Sacramento on the front, and the Montezuma hills at the west. His dike is one of the finest and most substantial. It is ten feet high, and well furnished with selfacting tide gates, which let the water out, but do not let it in.

SHERMAN ISLAND

Was the most interesting and satisfactory of all, because there all the problems of reclamation were first solved. It contains 15,000 acres, all of which are well diked, and a large portion reclaimed. We stopped at Biglow's near the lower end. We found there fine apples, figs, grapes, strawberries, melons, and vegetables of various kinds, on ground which had raised a crop of wheat this year; one crop of alfalfa had been cut

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this same season, and another was nearly ready to be out. The soil is fully rotted and ripe; very light, however, and seeming not to need plowing, or anything more than harrowing.

#### MODE OF TREATING TULE SOIL.

The upper tule lands upon the Sacramento and its sloughs, are brought under cultivation with more difficulty than those upon the San Joaquin. The former do not burn so deeply, and it is thought that they must first be run over with a tule cutter, which divides the surface into narrow strips, which are then turned over with the plow. But the tules on the San Joaquin are reclaimed by fire. When sufficiently dry, they are set on fire, the fire penetrates under the surface turf, and works along under it, burning to the depth of six or twelve inches. When it has burnt out, and the ashes are cold, wheat is sown broad cast, sheep are turned in and driven over it to trample the wheat in, and then comes the harvest. These tule planters are a curious set. Instead of blessing the land, they "dam it;" they irrigate it by dikeing out the water; and they prepare it for sowing by burning it up.

#### VALUE OF THE RECLAIMED LANDS.

These lands, when once reclaimed, presents three estimable qualities: First, they are rich, almost beyond the possibility of exhaustion; secondly, they can be enriched every year by letting in the waters of the rivers, and letting them deposit their silt—the soil which they hold in suspension; thirdly, they can be irrigated, most of them, every day, and all of them once a month, at spring tide. They have all the advantages of the Nile-irrigated valley of Egypt, and even more; for in Egypt the husbandman must wait two months for the water to subside, and the two months thus saved in California represent a crop of some kind. It may be, that once in ten or twelve years, all these lands, together with their dikes, may be overflowed by unusual freshets; but, even then, a crop of wheat could be sown and harvested after the waters had subsided. These qualities will surely make these lands the most productive and the most reliable, and therefore the most valuable of any in California. And this region, when once reclaimed, with its mild climate and gentle winds, must become a place of great resort and residence. The San Joaquin, in this region, is not a river, but a great lake, and must hereafter be the scene of regattas and yachting, in the midst of the garden of California.

J. W. D.