# Cranberry culture on a western plan: with valuable items and recipes from growers and members of the Wisconsin Cranberry Associations.

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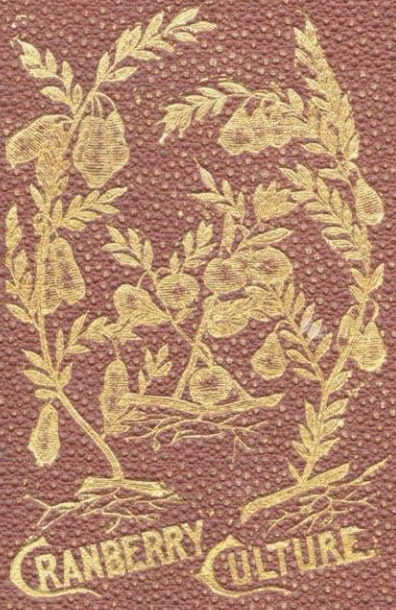
CRANBERRY CULTURE

# CRANBERRY CULTURE

—ON—

# A WESTERN PLAN,

WITH

VALUABLE ITEMS AND RECIPES FROM GROWERS AND MEMBERS OF THE WISCONSIN CRANBERRY ASSOCIATION,

—BY—

AUGUSTUS G. CARY.

GROWER, AND MEMBER OF WISCONSIN CRANBERRY ASSOCIATION.

CINCINNATI, O.

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# PREFACE.

With the assistance of those in the business whose practical knowledge is every year increasing and proving a success, and as the business is so rapidly increasing and demanding authentic information for further advancement and development for the "Cranberry Culture," I make this attempt and hope it will meet the approval of all interested, as also those about to enter it. Heretofore we have been indebted to our Eastern friends for information concerning this industry, but the insufficiency of any work to meet the requirements of our Western plans is being much felt at the present time, and as the industry is second to none, and so largely on the increase holding out an inducement for such a work, which I now take pleasure in placing before you and hope it will meet the approval, as I desire to make it plain, comprehensive and practicable, and trust it may be appreciated by all who peruse it and avail themselves of the facts herein contained.

THE AUTHOR.

GRAND RAPIDS, WOOD CO., WISCONSIN.

# CRANBERRY CULTURE

— ON A —

## WESTERN PLAN.

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## CHAPTER I.

ORIGINATION.

It was named from the appearance of the bud, the stem calyx and petals resembling the neck, head and bill of a crane, hence called craneberry, or cranberry. Botanical classification claims it belongs to the natural order, "Ericacee," heath family and to the genus Vaccinium.

The analysis of the fruit which is still appreciated made by Professor E. N. Horsford, of Cambridge, with the following results in one hundred parts:

| | |
|---|---|
| Water - - - | 88.78. |
| Ash - - - - | .17. |
| Woody fibre organic acids &c. | 11.05. |
| | 100.00. |
| Percentage of potash in ash - - | 42.67. |
| Percentage of soda in ash - - | 1.17. |

The berries were dried in a steam chamber at two-hundred and twelve degrees F., and from these the ash determined by slow combustion in a platinum crucible.

The qualitative analysis of the ash indicated the presence of the following substances, viz: Potassa, soda, lime, magnesia sesquinoxide of iron, sesquinoxide of manganese, sulphuric acid, chlorine, selicia acid, carbonic acid, phosphoric acid, charcoal and sand.

From this analysis it will be seen that only seventeen-one-hundreths, or less than two-tenths of one per cent. of the cranberry is found in ash, as in organic matter derived from the sod, all the rest obtained from the atmosphere and water. This is a reason why the cranberry will grow where nothing else will, requiring little for its development but air and water; this was in natures state, but at the present date the *modus operandi* of cultivation is largely increasing the size of the fruit and quantity per acre, as is the case with other crops, the privilege endowed in man by his creator in the development of the mind.

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## CHAPTER II.

### CHOICE OF LOCATION AND WATER PRIVILEGE.

This is an all important matter, as a suitable soil and the needed supply of water all the year round is not available and another most important point, *drainage*, the undertaking will fail. This is a reason that can be given why the business can not be overdone. As thousands of acres of marsh thought to be adapted to cultivation, only a small portion will be found suitable for the use when placed under cultivation. The allurial formation is the only one adapted; this includes the most barren and most fertile soils, the dryest and dampest. There are in Wisconsin three kinds of marshes adapted to culture, first, the moss bed marsh, second the feather leaf and sage brush, and thirdly the grass marsh, with cultivation, and the same water privileges are

equally good and can by proper management be made a success, although the cost of improvement differing. Choice of location should be made at a sufficient distance from the main land or river or supply streams to allow of a reservoir pond which ought to be acre for acre of marsh improved or less, providing the supply of water to be a running stream throughout the year then the pond could be one-third less than the cultivated marsh. If you have a suitable location for the pond at the head of your marsh with tamaracks it is well to make it into the pond as you will have less evaporation, the purpose of the said reservoir pond is to give a proper temperature to the water and supply it to the marsh; at times of the year the temperature should not be less than sixty-five degrees; the water from the pond at portions of the year should be applied to the marsh through drip holes so that the decomposed vegetable matter goes on the surface, its natural fertilzer instead of through the ditches to waste and robbing the marsh, it going on the marsh gives neutrition to the vines and is natures fertilizer. The surplus water, or water required for use on the other portions of the marsh can be run through four feet ditches, or ditches suitable to the lay of the marsh. Some marshes requiring deeper ditches than others according to full depth of muck &c. I claim today, that the reason the first cultivated, or I would say, partly cultivated, marshes did not produce an increase of crops, was from the ditches robbing the marshes of what nature intended for them, and giving nothing in its place, then the water at certain portions of the year, was lowered too much for the condition of the roots of the vines of such a marsh. It is one thing to know how to run a wild marsh, or one partly cultivated, and another thing to know how to run one thoroughly improved. All wild marshes can be greatly benefited by a pond.

## CHAPTER III.

### HOW TO PREPARE FOR PLANTING.

The least costly marsh to prepare for planting is the grass marsh with muck from one to three feet, then sand. The *modus operandi* of preparation is as follows:

If your marsh is a floating bog, first settle it by ditching for drainage, then build your dams to keep the water off it, say two feet high of sand faced with sod and a good many of them to equalize the water. It is useless to try and cultivate a floating bog. In the spring stop back your water and draw it well down, and mow close to the ground, then drag with a harrow until black, use a horse with patent clogs on; then put in your vines either with roots or chopped. This can be done at a cost of twenty dollars per acre. Have boys to handle the vines gathered thus: let a boy take a sod knife of light order and cut around the vines about two feet square, then take sod hook and pull them gently, separate all grass and weeds and pile them up for use. In two years from the time you remove the vines you will have another supply grown from remaining roots. Vines put in with roots will bear some berries the second year; the chopped vines will not bear as many; but the third year from both you can look for returns if your vines have proper treatment to get their growth and prepare for bearing fruit—drainage is the most important feature.

Second, the moss marsh. There are two ways of improving this kind of marsh; first, dry it down and harrow it; let the moss dry up and take it off, the roots of the vines will be left and will recover their growth; then roll the marsh thoroughly two years in succession and flood it in winter, and the moss will be subdued and the vines will

outgrow all else, and in two years you will have a fair growth of bearing vines. If the vines are not sufficiently thick scalp the marsh and carry off the scalpings and place them on the dams. The first plan can be done for fifteen dollars per acre, the second for twenty-three dollars or less by machinery. If the marsh has no vines of importance dry it down, mow around it about two or three rods, then set fire and burn slick and clean; then drag it and put in the vines; this can be done for twelve to fifteen dollars per acre. This marsh when set, ditched drained &c., with reservoir-pond, is worth all the way from three hundred to five hundred dollars per acre, in fact the valuation can hardly be made on it as the owners never sell when the marsh is brought to such a state of improvement, and the cost of running them after these improvements is so little and the returns so great. Third, is the feather leaf and sage brush marsh which must be scalped and scalpings places on the dams or burnt; rake over so as to get any stray roots left from scalpings picked up and set to vines at a cost of from thirty-five to sixty-five dollars per acre including partial building of dams from what is taken off the marsh. This is the price per hand. It is claimed that with the scalping plow and knife run by horse the work can be accomplished for one half the usual cost, the sod knife can be used alone to good advantage in cutting ditches etc. I have seen work done by the machinery and it compared favorably with hand work in any kind of marsh and was a great saving of time and money.

I think the general opinion of the growers is that of the three mentioned marshes the feather leaf (Cassandra Calyculata) has produced the best, but it may have been favored by the alluvial supply, as I know of marshes that are free of such weed that produce equally as large a berry and as many to the acre.

TURNING MARSH OVER.

I have had no experience only as viewed on Mr. Charles Kruger's

marsh and give it under the heading of the association. Mr Kruger says: Having been appointed to report on the best method of preparing ground for planting, my experience has been mostly in reclaiming foul brushy marsh, which I do as follows:

First, I mow the brush and burn or remove them, then cut with sod knife the same as for ditching, take out the first sod and then turn next into the hole leaving it bottom side up; follow across the patch of brush you wish to turn leaving spots of clean vines in their natural state, plant by scattering the vines over the surface and press or spat them down with a fork or foot where it is desired to remove the sod entirely. Tools are made which cheapens the cost very much, but turning over can only be done by hand; no brush or willow having made their appearance so far, do not press the vines too deep into the soil as the lower parts will rot. I have some planted deep four years old that do not look nearly so well as those planted two years old, which were simply spatted down. Land prepared in this manner require deeper drainage than ordinary natural bog. I prefer a ditch deep enough so it will always contain water to a shallow ditch that is dry the greater part of the dry season. The cost of preparing ground in this manner entirely by hand will not be far from thirty-five dollars per acre.

### HOW TO PREPARE FOR PLANTING.

Commence scalping alongside a dam or where you intend to have a dam. I should recommend the scalping plough; as a No. 1 machine will work, as I have said before, in any kind of marsh and does its work well and at one half the cost by hand and advancing your work many years. After scalping lay a portable train-track which you have in sections and remove scalpings to the dam or where you require them, or if you desire place them in windrows and burn them. It is a good plan to scalp in May and June, then carry off scalping, raise the water on the

top of the marsh about two or three inches it will heat up and all particles of grass, weeds etc. will rot in one month. I have done it and speak from experience. Then in fall dry down the marsh and leave it exposed to winter, and early in the spring put in your vines with proper treatment; the vines by the next spring will resemble a wheat field. Another plan is to plough in shallow sod marshes, using a plough that turns fourteen inches over and lays it flat, leaving no ridges or grass or weeds between the furrows, then plant your vines by poking them in every foot apart with a flat piece of wood on the end of a handle.

The cost of this last operation is about thirty dollars per acre.

PLANTING.

Choose your vines from one location when the fruit is on them so that you do not get them mixed as some are earlier or later in maturing, and these few would impede a portion of the crop at picking time. Put them in evenly and lightly with a sod hook, pitchfork or your heel. After being strewed evenly over the surface of the marsh take a corrugated roller and roll them in. Have the marsh pretty moist. Planting in spring is most desirable as the vines get firmly rooted by fall and will bud and give some berries the next year. It is a good plan, after planting with vines with their roots on to chop up some and scatter them all over the marsh to fill up in places that may not have been covered and make the planting even. Planting vines with roots cost about ten to twelve dollars per acre, but you must take into consideration the distance you have to bring the vines, thickness pulled from and the weeds, grass moss etc. to separate from them. In this case it may cost twenty dollars to the acre.

The thicker you plant the vines the quicker they will produce a crop. When you plant up into summer after your vines are in, it is a good thing to strew a little hay on the top to keep the roots cool and

you can keep the marsh drier; the hay will rot and disappear. Be sure you cut young grass so as to avoid seed; heavy thick vines mowed in spring make good seedling and benefit the old one which will bear fruit again the second year after being mowed.

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## CHAPTER IV.

### FLOODING,

After your reservoir-pond is built, I will now explain further. Make supply ditches of four feet wide, one shovel or more deep, after taking out the sod and let them lead into the ditches crossways of the fall and supply the different sections required, which ought not to be much over three quarters of an acre. Commence to flood in fall when the vines put on their winter coat, as we call it, having changed their color to a dark brown. Keep a supply of water running into the marsh all the winter. Hold your water over the tops of the vines until certain that the spring frosts are over; holding the water late in the spring is a preventative to worms. I am of the opinion that as a general thing the dams on the marsh for holding water for flooding purposes are too high; two feet to two and a half feet is high enough and more of them to equalize the water, having also open ditches crossways. After you are pretty sure that spring frost is gone, run your water down gradually partly through the marsh and surplus through the ditches to two or three inches below the surface and hold it through the summer about that stage.

I would here remark that the lay of marsh and condition of marsh may change the holding of the water in ditches as also will serve against worms working during the summer months, some marshes saturate and absorb greater than others, never allow water to stagnate on the marsh. Flooding is necessary to insure permanence to the vines

and protection against insects and frost; it also has a fertilizing effect, the streams flowing through the swamp land collect particles of vegetable matter which supplies the marsh. It is a safe rule to raise the water for flooding in fall when the temperature becomes sufficiently low to stop vegetation, say 63 degrees. The dams required for holding the water for winter flooding should be built thus:

You can use a theododite, or spirit level and two boards and go to the lowest spot along the line; then put on boards perpendicular eighteen inches apart, rest level on the top of them and point it to the highest part you intend covering with water and bring it to a level; then erect a pole and move a stick with a white rag up or down as you give directions; sight along top of the spirit level and judge the level with your eye, mark difference in the height of the two positions by substracting the height of the mark on the pole from the height of spirit level above the surface of the ground. Build your dams as thick as the depth of water will be; if a head of five feet be required dig the ditch five feet through the muck, throw out muck and fill with sand, place turf on each side of the sand, make the dam a foot or so higher than required to allow for settling. The dam should be built on a slant projecting at the bottom and so that the water should be at a level at both ends.

## CHAPTER V.

### GENERAL MANAGEMENT OF MARSH AND SANDING.

On this subject there is a great diversity of opinion, and right here should it be stated, that no two marshes are alike, or can be managed the same; or can a perfectly improved one be handled as one partly improved, or one in its wild condition. With farms the lay of

the land, soil, water privilege etc., control to a great extent the management and ruling.

A wild marsh partly improved with ditches and dams can be handled to a greater advantage by having a reservoir-pond, it will increase the size of the berry and also the number as the water at times through the summer can be held off the marsh or used through the marsh at other times, letting it drip through marsh from pond which keeps it cool at a time when the millers or worms work. Fill the ditches to the surface, which cools the atmosphere and keeps the miller from laying its eggs and they will seek a warmer place. It will also impede the workiug of any worms that may be hatched out.

I could advise for a newly planted marsh to give growth of vines that it be kept very dry through drainage for about two to three years. I visited frequently, for observation, the Gaynor marsh for the last two years, and this summer saw vines only set two years ago from choppings covering the bog all over and bearing some berries of immense size. I was informed that they had tried to dry it more, than they had been able, as there was considerable per cent. of water in the bog all the summer; although they had as thorough drainage as I ever saw. I observed runners on their marsh two and a half feet long. The vines are well budded for a crop this year. I am of the opinion that it will yield twice the berries per rod of the wild marshes, as the size of the berry will greatly increase the quantity and the extra price they will get for the size of the berry will assist in remuneration.

I have read that it is not advisable to flood a new meadow. I claim it is and give my reasons; firstly, it protects the soil and prevents its heaving with frost which would expose the roots of the vines; it allows the soil to pack around the roots and supplies the marsh with decomposed vegetable deposite as well as giving the young vines an even temperature when under water in winter which they cannot get

when exposed to the blast of winter and changing temperature out of the water, sometimes covered with snow, at other times uncovered, and early in the spring the young tender buds that have been covered most of the winter become exposed and in their tender condition it takes but little frost or severe cold winds to destroy them. The most harm is done to vines and buds in the spring by frost. Another fault of growers are that they do not put their vines sufficiently under water. I have repeatedly seen the tops of vines sticking out of the ice when flooded when the water they have let run to waste could have covered them. The spring preservation is the most important.

After the vines get a years growth, I would advise pulling the grass and weeds by hand, one pulling well done by men will suffice if done when the grass and weeds are young. Instruct your pullers to pull sideways as if pulled straight will disturb and tear the new runners of the vines.

I can not speak with experience of sanding a meadow as I don't know of any in the West that has developed sufficiently to give proofs of success. In the East they use the white sand from the Beach. We can use only sand that will crumble in the hand when compressed. If it adheres, or if it contains any per cent. of white clay, I should not advise its use. Sand also prevents the cracking open of the flakey muck which do not retain moisture nor absorb it from below in dry times. Therefore in this case sand would help in time of drouth and be a great saving to vines. Mr. Bennett, one of our leading Cranberry Growers, has many acres sanded. I give quotations from him:

"We have planted a piece of marsh after this method. That is strewed vines that have roots on, containing seven acres sanded two inches deep that have been planted two years last spring which produced a crop last fall of over fifty bushels of nice large berries to the acre or 350 bushels on the piece. They were the largest berries we had.

Mr. Smith and Mr. Gaynor also have some sanded marsh that will soon prove how beneficial it may be. It is doing well up to date."

If you sand I would advise for a new marsh before planting three or four inches. After planting two inches in putting on sand you must be controlled by quantity of muck and character of bottom; the most sand being required on the deepest muck as it will settle down and distribute until very little is left on the surface. Too much sand on a planted meadow has a tendency to crowd the roots and impede the growth of the vines. Sanding can be done advantageously in the winter months. Lay a portable train-track from your islands or main land or haul on the ice, have dump boxes on car, and after dumped spread on the ice evenly; when it thaws in spring it will fall to the meadow; keep a good supply of water in the pond from spring through the summer and in case of insects, you can use it as well in fall for frost. I would here relate that the mischief done by fall and spring frosts are eradicated by irrigation; many marshes, I could here mention, not having lost any of their crops for two years or more, although picking lasted quite late and through many frosts before the berries were taken off the marshes. This water application to keep off frost enables the grower to give his berries a chance of growth and an increase of crop of forty-two per cent of the early picked ones.

Have your marsh arranged in sections, one acre or less each so that you can run water on or off at will in a few hours and secure your crop, also have many open cross ditches of two feet. The water being in motion is a great preventative to frost; the open ditches every fifteen rods are excellent for drainage.

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## CHAPTER VI.

INSECTS AND TREATMENT OF SAME.

The vine worm which feeds on the cranberry vine spining its web around several ends of the vine, binding them together, destroys them. In Anchylopera the palpi are shorter, the head with the forewings broader than usual and the costa somewhat obtusely arched toward the base while the tip is often hooklike and the outer edge concave. The larvæ feeds between the united leaves of the plant; a spiredpoliana clemens is white on the forewings with a large reddish brown dorsal patch extending from the base to the middle of the wing and an oblique band from the middle of the costa to about the centre of the wing; the costa beyond is streaked alternately with white and reddish brown to the apex. The larvæ feeds on the leaves of spirea opulifolia or nine bask, it is pale green with yellowish tinge (clemens). Mr. Fish has discovered an undescribed specie which feeds on the cranberry and which we may call the cranberry anchylopera vacciniana. The moth is dark ash, the forewing being whitish with brown and reddish scales with white narrow bands on the costa, alternating with broader yellowish brown bands, five of which are several times larger than the others and form four of them irregular indistinct lines across the wing. The first line is situated just beyond the inner wing and is often obsolete, the second line is the largest and is slightly bent; in the middle of the wing there is a large brown spot parallel to the costa, being situated on the angle, the third line is oblique and stopped before reaching the inner angle and is forked on the costa, while the fourth line is a short apical diffuse irregular line. The apex of the wing is dark brown and is a little more accute than usual in the genus. The length of the forewing is 20 of an inch.

It lays its eggs on the leaves during the month of August and a new brood of larvæ appear in September, though they hatch mostly in the following spring or early in June and become fully grown in July. The larvæ seen from above is much like that of (Loscotoenia rosaceana) but the head is a little larger in proportion to the rest of the body, being as wide as the body in its thickest part. The body is more hairy while the protiorax is not dark. The chrysalis is rather slender, the body being contracted at the base of the abdomen on the rings of which there are dorsal rows of fine spines. Mr. Fish gives it that the larvæ called cranberry vine worms, hatch about the first of June from eggs that have remained upon the leaves of the plants all the winter, they commence to feed on the tender growing shoots of the plant, drawing the leaves together with their web for shelter concealing themselves and feeding within. Before reaching their full size, they, if very numerous, almost wholly destroy the leaves and tender shoots, giving the whole bog a dark dry appearance as though a fire had been over it. This is why in some places they are known as fire-worms. Having reached their full size they spin up among the leaves or among the dead leaves upon the ground ; after remaining in the pupa state about ten or thirteen days the moths come out and deposit their eggs upon the leaves. There is a second brood in the season and the most destructive mostly change to pupa on the 20th of July. On the 26th of July the first moth came out, and most were out before the 4th of August. The moth has been seen as late as the 20th of August. Most of the eggs laid in August do not hatch until the following spring, two or three larvæ have been found in September, but that is a rare occurrence at that time.

Another Tortricid larvæ which seems to differ generally from the vine worm in being thicker and having a larger squarer prothoracic ring and a less heavy body is called the Fruit worm. According to Mr.

Fish, these worms appear the first of August and work all through the month. The first signs of their presence is seen in the berries that are attacked turning prematurely red; most of them reach their full size before the first of September. In some places where the vines have been retarded by being kept under water until the first of June previous, it is common to cover the bog with water when convienent. They do not reach their full size until a few weeks later. When fully grown they enter the ground and spin their cocoons within a few inches of the surface. The cocoons are covered with grains of sand and are hardly distinguishable from small lumps of earth. They remain in the ground all the winter. Mr. Fish says, he has never been able to rear the perfect insect or know it positively. In the spring of 1867, I bred two species of Ichneman from these cocoons that had remained in the house over winter.

Cedaria numbers many species in which the antenuœ of the male is simple or slightly pubescent, and the fore wings are rather pointed at the tip, while the hind wings are rounded. The larvæ is elongated and slender with the head often notched, it feeds on trees or shrubs and the pupa is of variegated colors (Cedaria diversilincata Hubu); it is yellowish ochreuos with brownish angular lines, the abdomen is curved over the back. Mr. Sanders has found the larvæ feeding on the woodbine, according to his notes; the body above is dark brown with a slightly reddish tint and patches of a darker shade along the dorsal region being the color of the twigs of its food plant.

It remains in the pupa state about a week. We have also found both brown and green specimens, feeding on the grape vine in midsummer. The worms can be removed by hand-picking as they are rather conspicuous objects. A larvæ probably of Cidaria has been found by Mr. W. C. Fish stripping the cranberry plants late in August at Harwich, Mass. Mr. Fish writes: I have never met them that I am aware of

before, but on one bog in this place they destroyed nearly two acres of cranberry vines eating off the green leaves ; the bog being as black in spots as though the fire had been over it; they were not numerous at that time, but may prove sometimes to be a great pest to the cranberry growers. We failed to rear the larvæ sent by Mr. Fish. They are about the size of a canker-worm, the head which is no wider than the rest of the body is deeply indented on each side rising into a tubercle; the anal plate is long acute and beneath it are two minute acute tubercles tinged with reddish. It is a dull reddish brown simulating the color of the twigs of the cranberry and is finely lineated with darker lines, the head is speckled with brown, with a conspicuous transverse band across the vertex and two rows of pale spots across the front ; just above the spiracles is a broad dusky band, the body is paler beneath with a menal clear line edged with brown. It is 80th of an inch in length. Mr. Fish states that the owner of the bog flowed it with water so that it was completely covered and the worms were killed.

The genus Presliphora closely allied to Nematus is known by its nine jointed antemics and the single costal cell; the first submarginal (subcostal) cell having two recurrent veinlets, P. edentidem Norton has been discovered by Mr. W. C. Fish to be destructive to the cranberry. On Cape Cod he has reared the insect and sent me the following notes on its habits while the adult fly has been identified by Mr. Norton to whom I submitted specimens.

The larvæ were detected in the first week of June eating leaves; they were light or pale yellowish green when first hatched and grew darker with age. The head of the young was dark, but in the full grown worm lighter. When full grown they were about a 30th of an inch in length, and had two lighter whitish green stripes running along the back from head to tail. They had spun their cocoons by the 20th of June in the rubbish at the bottom of the rearing bottle ; on the 29th

of June they came out in the perfect state. We would add to this description that the body in two alchoholic specimens of the larvæ was long cylindrical and smooth with seven pairs of abdominal feet. The head is full rounded and blackish, but after the last moult pale honey yellow, the male is shining black, and Mr. Norton informs me that it is his P. edeota P. grosuslariæ, which is a widely different species in the northern and western states and injures the currants and gooseberries. The female fly is shining black while the head is dull yellow and the legs are honey yellow with the tips of the six tarsi, and some times the extreme tips of the hinder tibiæ and the tarsal joints pale dusky for a quarter of their length. The wings are partially hyaline with black veins, honey yellow costa and a dusky stigma, edged with honey yellow. The male differs a little in having black corcœ. Mr. Walsh states that the larvæ is a pale grass green worm, half an inch long with a black head, which becomes green after the last moult, but with a lateral brown stripe meeting with the opposite one on the top of the head where it is more or less confluent, and a central black spot on the face.

It appears last of June and early in July, and a second brood in August. They spin their cocoons on the bushes on which they feed and the fly appears in two or three weeks. The specimens reared by him flying on the 26th of August. P. Sycoplanta Walsh is an inquiline or guest gall saw fly, inhabiting a Cecidomyioin gall on a willow. The typical genus Tortrix has a palpi much longer than the head with the forewings about twice as long and broad. The costa arched abruptly at the base while the outer edge is truncote and sometimes hollowed out below the tip. T. gelidana Moschler is a common arctic form and occurs commonly in northern Labrador, and has been detected, a new species which feeds on the cranberry for which we suggest the name Tortrix ocycoccana. Its body is dark brown with lighter hair on

each side of the abdominal segments and fuscous, at the tip the fore wings are of a peculiar glistening gray, motteled with reddish brown scale, especially toward the outer edge. There are no well defined spots on bands. The hind wings are slate colored and the wings expand .64 of an inch.

As regards the treatment of the vine worm, I would say, there are two ways of getting rid of them or stopping their work if taken in time and found out where they commence work as every grower ought to do when giving careful attention to his marsh. The one way is to take a branch of a tree with the small limbs on it, and drag it by hand over the spots affected; the worms will drop off to the marsh and then flood and wash them off through the ditches or when you first discover them place hay over the spots and set fire to it, better to burn a few rods of vines than lose your whole meadow. Flooding is recommended by some, but not proven successful by others without the water can be kept on over forty-eight hours. The natural food for these worms is the feather leaf Cassandra Calyculata and the low bush huckleberry. The latter I fail to see around this section of country, although I learned it is north of us; I presume and it is the opinion of many that as soon as the wild marshes come under cultivation and the dams, roadways, islands, cleaned off and continued flooding in winter, the insects will be to a great extent done away with. Another good remedy to rid insects is to flood just before blossoming. Hold it on for twenty-four hours and it will wash many away if not kill all, let it off at expiration of twenty-four hours or it will injure the crop. For the destruction of the miller that lays its eggs on the blossom or, as some claim, on the little berry and perforates another, I would keep the marsh moist to lower the temperature which will prevent any from hatching and many from laying their eggs. It is found that less damage is done next to the ditches on the moist marsh where the temperature is not

sufficiently high; to hatch the eggs on the dry places it is. Another remedy is to put out lamps at dark early in spring. I would for economy sake suggest that the lamps be made only large enough to hold Kerosene to burn until 2 a. m. Place them on the islands, roadways or dams, about twelve rods apart, in a round pan, three inches deep with a little water and a sprinkle of kerosene to catch the miller when he falls after flying in the flame and burning his wings. I notice that every year the growers are increasing the number of lamps and putting them out earlier and keeping them out later in the season; use them only on dark and calm nights.

I wish to remark here, that as far as inquiring goes as to the millers' it seems to be a question of doubt as to the right one that lays the eggs for the destruction of the berry; or if it is a miller at all, it is a dark colored one, small, with a yellow head. But an experienced cranberry man informs me and from personal observation has seen a black fly in great numbers lighting on the blossom or rather darting at its coming in contact each time at the same season of the year, and he has the idea it is this fly (not shoe fly) that does the work and is the destroyer of the berry. He intends as also a member of our association, Mr Kruskie, who has so far made good scientific developments, to experiment further and inform the association. If the egg is laid by the larger miller, I am of the opinion that very few berries would be left to be picked from the multitude that fly, but I think a great many of these said millers are the friends and not the foes of the cranberry vines and berries—as they produce the worms that eat up weeds, brush &c.

TIP WORM.

I fail to find this worm mentioned only in comparison, but I know we are somewhat troubled with it.

It is a small, colored insect, very small, and eats the newly formed buds at the top of the shoot standing up concased on the inner or bud

side ; it works all summer more or less and while the berries are forming for the next years crop. I should recommend the same method of treatment as the one prescribed for the vine worm. The tip worms work can be observed at the onset and can easily be stopped.

There are other insects of less importance, but as there are no evil results on our western marshes up to date observable, an entomology being no small science and requires immense study which I have not been able to give it, it is sufficient to know, that our association has taken it up and we look for good *results* from their efforts. I would here call attention to a destroyer of the cranberry, a bird well known to the sporting community and Growers, called the Prarie chicken, which largely prey on the crops but of course, the Cranberry Growers being restricted by the game laws, would not think of shooting them.

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## CHAPTER VII.

### PICKING.

I would advise handpicking where you can, as raking, except your vines are old. Vines raked before or upright will be partially destroyed and at a loss of one third of the crop. Handle your berries in baskets or boxes at first, preferable easier to handle, having used both measure in the bushel box so called; it is a good idea when picking to have an extra supply of baskets or boxes on the trainway or at the boat near where you are picking to measure midday, and give tickets with amount of berries, and Growers name, commencing with bushels, half bushels, pecks, and quarts. These tickets are as good as gold and can be used at any store or will be cashed on presentation. Give your picker a number, and place opposite his number a duplicate of what the ticket shows

when paid and when ticket received cancel it. The price per bushel paid for picking must be controlled by condition of marsh distance of carrying berries etc., accommodations for pickers and rakers; but I would say it is well to abide by the rules of the Cranberry Association and carry them out as far as practicable. Prices paid of late years: pickers 50 to 64 cents per bushel clean berries, rakers wages from $1.50 to $2.75 per day and board. When you put in your pickers, say forty to fifty with an overseer, place them in line and commence close to ditch, allowing three to four feet room for each picker according to thickness of berries; the overseer is held responsible for their being picked clean; place rakers in rows if the berries warrant it. Let them pick up some, it does not pay to pick up clean; it is better to contract picking of the berries left after rakers are through to go over the marsh allowing so much per bushel, which price must be controlled by the price of berries in market.

## CHAPTER VIII.

### CLASSIFICATION OF BERRIES.

There are growing on our marshes including the cultivated ones the following varieties;

The Cherry, the Bell, Bugle also Early Blacks some New Jersey and Cape Cod varieties as also the Belin and McFarland.

The first mentioned is known by its spherical form and when ripe is a paler red than others. The second, the Bell, resembles a bell and is a deeper red. Third, the Cherry, is a dark red, round in shape, a very hardy berry, great solidity when perfectly matured, is an excellent keeper and flavor. You will find many of the berries in the spring of the year on the marshes sound. Several of our growers have planted

the Jersey varieties and also the Cape Cod and some the Belin. The last named have the preference as they seem better adapted to soil and climate, but the native berry takes the lead, and when those who use them understand the cooking they will always seek them in the market.

Mr. Bennett one of our growers whose name I have introduced before says, that the Early Blacks is the earliest berry in the East and the McFarland said to be the largest berry grown on Cape Cod. The early Blacks will be four years old next spring, they produce a nice bell shaped berry, not so large as our native variety, but I have noticed that they don't ripen any earlier. The McFarland have been planted but two years next spring and were planted in rows eighteen inches each way and only the tops of the vines were used in planting, they produced a few nice large berries last year, but of course have not been planted long enough to determine whether they will be an improvement on our native berry, or not. I think the condition of the marsh and the thickness of the vines has something to do with the size of the berry. Our largest berries this year were raised on vines planted two years ago last spring; on our older planting where the vines are thickly matted the berries are smaller.

Should the Cape Cod variety fail to be thrifty I would recommend the use of salt as it is natural to them having had the benefit of the breeze from the briny ocean.

## CHAPTER IX.

### BRUSH WEEDS AND MOSS; HOW TO GET RID OF.

Brush and weeds come out by scalping by hand or machinery, moss either scalp or dry down, rake off and burn or dry the marsh down

and burn it, then roll and flood; the grass burn if you do not have t.o many vines

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## CHAPTER X.

EXCESSIVE HEAT.

Heat is more destructive to the crops than any one has an idea of, when the berries are about to change from white to their ripening color, a temperature above eighty-threedegrees will soften them and I should advise running water through the ditches.

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## CHAPTER XI

HOW TO MAKE FLOOD GATES.

One kind of flood gate will not work in every marsh; therefore it is hard to describe one to suit all. I would advise the visiting of different marshes for choice. I give you one here by Mr. Charles Kruger, grower, said to work admirably. First put in stops by digging out a trench for putting in the gate, dig ditch one foot wider than common width about three feet deep or two feet below the bottom of the ditch, start a well curb twenty inches high, sixteen feet long, five feet wide, for six foot ditch, others in proportion; nail two by four spike at centre and then another, put on top even witht op of curb and spike, fit in bottom boards and mark one, two, and three as may be; then remove them ready for use and settle in curb so that the top joist will be four inches lower than the ditch, throw same dirt back and pack it good inside and outside of curb, fill even with joist, bail out water low enough to nail in bottom boards as numbered, and sideboards; sideboards should be nailed on inside, instead of outside of scantling. This will leave a

shoulder below the bottom of ditch which forms the curb, and leaves also an opening in the side of flume, for self filling; in case there should be any wash below, then put dirt on side as high as top flume, nail on slats to hold splash boards. The material used is two by four scantling, and one inch boards ten inches wide. This method avoids crawfish, musk rats, or turtles working under and admits of a boat passing through and will not heave with frost.

## CHAPTER XII.

### LEVELLING AND ROLLING.

Rule for levelling was given under the head of flooding. Rolling should be done, in my opinion, immediately after picking before the newly formed buds are large, and it gives the vines a chance of righting themselves, before putting on the water for winter flooding; the marsh is in better order for packing down, the roller should be sufficient large and heavy enough to do the work good.

## CHAPTER XIII.

### HOW TO CONSTRUCT A RESERVOIR-POND.

First, find out the fall of the marsh, which every grower ought to be conversant with to improve, then run your line angling so that the water will be the same height at both ends, dig about three to four foot ditch, throw out sods on the opposite side to what your pond will be, then dig a ditch on pond side, and fill first ditch with sand from second ditch, place your sods on the outsides keeping middle full with the sand, let your dam be built three or more feet back from the waters edge of

your pond, make the dam six feet high, ten feet wide and level the top with sand, seed it down so as to prevent it washing with heavy rains, make in dam drip holes by planking about a foot wide at every fifteen rods; the sides of the dam should slant larger at the bottom about three feet. In building a reservoir-pond, if you have some tamarack in the swamp at the head, it will be well to erect it there as you will not have so much evaporation. You can put your flood gates in for your supply ditches as prescribed by Chas. Kruger's plan.

## CHAPTER XIV.

### KEEPING BERRIES AND CURING THEM.

When you receive your berries at the cranberry house from your pickers, place them away in one or two bushel boxes; some prefer one, some the other; one bushel box can be handled by one man when feeding the mill. The boxes have lath sides, and bottom, with boarded ends, and strips to stand on, or you can put your first lath on allowing a space for the box to stand on the other, and allow for air; fill your boxes well to allow for dirt and shrinkage and pile them up so that the air can pass through and circulate around them, have your boxes or the compartment to hold about one bushel large, allowing for dirt; the chaff is good to keep in the berries for curing purposes. Then at any time you can estimate in case you want to make a sale; lay them away in the cool with not too much light, they will cure nicely in one week to ten days, ready to run through the mill and barrel. Never run your berries through the mill until your are going to barrel them, keep your raked ones from your picked ones. When you run them through the mill you can assort them to suit yourself, but from my experience, I think, two grades of berries pay best, give best satisfaction,

and you have no poor ones in to decay, and the third grade will readily sell for little less per barrel. The extra you get on your two grades will amount to more than if you had the three grades together and then the chances are that some would be softening which will not occur with the two grades, if you have a mill that does not bruise the berries.

Barrelling, first thing is to see your barrel is clean, hoops on in good condition. I would reccommend the four hoop barrel, it is taking the place of the eight, easier for the grower to handle, and more substantial. Be sure you have standard size, (twenty-two and half inches between heads, eighteen inches bilge, sixteen and a quarter inches head). Take out head, upper hoop off, fill up, put on hoop, fill six inches higher; in the middle above level of the barrel put on head and screw down with force, or use the barrel header which is a very convenient machine, as you can move it to any part of your cranberry house, instead of taking your barrel of berries to the screws and time is saved which is money at cranberry picking time of high wages; nail on the two outside hoops and let it go on its way to the proposed storehouse, to await the advantage of the market and have the case and temperature which we fail to give it in our illy constructed cranberry houses. I think we will appreciate the motion of the association in locating a storehouse, to keep us independent of buyers when prices are low, or made low for purpose of getting our berries cheap, and they selling them dear. Keeping properties of the berries: I think the western berry a better keeper on account of our meadows being covered with thick vines while those East, not so well matted, are subjected to reflected heat from sand, the direct heat of sun ripens them too quickly and they soften. Spots may be seen like a bruise on the berries, from this cause. Here arises the question if sanding will be beneficial, as in our summer month we have occasionally very intense heat from the sun. I think

we all should try and arrive at a point, to construct cooler and more airy places for curing and keeping our berries.

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## CHAPTER XV.

FROST, AND HOW TO AVOID IT.

Hold the water late in spring until the first or fifth of June, this will save crop in spring, also keep off worms.

In fall keep your ditches full if a frost is approaching flood. This raises a mist or fog two to three feet high and saves the berries. I have on the uncultivated marshes seen berries covered with frost and not injured; as the frost was gradually removed it lost its power to destroy. Another caution against frost is to clear off all brush and weeds on islands and dams. They claim that berries on a strip where vines in a natural bog had been covered with sand, thrown from ditches being firm and hard, while on both sides of this strip they were softened.

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## CHAPTER XVI.

RATS AND MICE.

Trap the former or shoot them, the skin of every rat will pay handsomely for the carcass the ammunition was spent on. Mice can be knocked on the head with a stick.

## CHAPTER XVII.

SCALDING

Is the result of too much water to the surface, when the sun is extremely hot, or is also done by rain showers, the sun shining on the berry immediately after summer showers. This is not likely to occur on marshes with vines well matted, as the ground will be shaded.

## CHAPTER XVIII.

CRANBERRY MILL CLEANERS.

There are a great many Eastern mills in use from New Jersey and Massachusetts and some are in use which the growers have manufactured themselves. There is an open field for a good invention of a separator, for the frozen berries, as also for a cleaner that won't bruise the berries and do the work more expeditiously. I am informed that one of the growers is now getting up one and he has my best wishes for his success.

## CHAPTER XIX.

In a season when the frost does not affect the crops, which will be so from now out on the cultivated marshes, who have a goodly supply of water. They can be picked and placed in the barrels, for $2.50. For the last sixteen years good berries have not sold for less than five dollars per barrel and have sold as high as twelve dollars per barrel on the track. There is one thing rather peculiar about the cranberry crop, that when there is a good supply, the commission men and buyers are more active in purchasing and generally hold a small Wall

street over the crop. When the crop is small they are indifferent to speculation. I would here remark that the benefit of the proposed storehouse mentioned at the association, will enable the growers to arrive at a fair margin every year, by holding their berries and taking advantage of the same.

I would also suggest another good plan. I think it would work to the advantage of the growers, if a pool were made so that small lots of berries could be purchased, and stored and kept off the market. These small lots thrown on the market are mostly inferior, and injure the trade for the seller; then the commission men could only buy outside inferior lots, the storehouse would refuse to receive and would soon tire of such stock, and would stop their purchasing outside the warehouse.

In my estimate of profit I did not deduct for expenses of running the marsh and improvements, which is equal to money invested at ten per cent. interest, as also the increase of valuation for what improvements are made.

## CHAPTER XX.

### TOOLS, ETC.

For scalping, there is the scalping plow and sod knife cutter by horse power. A sod knife for hand use, can be made by the blacksmith out of a cross cut saw blade, or a hay knife by having a long crooked handle put to it and the blade drawn out some. The edge sod knife is a good knife for light work; turning dams etc., use sod hooks with short teeth long or short handles. There is another sod knife like an axe very useful, grub axe, common axe, and hay fork, shovels and spades, long and short handles, garden rake, hay rake, triangular hoe, scythe,

long and short blades. The latter for mowing the marsh close down, only can be done with the short blade. Other tools such as are required at home will be necessary.

## CHAPTER XXI.

### BLAST.

Blast caused by drought injures a great many vine unnoticible and the ravages placed to the tip worm, or some other insect. I have it from good authority that a marsh at a very dry time the upper leaves of the vines become concave and loose their buds and no worms; descernable proof of it being blast, is that it only occurs in the dryest portion of the marsh and on the surface of it. The damp and lower places, not seen, it can be avoided by moistening the marsh, and letting the water raise to the ditches. The condition of the atmosphere will kill vines; also reflected rays are very damaging, more so than direct rays of the sun.

Mr. Megow, one of our cranberry growers, stated at the association that the thermometer was placed near the water when the berries were scalding, and it registered 120 degrees, when the temperature above was only 70 degrees, therefore I come to the conclusion that the reflected rays were the most damaging. This gentleman also says that 32 degrees below zero will kill in winter, and 85 degrees above will kill new shoots or settings. Mr. Bennett, another grower, says; Vines kill at Cape Cod at two degrees from condition of atmosphere. Mr. Brooks, grower, says: more vines are killed in February and March, than in any other month. That means when the marsh is not properly flooded, because the sun has melted the snow away from the high bushes leaving them exposed to the sun, wind and cold. Here I would recommend that the high bushes be grubbed out and burrows be rolled down as they harbor insects.

## CHAPTER XXII.

HOW TO STOP OR PREVENT FIRE.

When you want to burn marsh, or see a fire at a distance approaching take two or three men, mow a space of three or four rods wide then get tubs which you ought to keep on hand, fill them with water at every twelve rods, then wet your blankets that are attached to a stick and drag over the mowed grass, it will suprise you to see how long a tub of water will last, you then stand back when fire first approaches a few minutes, and then you can conquer it.

## CHAPTER XXIII.

BY MR. JOHN GAYNOR, GROWER.

Most growers call the bud that can be seen on the tip of the vine in the fall a fruit bud. Now I have grave doubts as to whether every one of those contain the rudiments of a blossom; of course most of them do, but I think some are simply branch buds and do not produce blossoms at all. I noticed on Mr. Bennetts scalping a fine showing of buds in the fall and expected to see it white with blossoms in the spring, but the reverse was the case, the blooms were very few; perhaps Mr. Bennett can give some cause for this. Mr. Bennett said he drew off the water very early to facilitate working and probably the frost injured the blossoms. Mr. Gaynor says, it is determined in the fall whether the bud is a fruit or simply a growth bud and no condition in the spring would produce fruit from a growth bud.

Mr. John Arpin has cultivated cranberry marsh, 60 acres in vines planted on ploughed ground on light sod thereby turning up from two to four inches sand. In the fall of 1886 vines planted upright in small

bunches one foot apart in furrows, this marsh bore fifty barrels in 1890. D. J. Arpin and E. P. Arpin each have twenty acres of similar cultivated marsh, planted somewhat thicker than on the J. Arpin marsh, also vines cut into one and a half inches in length with a hay cutter, were sown over the ground and dragged and rolled in. This marsh looks very good and bore one hundred barrels in 1889, and 500 barrells in 1890.

The berries raised on the Arpin sanded marshes are larger and of uniform color, ripening a week or ten days sooner than the berries raised on wild or unploughed lands. The Arpins have a brand called "Bouquet Cranberries," for the fruit on these sanded marshes, these berries are fully equal in size and color to the Berlin Bugle berries.

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## From James Gaynor, Grower, on Heat and Moisture.

The agency of nature are few in number but, far reaching in their multiplicity of effects, we see a natural law in a single case, in the next case that come before us we fail to recognize it: we see the riggler in the rain barrel change into a mosquito, and think it singular because we have not observed this change in other insects. On closer observation, we conclude that the change is the law of all insects life. But we fail to see that in the case of the frog. It is the working of this same law that changes a herbivarous fish into a living breathing carniferous quadruped, that changes the hair covered gosling with its sharp thin voice, into a feathered goose with a coarse heavy voice and the beardless boy into a bearded man.

We see the law of sex in animals, but fail to grasp it in plants, we know that our domestic animals do not begin to hear until they are about to complete their growth. But we fail to recognize that it is the same law that makes the thriftieth growth in plants, incompatible with

a heavy crop of fruit. Now if you will reflect in this line of thought, you will see we are apt to look too narrowly at effects, and fail too often to grasp the broad underlying law or cause to which a multiplicity of diverse effects may be traced. If you have caught my meaning you will not hesitate to agree with me when I say that water is natures cart and heat is her horse.

Passing over the ocean currents, the formation of continents and islands, the moving of mountains into the valley to the gentle currents that carry nourishment to all parts of the body, of the animal and the plant, and in them all you see that water is natures cart, and heat is the power that moves it, you may think that plants are not endowed with the power to move, because growth is about the only vital motion to which most plants are subject. But this most important motion is more dependent on heat and moisture, than on all other agencies combined. I would therefore urge upon you that when you see your vines fail to thrive, do not hunt for the cause in moon signs or mysterious indefinable properties in the soil, but see if they have the proper supply of heat and moisture. If they are not scalded with water or wilting with drowth, you can rest easy on that part of the consideration, and attribute their feeble growth (their only kind of motion) to a lack of heat. Neither the leaf nor the root of our vines will show signs of life and activity below a temperature of sixty degrees. Many of our wet compact marsh soils remain below temperature for all time but a few weeks in midsummer.

If you know how to use the thermometer on such a marsh you can prove what I say. By repeated experiments it was found that cream would churn best at about 64 degrees, and that much above or below that temperature, the butter would not come. Before the fact was known the failure of the butter form was attributed to all sorts of mysterious and mythical agencies. I often think we are so given to hunt for

mysterious causes, that if we could be set back a few hundred years we would be hanging some witch for preventing our vines from thriving. When you have learned that the want of heat is the cause of the failure in growth you will inquire: How can we warm our bogs? The law of transmission of heat is more neglected in teaching natural science than any other branch of equal importance, and if I should attempt it here I would probably fail to impart to you much practical information. I will give you a few hints however, that may lead you to think and study further, and then I will close.

The source of heat is the sun, this heat is imparted to the water and to the surface of the soil, and from the soil to the air. Most soils are poor conductors of heat, and unless the heat can be carried downwards into them, the air or water it will not penetrate to any considerable depth, not usually far enough to warm the soil down to the roots of the vines. You may warm your wild marsh to good advantage, by flushing it with water that will stand on the surface in scattering pools that will grow warmer under the suns rays, and transmit their heat to the moss rooted vines standing in hummocks around them, or you may warm it by stripping the surface of the bog bare of vegetable blankets that cover it, exposing the soil to the sun, and drying it down until the warm air penetrates it through the pore the water previously filled. This is the method the agriculturist relies on.

The same blanket that keeps a man warm will keep a chunk of ice from thawing rapidly on a hot day. And the worst possible condition for our marsh is to have a blanket of vegetation, between the soil and the sun; and the worst stage of water for the blanket covered marsh is to have the water a few inches below the surface where the sun can not reach it, but where the cooling influence of its evaporation is felt all over the mositened surface.

If these few suggestion will lead you to observe and make experimental tests, to prove what I have said, I will have accomplished the purpose of this short article, and I shall be satisfied.

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ITEM FROM WM. L. MEGOW, GROWER.

*Crescent Island, Feb'y* 4, 1881.

A. G. CARY, DEAR SIR: Yours of Jan'y 15th, received and contents noted.

I will comply with your request as far as I am able, but my idea of reservoir and bulk heads or sluice ways may not be practical, or applicable to all differently located bogs, but I have found them of practical benefit in the cultivation of my own bog.

I consider a large reservoir of paramount importance to the successful cultivation of any cranberry bog. In laying out a bog, I should recommend that about two thirds of the territory be used for a reservoir and only the remaining third expected to produce cranberries.

This especially refers to those marshes which depend upon surface water, for their water supply, when an adjacent stream is dammed for flooding purposes a smaller reservoir will suffice, a reservoir however is as strongly recommended in the latter case as the former, for three reasons. First, the water when drawn directly from the stream is cold and causes a shock to the vines which invariably retards growth.

Second, when flooding to prevent frost if you have warm water to use, a fog or steam will begin to arise from the water as soon as it is set in motion, and it will not be necessary to flood deep enough to cover either fruit or vines. If you can not draw the water off in the morning the fruit is not injured by the double action of sun and water. Third, from a properly located reservoir water can be more quickly and evenly distributed over the bog, than as if only one sluice is used for letting water on.

In selecting a location of a bog first inquire into the amount of water to be dependent upon, and also what natural helps there are towards reservoir making. The best thing nature can do for us is to supply a constantly flowing inlet, and hills or high banks on both sides. Then it only remains for us to dam securely the inlet and we have the best kind of a reservoir.

The reservoir should always be at the upper end of the cultivated bog.

If the high bank extend also along the sides of the cultivated bog it will be found by observation, that that portion of the bog that is sheltered from the winds as well as that that lies highest is the most subject to frost. For this reason more water is needed near the banks than in the middle. The water naturally flows towards the central and lowest parts of the bog thus leaving the highest and outer parts of it the most exposed to frost.

To counteract this tendency a ditch with a dam below should be placed about two rods below the reservoir dam and extend along the entire length of the bog, close to the high banks on both sides. Small sluiceways should be constructed in the dam, about twenty rods apart. The cultivated bog should be supplied with transverse irregating dams with ditches above them.

First, if the season is unduly wet and the reservoir is filled to overflowing, then the surplus water may be drawn through these ditches around the bog, and disposed of through the lower outlet. Second, in case frost is predicted these ditches can be filled with the warm reservoir water, and be held in readiness for letting into the bog just before the mercury reaches the freezing point. Now by means of the transverse ditches, it will be seen that the water can be quickly and evenly distributed over the surface of the bog, and frost will be warded off without covering either fruit or vine. Without these facilities for

distribution of the water some of the berries are liable to become water soaked and ruined while others are still subject to the ravages of the frost king.

One of the most essential requisitions of a cultivated bog is a series of sluiceways which can be relied upon. Mink, musk rats, crabs, snakes, etc., are among the enemies of the sluiceway, and they must be constructed with a view of frustrating the ravages of such pests. Having temporarily dammed the water away from the location in order to make the work as dry as possible, I proceed as follows:

First dig down in the ditch to a little below the level, over which I wish the water to flow when drawn through the gate, next I dig three or four transverse trenches three or four feet deep and extending four or five feet beyond the sides of the ditch into these trenches I place plank standing on edge with the edge of each plank overlapping the upper edge of the plank below and on the side of the plank against which the water is to press, now I fill up with dirt, either sand or muck, now sod, all spaces level with the top of the planks, the upper edge of the planks all being on the same level. I next prepare a box made of double boards securely nailed together, and all joints well broken. The box is the width of the ditch any desirable length, twelve to sixteen feet being a good average length and twelve inches high. The bottom and sides are of the above dimensions and there are no ends and the top is about two feet shorter than the bottom.

The shorter top is so placed that the difference in length shall be at one end. I now place the box with the open end at the front, *i. e.* the end against which the pressure of the box extended a few inches beyond the buried planks. I now nail two planks in an upright position one on either side of the inside of the box, in front the edges of the planks are to rest against the top of the box, two more planks nailed in the same position in front of the latter and about one and a

quarter inches from them, will form a slot in which the slash boards or gates will slide easily to place, when I use planks for gates I make the slat proportionally wider. I next drive a square post outside of each corner of the box, and just back of the intrenched planks on which the box rests. The top of the posts should be high enough to coincide with the top of the dam. I also drive similar posts back of the other intrenched plank, which extends on either side from below the box. I now place planks four or five feet in length against each post in the same relative position as the buried plank, these extentions from the side of the box, I for convenience call wings. I now fill all the spaces carefully with dirt level with the top of the box, now I take long planks placing them together edgeways across the top of the box and against the posts extending on either side to the length of the rest of the wings, continue to place planks in the position with edges overlapping as before until the wings are as high as the posts and dam. I now fill up the places between the wings with dirt and level the top of the dam. The front posts should be set just back of the upright planks, thus bringing the front wings back of the gates or slashes.

I consider the covering sluiceways which I have described much better than the open ones used by many growers for this reason :

First, the bottom and sides of the open ways are often bulged and raised by freezing in winter and before the frost is out of the ground around them in spring, the mink have found their week spot, and a new sluiceway must be constructed. I have never had the like experience with the covered sluiceways ; second, the open sluiceways being more exposed to the action of the sun and air the planks rot very much faster.

Hoping the enclosed theories and *modus operandi* may be of use to you I am, Yours truly

W. E. MEGOW.

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Mr. Bennett, cranberry grower, delivered at the association the following:

Mr. President and members of the association. During the past year I have been where I have seen a greater variety of conditions under which cranberries are grown than ever before. I have also been more deeply impressed with the importance and profit of raising a larger berry to meet the demand of the coming generations and a future market.

So long as the world stands the pickers will prefer to pick larger berries, the growers prefer to raise them and the jobber to handle them. Large berries are always saleable when others are drug on the market. The question then as to how they can be raised on the vines we now have, becomes one of vital importance.

There are over fifty experimental stations in America scattered from ocean to ocean and from the Gulf of Mexico to the Polar Sea. They are under the charge of men of experience, and devoting a vast amount of time, patience and capital experiment with all kinds of grain and fruits, from all the nations of the earth. There are also any amount of private individuals making tests all over the land. We live in an age of facts which are scattered thickly about us new and fresh, we do not need to search the dusty leaves of ages past. I used to think we should study nature and imitate her ways. But when I see man produce two tons of hay, where nature produced only a half a ton, produce 100 bushels of corn, where nature produce half a bushel, a ton of grapes, where nature produced 100 lbs, 100 bushels of nice

apples, where nature produced two bushels of thorn apples, I hesitate to continue to blindly imitate all her ways. Even the fish in the hand of man are made to produce and hatch 175 eggs out of a possible 200, while the fish left to natures ways only produces 100 fish on the average from 200 eggs. In 10,000 ways we see man master over nature.

Then lets gather up the facts from every source and advance with the age in which we live.

My own experience so far in raising cranberries from Eastern vines has not been satisfactory. The vines do not seem to be so hardy as our own, and the berries do not equal the ones produced in the East, and I doubt if the berry is in any respect equal to our own if given an equal chance, besides the chance there is that some foreign enemy of the vine will be introduced to our plantations with these imported vines. I have no doubt the second and third generations of the vines will show better results. At the close of the war some from the north went south and planted the Irish Potato in southern soil, where the Sweet Potato grew before, the result was a soggy worthless product, but persistent replanting, has produced on southern soil as far south as Louisiana at least a much improved article. Our fine winter keeping apples such as the Baldwin, and Greening, become fall apples in Southern New Jersey and Pennsylvania, a change of only four or five degrees. There are many things that begin to grow in the northern climate long before the ground gets warm. The Soft Maple, Elm, and Willow, of the forest, the Daffodil, Lilac and other flowers bloom before the snow is all gone, showing that they require but very little heat. Not so with cranberries. It will only grow in the heat of summer and make its most rapid growth, like the corn and pumpkin vine, during the very hottest months of the year. We may learn from this very important lesson that a large amount of heat is necessary to produce a crop of cranberries. Some contend that they can start the

vines best and earlier in water, but such growth is deception and is obtained at the expense of the vital forces of the plant, like applying hair vigor to the head of a baby, the hair may grow faster but the child does not. There can be no healthy growth of the vines except by proper food, obtained by the roots. Their food is produced by chemical changes which do not take place under water especially under cold water.

Now it is a fact quite generally understood, that heat goes up in the air, and cold goes down. This is reversed in water, a fact not so generally known. The top of an ice house is an oven, its bottom the coldest of cellars, if we wish to cool this room with ice, we would put the ice up to the ceiling instead of on the floor. All our ice cooling devices are constructed on this principle. If we wish to heat this room we build a fire on the floor not on the ceiling.

For many years it was an unsolved problem in my mind as to where the water in our wells and springs obtain their coolnes. We dig into the earth and as we descend the heat increases, we might be led to imagine ourselves soon to come upon the devils fireplace when we strike a small spring of living water, and it is icy cold yet apparently enclosed in the heated walls of earth.

I have asked myself many thousand times from whence comes this icy coldness and I ask you to-day to listen to my answer and then give a better one if you can.

It is the heat that goes up in air, goes down in water, and cold is produced by the absence of heat, as we dig into the earth. We admit air, the heat arises and the well becomes like the top of an ice house an oven. As soon as we strike water, the surface of the water is continually receiving the cold from all the vast course of water below it, with which it connects or speaking more scientifically: at the surface of the water the heat goes up in air, and down in the water, thus leaving

the water near the surface without heat; the absence of heat produces the feeling of cold. The iceberg which represents a vast amount of cold float above the water. The ice in our lakes, and rivers are on the surface, while the fishes they contain nestle on the bottom for warmth. To them the ice house is bottom side up, the heat comes down to them, and the cold goes up to form the ice above. Place frozen potatoes, apples, eggs, cranberries or any other frozen substance in water and see how quickly the frost will leave them, and form ice on their surface, never on the bottom.

I said two years ago that within six or eight inches of the surface of the earth nature produces food for nearly all the products that grow upon the surface of the earth and they all take their meals in this kitchen with walls only six to eight inches high.

This the warmth of the sun, the air and water, must penetrate, and the gasses which are the smoke of this kitchen fire must escape, otherwise all must starve.

If we flood the kitchen with water, we exclude the air and the chemical changes which were preparing food for the plant stop at once, and large forests and every living green thing starves to death.

I observed this fall that the cranberries grown on the small marshes even two-hundred miles north of here, were much larger than the berries grown on our large marshes, here our marshes being like a vast lake, requires half the summer to warm up, while the small marshes like our shallow ponds get warm much sooner. Then again the smaller marshes get dry earlier in the season, thus permitting air to penetrate early among the roots, which greatly hastens the warming process, for while a tub filled with cold water should require many an hour of sunshine to warm it, the tub if filled with air only would be warmed in a single moment.

From this it would seem to drain early and drain deep, and to keep

off all outside cold water, would be the proper course to increase the size of the berry. But such a course requires the utmost caution, for the vines are rooted only in the moss, to drain deep, while it would not be as dangerous in early spring as in midsummer, yet it would be taking great chances of loosing the entire crop, vines and all, and it would be better to accept of a small berry than none at all. If the vines are rooted in the muck, and the marsh has been kept wet for several years the roots run very close to the surface and it will require great care to so regulate the water, that the greatest amount of early heat can be secured and the roots be encouraged to run deeper. I once asked a Cape Cod grower of long experience the question: How far below the surface would you keep the water to grow a crop of cranberries? He looked at me with apparent surprise as much as though I had asked him if they did not grow some of their largest berries on pumpkin vines. But he suppressed his emotions and replied. When I think my vines need more water I let it on if I can. Now most of us are farmers, or have been, and if not we can all tell when the wheat, corn, oats or grass, needs more rain or water, and none of us would think for a moment of holding the water under them at any particular depth below the surface for the entire season.

If the marshes are well sanded and the vines well rooted in sand, it will absorb a greater amount of heat and at the same time admit of being drained to a greater depth without danger or loss of the fruit or vine; then with sufficient supply of water in times of need the vines can be started early and be kept steadily growing until I am confident a berry can be produced on the vines we now have full double the size of our usual product. Our corn is all nubbins some years, while other years on the same ground and from the same seed we have nearly all large ears, both years they started alike but a drouth checked the

growth, or a surplus of rain drowned out the shallow kitchen and spoiled the soup.

In either case the result is the same, the loss of a week or more of growth, and the product is all nubbins one year, and all large ears the next. We see this same thing repeated year after year with all kinds of fruit, grain, and vegetables. The law is universal.

That there are many varieties of cranberries, some much more desirable and larger than others can not be denied, yet they all require essentially the same conditions to reach a perfect developement.

Last winter we flooded deeper than ever before. During the following summer we observed that the upper part of each section which had not been so deeply flooded as the lower part, kept ahead until fall and produced the best results. The natural conclusion was that we had flooded too deep.

The facts were that in draining off the water the upper portions became dry and porous like a sponge, admitting the warm air and getting this warm air in about the cranberry vine in a single day, while the lower part of the section remained saturated with cold water for a week or more, this showed the importance of having more through drainage at the lower side of the section.

We had a ditch along the upper edge of the section with a dam above the ditch by which the cold water was shut off, and from this ditch a sufficient supply of water supplied to keep the vine on the upper side of the section from becoming too dry, but for this ditch with its water supply there is no doubt but that during the hot summer months the upper part would have become too dry and the lower part of the section would have gained on the upper, and in the fall have shown the finest crop, and deep flooding would have received the credit.

I understand that one of my neighbors who piled his scalping in

rows and planted vines between the rows greatly increased the size of his berries; in this case the surface heat was greatly increased, at the same time the cold water from the vast body of the wild moss covered marsh was prevented from passing over it. The warm marsh water sank below the surface and passed off gradually at the same time producing a warm moist atmosphere very gratefully received by the cranberry vine, which is returned in larger fruit worth an extra dollar per barrel on the market and is always easy to sell. We are yet learning our A. B. C's, while heat goes up in air and down in water, there is a limit beyond which it does not pass.

If we could place ourselves in midair from 125 to 300 feet above the earth we would find a point where there is neither dew nor frost, above this it is eternal cold. As far as man man has gone heat goes down in water so slowly that its rate of motion has never been measured and the depth of which it goes is unknown, but if we could trace the waters of our hot springs, their lowest depth and the gulf stream of our ocean to their greatest depth, we might find there the accumulated heat of ages, which went down there from the surface of our marshes, lakes, rivers and ocean.

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The warmer air too high above us goes,
The warmer water too far below us flows.
We can only catch the passing sunbeam
And hitch it to the pond or stream,
Or quicker in the dryer marsh it goes,
Early warms the dormant roots and larger berry grows.

## RECEIPTS FROM GROWERS ASSOCIATION.

In justice to the growers, and I would presume some of their wives, I copy receipts for cooking and using cranberries, adapted by the Wisconsin Cranberry Growers Association in annual convention at Grand Rapids, Wisconsin, January 14th and 15th, 1891.

### HOW TO COOK CRANBERRIES.

Never cook cranberries in tin, iron, or brass, the acid of the fruit will disolve some of the metal and render the fruit unsuitable for food. They should be cooked in earthen, granite or porcelain lined dishes, and when cooked kept in earthen or glassware, never in tin.

Cranberry Sauce No. 1.

1 pound berries (1 qt.)
1 pint water.
½ lb. granulated sugar.

Boil water and berries ten minutes, add sugar and boil five minutes longer.

Cranberry Sauce No. 2.

1 quart berries.
1 pint water.
1 pint sugar.

Do not mash while cooking, or use one third more water strain out the skins through a sieve.

### Cranberry Tarts.

Stew same as for sauce before putting in the crust, and better if the skins are removed. A dressing of whipped cream is much esteemed with them.

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### Cranberry Pie.

For pies with upper crust the berries should be whole and cooked in the pastry, using about the same amount of sugar as for sauce.

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### Mince Pies.

Add one half as many berries as apples, chop with the apples and add a little more sugar.

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### Steam Batter Pudding.

Stir the cranberries into a light batter; steam two hours and serve with liquid sauce.

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### Steamed Cranberries for Dumplings.

Use cranberries instead of apples, steam about one hour and serve with sauce, or use one-half cranberries and one-half apples

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### Cranberry Short Cake.

Make crust same as for strawberry short cake, cut and fill with cranberry sauce already prepared.

## Cranberry Wine.

Scald five quarts of cranberries with the skins burst, then strain through a thin cotton cloth, do not press them, simply let the juice drain off; then add two pounds granulated sugar; make a syrup with enough water to make one gallon of the whole. This makes a nice drink fully as refreshing as lemonade.

## Frozen Cranberries.

Many people prefer the flavor of frozen cranberries, freezing converts a part of the starch into grape sugar and modifies the flavor of the fruit. Frozen berries should be quickly thawed by pouring hot or warm water over them. They require one-third less sugar than berries that have not been frozen and will make a fine hard jelly or sauce.

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## How to Keep Cranberries.

Cranberries may be kept until summer by placing them in a stone jar and covering with water, it is better to change the water occasionally after warm weather, or they will keep until spring if kept in a cool place and the light kept from them.

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## Cranberries as a Medicine.

A poultice of cooked cranberries is one of the best known remedies for Erysipelas.

They are much prized on shipbound as a preventive to scurvy. They are said to be the most healthful fruit for invalids

## To Cure Corns.

Split a cranberry and bind one half on the corn over night, repeat until cured.

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## Dyspepsia.

Severe cases of dyspesia have been cured by simply eating raw cranberries.

No fruit is so healthful, hardy and desirable for a staple as fine ripe cranberries.

## The reason why Wisconsin Cranberries are the best.

First, they grow in the North and are better flavored. Second, they have better keeping qualities. Third being solid they weigh several pounds more per bushel than the larger varieties and will make that many pounds more sauce.

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The following resolution was passed:

It is resolved by the Wisconsin State Cranberry Growers Association in convention assembled that in their opinion the industry of this country would be best served by holding the coming World's Fair at some central point, and that in our opinion Chicago is the point that would be the most convenient for the people of this country. The secretary then read a comunication from Mr. A. J. Rider in regard to extending foreign trade. After some discussion it was moved and carried, the secretary write Mr. Rider, that we as an association fully agree that the plan is a good one and should be carried through, but owing to our remoteness from the sea coast, that our interest would be best served by devoting our work in that line to the great West and we pledge ourselves to do so.