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Ninth Annual Proceedings

OF THE

WISCONSIN

State Cranberry Growers'

ASSOCIATION.

ANNUAL CONVENTION,

**Held at Grand Rapids,
August 13, 1895.**

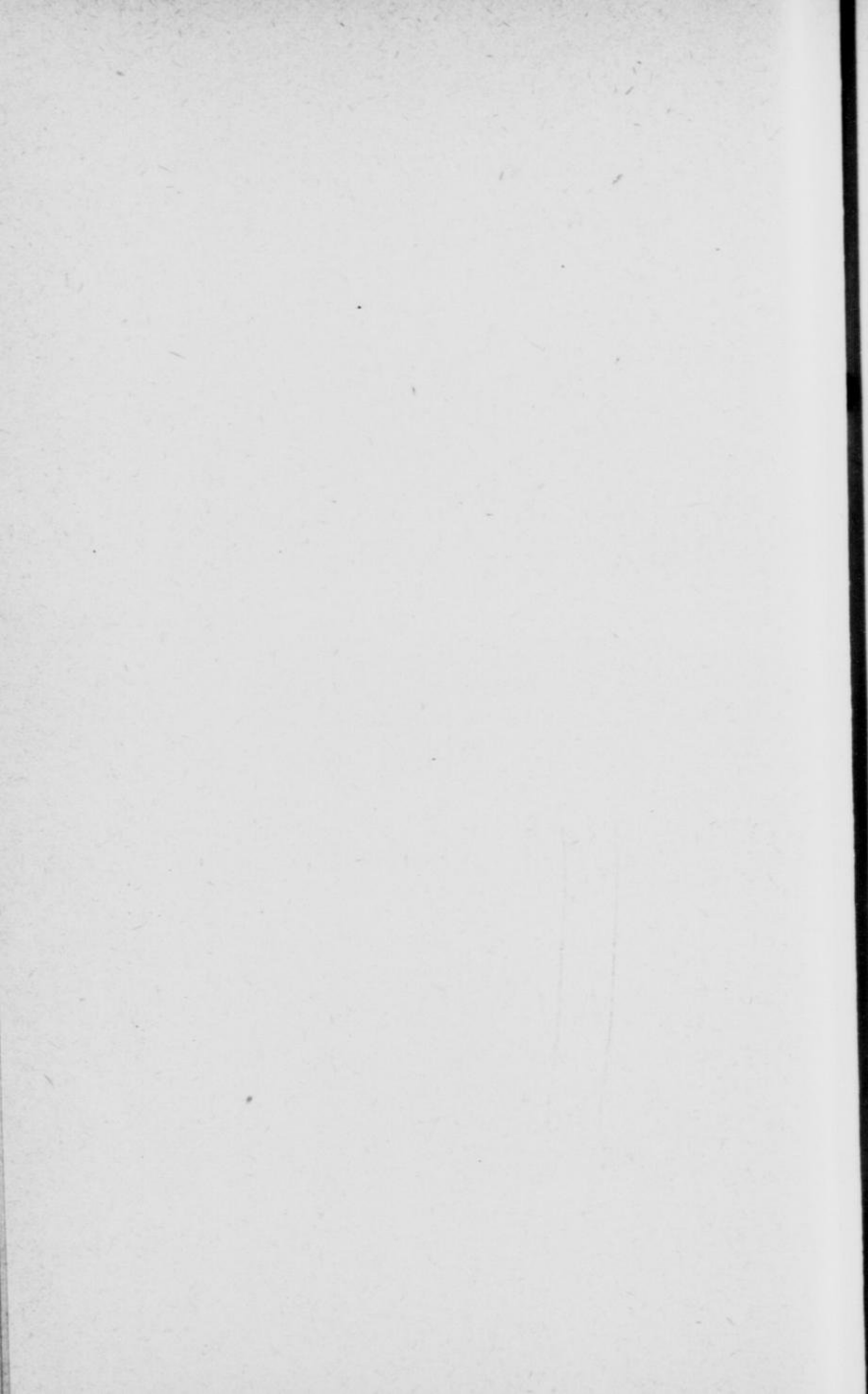
ANNUAL MEETING,

**Held at Grand Rapids,
January 14, 1896.**

**H. O. KRUSCHKE, President,
Auroraville, Wisconsin.**

**E. P. ARPIN, Secretary,
Grand Rapids, Wisconsin.**

CENTRALIA, WISCONSIN.
BRUNDAGE BROS., PRINTERS.
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LETTER OF TRANSMITTAL.

TO THE HONORABLE WM. H. UPHAM,

Governor of the State of Wisconsin.

SIR: I have the honor to submit herewith, in requirement of law, the Ninth Annual Report of the Wisconsin State Cranberry Growers' Association, containing papers read and discussions thereon, together with an account of moneys received and disbursed for the year 1895.

Respectfully yours.

E. P. ARPIN,

Secretary.

Grand Rapids, Wisconsin, January 16, 1896.

PROCEEDINGS

OF THE AUGUST CONVENTION HELD AT GRAND RAPIDS,
AUGUST 13, 1895.

The meeting was called to order in the city hall at two p. m., by Vice President Spafford, and the minutes of the previous meeting were read and approved.

Mr. Andrew Searls, in behalf of the Executive Committee, submitted a report of the inspection of the Experimental stations, showing their condition and recommending that the stations at Mathers and Bearss Marsh be abandoned, and the experimental work confined to one station which should be enlarged to five acres, provided with a windmill and irrigating pump.

After an interesting discussion upon the subject of windmills and pumps and their use in connection with cranberry culture, the motion prevailed instructing the Executive committee to arrange for the enlargement of Experimental Station No. 1, at Gaynor's marsh, and for the placing there of a windmill and the necessary pumping apparatus.

Mr. W. S. Braddock was chosen to act as secretary of the association until the regular annual election.

The statistician reported that from letters and reports he estimated the crop in sight at about 6,000 barrels for Wisconsin.

The secretary was instructed to send notice to members of the association who are in arrears for dues.

Upon motion of Mr. A. E. Bennett, the secretary was requested to prepare a suitable notice of the late Secretary J. H. Treat and cause it to be published with the proceedings.

The meeting adjourned at 5:30 p. m.

W. S. BRADDOCK,

Secretary.

IN MEMORIAM.

Mr. Joseph H. Treat was born in Princeton, Wisconsin, October 27th, 1851. He received an academic education and fitted himself to enter upon a business career. After coming of age he removed to Juneau county to engage in the cranberry business, at the time when that industry began to attract inquiry and investment. A large tract of marsh lands was purchased in company with his father, and for many years great success attended his efforts in cranberry culture. He was active and prominent in every attempt to introduce better methods and improved processes in the culture and care of the fruit.

Among the first to urge the formation of the Wisconsin State Cranberry Growers' Association, he was soon elected the secretary, and acted in that capacity from the time of its incorporation until his death. He performed the duties with marked ability, and to his watchful care and untiring devotion is largely due whatever measure of success has been achieved by the organization.

His death occurred on Wednesday, July 24th, 1895, at his home in Meadow Valley, Wis. The end was peaceful and painless.

As a business man Mr. Treat was upright and honest in his dealings; as a citizen he was public spirited and enterprising. He was kind, unselfish and helpful as a neighbor; as a friend he was faithful and true. His memory will be cherished by his friends and all with whom he was associated deeply regret his untimely death.

PROCEEDINGS

OF THE ANNUAL MEETING HELD AT GRAND RAPIDS,
JANUARY 14, 1896.

The meeting was called to order at 9:45 a. m. by President Kruschke.

The proceedings of the August convention were read and approved.

President H. O. Kruschke then delivered his annual address as follows:

Another year of drought, frosts and fire has passed, and, like several preceding, was remarkable in the severity of its droughts and frosts. Evidently we are going from bad to worse, so far as cranberry growing is concerned.

The abnormal climatic conditions have struck the cranberry grower harder than any other class of soil toilers. Our worthy vice president made the statement (and we all thought he was right) that a good crop of cranberries could be grown whenever a good crop of corn could be grown. It looks now as if Mother Nature had taken this statement as a challenge and to show that Mr. Spafford had figured without the host, she produced the greatest crop of corn in our history, while cranberries are scarce as hen's teeth. Mr. Spafford neglected to put in this proviso, "if you have plenty of water."

Our greatest need is water! water! water!

Oh, for a Moses to smite the rocks! We cannot go and beat the bulrushes, for these have been dried and burned. Neither do we want an infant Moses, but a full grown one, one who can strike the rocks with vigor. Perhaps he will be forthcoming. Man has overcome so many apparently insurmountable obstacles in his path, that we have no reason to believe that this water problem will not be solved in the near future. A few years ago, when water was more plentiful, few wanted to hear anything about pumping water for cranberry growing purposes. But now many are ready to put in pumping machinery if only the water is to be had. I think none of us can form a true conception of what can be accomplished in cranberry culture with a never failing supply of water. None of us have been blessed with an unlimited supply. On the Fitch-Palmetier marsh near Berlin, all of the water that does not fall directly on to the marsh has to be pumped on. It costs about one

thousand dollars a year to keep up a water supply. This year some over 2,600 barrels were grown. The marsh, however, is capable of producing from 10,000 to 15,000 barrels and thus reducing the cost of the water supply from nearly 40 cents per barrel to 10 cents per barrel or less. The cost of pumping is a small item when it means crop failure, or crop saving.

If your water is to be lifted not over ten feet, put in a 15 horse gasoline engine and a hinge pump. All you have to do is to start the wheel and it will run as long as the gasoline holds out. No engineer required, no guage to watch, no danger of explosions. If water must be raised to a greater height, you will want a centrifugal pump, or a deep well plunger pump.

Arrange your pump in such a manner that when you have flooded the marsh against frost, you can pump this water from the marsh into the reservoir, unless it can be run to a lower lying reservoir or marsh. I trust that by another annual meeting many of you will be able to report a success in this line of work.

There was never a more propitious time than the present for capital to engage in cranberry growing. We have emerged from the "barbaric stage in cranberry culture" as our friend Gaynor justly termed it. What we do from now on must be done systematically, based on scientific principles. We will commence at the bottom, from water to vines, then we will find berries to pick, and a market to dispose of them in. We will not seek to plant a thousand acres, but confine ourselves to such acres as we can properly control, and bring this up to its maximum productiveness. Then our best record of yields will be put in the shade. Our children will have reason to be thankful for these droughts and fires which brought method into cranberry culture.

The report of the statistician having been called for, it was shown that the aggregate crop for the state amounted to 9,250 barrels, the increase over the August estimate being due to the Berlin district.

President Kruschke submitted his report as a committee of one appointed to assist in devising measures for better fire protection, as follows:

GENTLEMEN: "In union there is strength." With this maxim my mind was strongly impressed when I sought to unite my efforts with that of the Wisconsin State Forestry Association whose annual meeting was held in January in the Capitol at Madison, it being understood that a measure was to be drawn up by this society for better fire protection, and to bring it before the Legislature, then in session. I was courteously received by all of the officers of that association. I read a paper on fire protection, and some of my suggestions were incorporated in a bill known as the Assembly Bill No. 519. The bill had to run the gauntlet

between lumbermen and sportsmen, although many of the lumbermen were anxious that some measures against the oft recurring fire calamities be enacted. Yet the burning of the tops of their felled trees was considered too great a burden. So merely to lop the branches was substituted. It was thought best by the friends of the bill to insure its passage in a mild form, and as experience would teach what other features of this kind would furnish better fire protection, they could be added by amendments, by future legislation. The last legislature was so very economical that bills having appropriations attached had a hard row to hoe. Our bill called for an appropriation of \$2,000 salary for a state fire warden. This was cut down by the assembly committee to \$500 and by the senate committee another \$200 was lopped off. Little could be expected for \$300; but I think we are getting our money's worth. And the last legislature is receiving praise for its great economy.

Mr. Wipperman, of Wood, and Mr. Hurd, of Juneau county, assisted me wherever they could do so. They never tired in complying with my requests but always responded, and extended their help lavishly. For their courtesies I still feel grateful.

All of which is respectfully submitted.

H. O. KRUSCHKE.

James Gaynor then made the following report as conductor of the Experimental station:

It will not be amiss to repeat again in this report the aims and methods of the station.

We find the cranberry in Wisconsin a wild, uncultivated fruit. It is our purpose to study the best methods of cultivating it, and to select from the wild vines all the distinct varieties we can find and cultivate and domesticate them. In short, to do for coming generations with the wild cranberries what past generations have done for us with the strawberry, the apple and the orange.

The station consists of one-fourth of an acre, which is divided into sections eight feet square. A single vine of each variety is planted at the center of a square. We do not intend to plant more than one vine of any given variety. By starting with a single vine we hope to secure perfect distinctness and uniformity in the varieties we may succeed in establishing. Aside from the merits of any variety, uniformity is of itself a high merit in any variety of fruit. And it is only by starting with a single progenitor that any variety of plant or animal can be established.

We have now planted 102 sections, of which sixty-two were planted in the fall of 1893, ten in 1894, and thirty in 1895.

In selecting varieties to plant we have aimed to procure them from as wide a range as possible, in order to get all the leading varieties grown.

We have from the Wisconsin River valley, 21 sections.

From the Fox River valley, 20 sections.

From Oregon, 3 sections.

From Massachusetts, 22 sections.

From New Jersey, 7 sections.

From Nova Scotia, 23 sections.

From Sable Island, Canada, 4 sections.

Two sections are occupied by seedlings planted from the Tuttle berries exhibited to the association in January, 1894.

Many of the vines planted the first year died. This was caused by the excessive drought of the summer of 1894 and by not planting them deep enough. These sections were replanted by the same varieties as far as practical. Since the first year no vines have died and all have made exceptionally large growths.

The seedlings were grown by separating the seeds from the fruit pulp and laying them on the surface of the sand and covering them with a thin layer of black muck. The first year they made a very feeble growth, but at the end of the second year they show up strong, vigorous plants.

In the 102 sections planted, we think we can claim about eighty varieties. Many of the vines sent to us were imperfectly described as to the kind of fruit which they produced, and but little opportunity has been offered as yet to properly classify them and judge of their merits, as this can be done only when the fruit is on the vine.

As there are 183 sections at the station and 102 have been planted, this leaves eighty-one yet to be planted. We would like very much to complete the planting of all these sections before the close of next season, but to do it we must have the assistance of the cranberry growers. There is not a cranberry marsh in the United States, that, if closely examined when the fruit is on the vine, will not show several varieties of berries. If each grower who is willing to give his mite to the work we have undertaken will send us two or three of the varieties he finds on his marsh the work would soon be done. A single vine of each variety will be sufficient—the larger the vine the better. It can be packed in a small paper box with wet moss or a damp rag, well wrapped in close grained paper and addressed to Gaynor Bros., Grand Rapids, Wis. It will be better if some of the fruit can be left on the vine; but if not, then a short description of the fruit can be sent us by letter. Each one sending us a vine to plant will have the right to claim the first year's cuttings from the section after the section is fully covered by the vine. A record of the name and post office address of the sender is kept at the station with the history and growth of each vine.

All of which is respectfully submitted.

JAMES GAYNOR,
Grand Rapids, Wis.

Mr. Andrew Searls, of the Executive committee, submitted the following report upon the enlargement of Experimental station No. 1:

MR. PRESIDENT AND GENTLEMEN OF THE ASSOCIATION:

In accordance with the resolution passed by the association at the last August meeting to add five acres to Experimental station No. 1, the committee have proceeded to carry out the wishes of the association and have leased five acres in Sec. 35 and extending partly into Sec. 26, T'p 22, R. 4. It is in the form of a rectangle, twenty rods wide by forty rods long. Consideration to be \$12.50 per year, the lease to run ten to fifteen years, at the option of the association. We think of this ground about one and one-half acres should be used for reservoir purposes. This leaves three and one-half acres, less the necessary dams and ditches, to be planted to vines. It is proposed to plant at this station a few well assorted varieties—the best we can secure—and to give to each at least one-fourth of an acre and not more than an acre, making in all not less than three nor no more than perhaps eight well assorted varieties. These it is our purpose to cultivate as a sort of cranberry nursery, from which the association will after the third or fourth year, make cuttings to be distributed to the cranberry growers of Wisconsin for further propagation, on such terms and under such rules and regulations as the association shall fix. In this way we hope to give to all cranberry growers of Wisconsin the best variety of cranberries to be found.

At the August meeting, it was thought best to furnish this station with windmills and pumps to supply the vines with water for growth and protection, and accordingly we have had erected on the ground two twelve foot mills, furnished with ten inch irrigating pump, with nine and three-fourths inch and twelve inch strokes respectively, and guaranteed to lift over 7,500 gallons per hour with a good, fair wind, the association to buy the one giving the best satisfaction. We have had two wells dug and connected with pipe so that the mill may draw water from both wells. The dimensions of the wells are 7x8 and 7x16 feet respectively, one being to the depth of eight feet, the other nine feet, and both being curbed with plank and tightly battened to keep out sand. One of the wells was originally dug ten feet deep and then the bottom covered with gravel to keep down quicksand, fine particles of which continued to float in the water and we feared would soon cut out the pump cylinder. These wells proved not capable of furnishing the mills with water, nor quite sufficient to keep one supplied during high winds, so we have made some experiments in the way of furnishing the wells from a greater depth and have sunk a pipe down to a depth of forty-four feet, using eight inch galvanized piping, striking clay at a depth of thirty-two and one-half feet and getting a fine flow of water at thirty-eight feet which rose up at the rate of twenty gallons per minute into our well. We expect to continue sinking this pipe in hopes of striking a greater flow.

We have had one acre surfaced with a surfacing plow, and most of the sod removed. Cold weather coming on

prevented our finishing this part of the work. We have had 200 loads of sand drawn upon the ground and we expect to plant out at the station at least two well assorted varieties, giving to each not less than one fourth of an acre.

As a result of our tests made at the station on the capacity of a windmill to raise water, we would say that one twelve foot wheel, properly set and adjusted to a ten inch pump with a twelve inch stroke, will lift on an average 35,000 gallons a height of eight feet each day. When the seepage of water is small and the ditches dug shallow across the fall of the water and not more than two rods apart this water supply ought to be sufficient to take care of ten acres of vines.

The most serious problem that will confront the cranberry grower who contemplates the erection of the windmill to increase his water supply is the construction of a well of sufficient capacity to supply it. So much depends on the character of the ground that nothing can be said on this subject that would have a general application.

At the station the water level is about thirty inches below the surface of the ground. The muck was about three feet deep. Below this for the next foot it was a mixture of muck and sand, and for the next eighteen inches it was yellow or reddish sand. From this point down to a depth of twenty-two feet we found a light colored quicksand. Below this and down to a depth of thirty-two and one-half feet we found coarse sand intermixed with small chunks of granite and broken sandstone. From a depth of thirty-two and one-half feet to thirty-four feet it was a stratum of dark red clay. Below this we found a good flow of water from what appeared to be a coarse, broken rock stratum down to the depth of forty-four feet.

The galvanized tubing above referred to was sunk down to the layer of clay, a depth of thirty-two and one-half feet. Below this depth we depended on the layer of clay to protect the well from the caving tendency of the sand. In this we were disappointed, for the well, after flowing freely for three days, on the fourth day caved in and filled up to the end of the tubing. After this the flow was small.

In a structure of soil like that just described, we would prefer to draw the water for a windmill from the sand above the clay, because we believe the water better adapted to the growth of cranberry vines on account of the organic matter it holds in solution. A much freer supply could be got at greater depths, but it might not be as well adapted to the growth of vines.

A report of the expenses of our work is herewith submitted.

January 14, 1896.

ANDREW SEARLS,
Chairman of Executive Committee.

A discussion followed as to the best method of sinking wells and Prof. F. H. King advised shutting off the quick-

sand and deepening the well to the gravel, and thus take advantage of the flow from the quicksand.

On motion of J. A. Gaynor, the chairman was requested to obtain as many views or opinions as possible as to the construction of wells for securing a water supply on our marshes, and to incorporate them in his report.

The following were unanimously elected as officers for the ensuing year:

President—H. O. Kruschke, Auroraville.

Vice President—S. A. Spafford, Grand Rapids.

Secretary—E. P. Arpin, Grand Rapids.

Treasurer—A. E. Bennett, Grand Rapids.

Member of Executive Committee—Andrew Searls, Grand Rapids.

President Kruschke exhibited a sample of cranberries taken from one of the Berlin marshes which clearly showed the effects of the fungus disease known as "cranberry scald."

The meeting adjourned one hour for dinner.

AFTERNOON SESSION.

The meeting was called to order at 2 o'clock by President Kruschke.

On motion of E. P. Arpin, the executive committee were authorized to continue the experiments in securing a water supply at the experimental station.

Mr. J. A. Gaynor suggested that in making wells care be taken to save samples of the soil at different depths, as indicating the character of the water supply.

Prof. F. H. King, of the Wisconsin State University, then read the following paper:

POSSIBLE WATER SUPPLIES FOR CRANBERRY CULTURE IN ADAMS, PORTAGE, WOOD, JACKSON, MONROE AND JUNEAU COUNTIES.

There are in Adams, Portage, Wood, Juneau, Jackson and Monroe counties the equivalent of from fifteen to twenty townships of what in former years were marsh lands, wet enough to require drainage in order to fit them to produce native marsh hay, and large areas of which

were naturally supplied with water in such quantity as to insure remunerative crops of cranberries.

It seems to be the nearly unanimous verdict of those who are familiar with the needs of the cranberry plant that the only obstacles standing in the way of developing a large and highly productive acreage of cranberries on these lands are the scarcity of water and the lack of intelligent management. All, too, appear to be equally unanimous in the conviction that with the water which is likely to be available from natural sources it is useless to think longer of pushing this industry anywhere in the region in other than exceptional localities.

On the other hand, these lands have so far dried out during the past five years as to render a large portion of them firm enough for agricultural purposes without drainage, and enough has already been done in the way of testing their general productiveness under present conditions of moisture to furnish a fair foundation for hope of reasonable success in this direction, provided the water conditions remain as they now are.

Ought, therefore, the cranberry industry in this region to be largely abandoned and attention be directed mainly to problems of general farming? A correct and early answer to this important question is greatly to be desired, and not simply by the people immediately interested in the lands, but by the state at large and the whole country as well, for the cranberry is an important fruit.

WHY THE MARSHES HAVE BECOME DRY.

Let us first inquire into the conditions which have brought about a general lowering of the water table of the region to the extent of three to six feet. That such a change has taken place there can be no question; and several factors have worked conjointly to bring it about.

The first factor in the order of magnitude, without much doubt, is a falling off in the amount of the mean annual rainfall. We have accurate and continuous records of the rainfall at various places surrounding the region under consideration, as at Dubuque, La Crosse, St. Paul, Duluth, Marquette, Milwaukee and Madison, extending over a period of nearly twenty-five years, and when we compare the mean annual rainfall of these places for the whole of this period with the rainfall of the past five years at the same places, there is seen to be a mean deficiency of about 4.6 inches per annum, or a total deficiency for the five years of 23.45 inches. It is safe to assume that a shortage equal to this has occurred in Central Wisconsin. With such a shortage in the rainfall, when the drainage outlets have not been diminished, it is evident that the level of the ground water must subside and must continue to do so if the rainfall does not increase, or the deficiency be made good in some other way.

The second factor which has tended to lower the level of the ground water is the very large destruction of the

moss, humus and undergrowth both upon and to the north of the region, which has resulted from fires and the ax. The destruction of these materials has largely reduced the impounding of the rain and melted snow, allowing it both to drain away into the streams and to evaporate much more rapidly than was possible under the earlier conditions. These are permanent changes which the future must tend to augment rather than to decrease, so that with recurring wet years there is little reason to expect that the old regime will be restored.

Then, again, it is true that the chief deficiency in the rainfall for the past five years has occurred during the three summer months, and as this is the hottest season the large reduction of the rainfall has very greatly augmented the total surface evaporation and thus tended to change the marshes to dry land. This condition is not likely to be permanent; but if the lands are improved so that a large acreage of farm crops is produced each year there must necessarily follow, as a direct result, an increased evaporation through the pumping action of the roots and thus a permanent lowering of the water table because well tilled fields always produce a larger growth and consume more water per day than native vegetation does. Increased evaporation must therefore tend to make these lands permanently dryer than they have been in years past.

A fourth factor which has been operating to lower the ground water in this region and which will continue to do so to an increasing extent is the growing number of artesian wells which are being sunk into the Potsdam sandstone for the supply of cities to the south, west and east of this region. All of the wells in Wisconsin, Illinois, Iowa and Minnesota which are drawing water from the Potsdam horizon derive the chief part of their supply from the rains which fall upon northern Wisconsin and north-east Minnesota, and, as these wells draw out the water in their immediate localities, the water to the northward and beneath the lands we have under consideration flows away downward and disappears from the surface, leaving it necessarily drier.

It must be evident, therefore, that unless a series of years wetter than the mean of the past twenty-five years is to follow, there is little reason to expect that these marsh lands will ever become as wet as they were in former years, and hence that they will ever be adapted to cranberry culture unless artificially supplied with water.

Is it then for the best interests of these counties to abandon cranberry culture and to give exclusive attention to general farming?

The answer to this question depends partly upon the real value of these lands for general agriculture and in part upon the possibility of an adequate supply of water for cranberry irrigation at a sufficiently low cost to make this crop remunerative.

THE VALUE OF THE LANDS FOR GENERAL AGRICULTURE.

If the marsh lands of the counties in question remain as dry as they now are, or if they are properly drained, as they can be, so as to hold the water table from two to four feet below the surface of the ground, then the marsh lands will be reasonably productive for a term of ten to fifteen years at least, and I believe can be made permanently so under a judicious system of husbandry. But the coarse, sandy lands whose surface is more than four feet from standing water in the ground in wet seasons I feel confident are of doubtful agricultural value unless they can be irrigated.

Then, again, should an extensive and general system of land drainage be entered upon which aims to make agriculturally productive even only the moderately wet marshes of this region, it is my conviction that such a procedure would so lower the general water table under the marsh borders as to throw over into the category of unproductive lands an area which would probably exceed the acreage of the marshes which might be made agriculturally productive by drainage. That is to say, my fear is that after having gone to the expense of draining these lands there might be left in these counties a less acreage of productive soil than would exist were much of the wet marshes held permanently as such.

This fear is founded upon the fact that most of the marshes in question, together with the semi-marshy border lands, are so generally underlaid with coarse sand instead of clay that there is nothing to prevent the water from draining away very rapidly, and these lands cannot be productive with simply the water they will retain of the rains as they fall.

During my visit in Europe last summer, where I went largely for the purpose of studying methods of irrigation as practiced in climates of greater rainfall than our own and to learn what I could of what had been done there with sandy lands, I was very greatly surprised to learn that fully one-half of the whole of Holland is as sparsely populated and as little improved to-day agriculturally as are the counties we have under consideration.

These are coarse, sandy soils too far from standing water in the ground to be productive with the large rainfall of that country. The lands they are tilling are those which lie very near or below sea level and require drainage. So, too, the high sandy lands wherever I saw them, whether in Germany, Holland, Belgium, England or Scotland, are to-day largely unreclaimed and uncultivated unless irrigated.

These facts make me feel very confident that it will be a great mistake to do anything which tends greatly to lower the general level of the ground water under these sandy lands. It is irrigation which they need rather than general drainage.

UGHT CRANBERRY CULTURE TO BE COMBINED WITH
GENERAL FARMING?

Now the facts and conditions which have been presented make me feel that instead of abandoning cranberry culture altogether a judicious partition of the land ought perhaps to be made and cranberries grown not for themselves alone, but because they are a valuable crop which can be grown on lands which need to be kept too wet for other crops for the sake of holding the general water level to the proper height beneath the border and semi-marsh lands which must otherwise become largely unproductive.

But cranberry culture cannot be made productive on these marsh lands unless more water is supplied than is likely to be available through the local rainfall. Is there any available water which can be used in cranberry culture and indirectly be made to help make semi-marsh lands more productive?

POSSIBLE WATER SUPPLIES.

It will require a much more extended study of this region and its surroundings than I have thus far been able to give it before a full measure of the available water can be stated. I wish, however, to point out here the possible supplies without attempting to give definite expression to their magnitude.

The available water supply for the marsh and semi-marsh lands of Adams, Portage, Wood, Jackson, Monroe and Juneau counties belong to three classes. These I wish to consider briefly in the order of their probable magnitude, considering the smaller supply first.

UTILIZATION OF THE LOCAL STORM WATERS.

The smallest supply that could be used for cranberry culture is the local storm water. I see no reason to suppose that the marshes which at this particular time are barely dry enough to plow will not require drainage just as soon as an increased rainfall shall occur.

Now in laying out the drainage systems for these marsh lands it seems to me that before open ditches are dug, which shall lead the storm water directly into the water ways, conveying them permanently out of the region, we should first consider the feasibility of storing these excess waters in local reservoirs to be utilized in maintaining cranberry and perhaps other gardens.

To make my idea of the utilization of these waters definite let me assume that I have 160 acres in which one-fourth of the whole area requires drainage in order to make it productive. Then reserve two, three or more acres in the lowest part of the farm upon which a reservoir shall be built and to which the drainage ditches of the whole farm shall be led and into which, by means of pumps driven by wind or other power, the water shall be lifted and stored for utilization in the production of cranberry, celery or any other desirable crops. It is impossible with any available data to say now how large a reservoir would

be needed to hold the drainage water from the quarter section conditioned as we have supposed or how large an area in cranberries the water so stored could supply. My judgment is that a one acre reservoir three feet deep would be found more than ample. If we suppose that only one-half of this reservoir could be maintained full throughout the season then there might be cranberry marsh adjacent to the reservoir of not less than three acres.

UTILIZATION OF THE UNDERGROUND WATER.

The second available supply of water in the counties under consideration is that which is creeping slowly toward the south through the sand and sandstone which underlie the district. The exact amount of this water we do not know, but that it is very large in the aggregate there can be no question.

Sandstone of the compact type such as is sometimes used for building purposes will hold, when its pores are full of water, the equivalent of a depth of .72 inches for each foot of thickness, while the loose sands such as underlie the marshes we are considering will contain for each foot of depth not less than four inches of water. About forty per cent. of this water will quickly flow into any suitable well. On the basis of these figures 100 feet of the most compact sandstone likely to be found in the region under consideration should yield not less than five feet of water and the most open sand not less than twenty feet. That is to say, the amount of available water is equivalent to that of a lake from five to twenty feet deep for each 100 feet in depth of sand or sandstone and whose area is that covered by the sandstone itself. This water supply, too, lies so near the surface that it may be obtained by lifting the water through a distance not to exceed twenty to twenty-five feet.

The factor of greatest uncertainty regarding this water supply is the rate at which the water can be made to enter the well. At Babcock there are two six inch wells seventy-four and fifty-nine feet deep respectively, which go through the sandstone to the granite. These wells, I am informed by Mr. J. W. Booman, have each a measured capacity of 76,800 gallons of water per twenty-four hours.

At the city waterworks of Tomah they have an open well through the sand and clay twenty-four feet, and four into the sandstone which has a maximum capacity of 200 gallons per minute or 288,000 gallons per day of twenty-four hours. These are the only wells in the district under consideration from which I have obtained data regarding their actual capacity.

The Babcock wells being near the northern boundary of the water bearing strata, and the Tomah well being a shallow one, give results which are likely to be under rather than over the amounts which may be expected from other localities of the district where a greater thickness of sandstone exists.

Let us then consider the possibilities of a well having

the capacity of those at Babcock, that is, 76,800 gallons per day of twenty-four hours.

It will not be impracticable to pump ten hours per day regularly and in case of emergencies the pumping may go on day and night. Pumping ten hours per day such a well would yield an acre-foot of water in 10.2 days. If we suppose the loss of water from a reservoir by evaporation and by percolation to be at the mean rate of one inch in twenty-four hours then a reservoir which could be maintained full by the well could have an area of 1.175 acres. A reservoir of this size and three feet deep backed by a water supply of the size stated would maintain and amply protect, I think, a cranberry marsh of seven acres.

Now it seems to me from what is known of the geology of the region and the capacity of the wells at Babcock, that there is much assurance for the belief that nearly every section of the fifteen to twenty government townships of marsh land in Adams, Portage, Wood, Jackson, Monroe and Juneau counties might be provided with a water supply from the two sources now considered which could amply maintain and protect not less than seven acres of cranberries in first-class condition.

The third and largest supply of water which might be used in developing the cranberry and other agricultural interests of the counties in question is the flood waters of the Wisconsin and Black rivers and their tributaries which now run to waste, doing service neither to manufacturing nor agricultural interests.

The topography of the country is such that there are no engineering difficulties in the way of leading the flood waters of the East Fork of the Black river, the Yellow river and the Wisconsin river out into chains of reservoirs distributed over a very large part of the flat lands of Adams, Portage, Wood, Jackson, Juneau and Monroe counties, where they could be used in developing immensely rich cranberry lands and where the waters percolating from these reservoirs would serve to hold the water table under the semi-marsh lands up to that height which is so essential to their development for general agriculture. The irrigation of lands in humid climates has long been practiced on a very large scale in Europe; so large indeed that statistics place the amounts of irrigated lands in France at 400,000 acres and in Italy at 3,700,000 acres, and yet these countries have as much rain as we do, and it is as favorably distributed for agriculture as ours. Even in the south of England the irrigation of water meadows has been so long practiced there that it does not appear to be known to history by what people the system was introduced. We have in northern and central Wisconsin a large amount of land whose water holding power is below the average and which can only be made to yield their largest returns when the usual rainfall is supplemented by irrigation. It is quite probable that manufacturing interests will soon seek state or national legislation looking toward the impounding of flood waters in reservoirs about the head-waters of var-

ious streams, and should this be done the law should be so framed as to permit agricultural interests to share in due proportion in the use of these impounded waters.

WHAT IS THE BEST WAY TO DEMONSTRATE THE AGRICULTURAL POSSIBILITIES OF CENTRAL WISCONSIN?

The one great problem of immediate and paramount importance for central Wisconsin is the demonstration of its agricultural and horticultural possibilities. How can this best be done? It seems to me that any effort in this direction which does not take into account its water resources and its possibilities in the direction of cranberry culture would be a great mistake.

If it can be demonstrated that there is an underground water supply which can furnish to each quarter section of land in the counties under consideration a quantity of water equal to that which is now had at Babcock, that is, to supply ten acres with twenty-four inches of water, then it seems to me that the possibility of profitable cranberry culture has been placed beyond question. If, in addition to this, it can be shown that the higher sandy lands will produce abundant crops of other kinds when adequately irrigated, then there can be no question but that the forty government townships of flat land in the counties under consideration may be placed among the richest agricultural lands in the state.

It has been pointed out that the sands and sandstones which underlie this district probably contain from five to twenty feet of available water for each 100 feet of sandstone.

To irrigate ten acres of land on each quarter section to the extent of twenty-four inches each season, drawing the supply from the ground water beneath, it would only be necessary to consume a mean of 1.5 inches of the five to twenty feet of available water which lays beneath the district.

There seems to be promise enough of the amount of water in question being available at so low a rate as to make it well worth the while for all parties who have large financial interests in these counties to combine their resources in an effort to demonstrate at one or more well chosen localities in the several counties what can be done in the way of utilizing this underground reservoir of water in the production of cranberries and other agricultural products. And I am authorized to say that the Experiment Station will gladly co-operate in such demonstration, giving such aid as lies within its power.

COST OF PUMPING TWENTY ACRE-FEET OF WATER.

It is claimed that at the present prices of gasoline, the gasoline engines now made will produce one applied horse power at a cost of 1 to 1.5 cents per hour for fuel. To lift twenty acre-feet of water twenty-five feet high in 120 days of ten hours each would require an engine capable of yielding .57 horse power and the fuel cost of this power at 1.5 cents per horse power per hour would be \$10.26.

Stating the capacity of gasoline engines in another way, it is claimed that one pint of good gasoline will develop one horse power during one hour. It is further claimed that when coupled directly to the pump, as they may be, they are so nearly automatic as to require not more than thirty minutes attention during a day of ten hours.

Gasoline engines of 4-horse power are sold by different manufacturers at from \$300 to \$400 each, and a centrifugal pump with fittings for 200 gallons per minute would cost not to exceed \$50.00.

The cost of a well will depend on its size and depth. Mr. S. F. O'Conner quotes the following prices to furnish all tubing and do the work in first-class manner: For a six inch well, first 200 feet, or to the rock, \$2.00 per foot, from rock to completion, \$1.75 per foot. For an eight inch well, \$3.00 and \$2.25; for a ten inch well, \$4.00 and \$3.00; and for a twelve inch well, \$6.00 per foot to rock and \$4.00 per foot after that.

Mr. E. P. Colleran, of Tomah, quotes prices which are \$1.25 for six inch, \$1.75 for eight inch, and \$2.75 for ten inch and furnish everything.

The three six inch wells of Mr. Mills, of Millsonia, which are seventy-two feet deep and thirty-five feet to rock, cost him \$50.00 each.

The prices quoted by Mr. Colleran are not much above the actual cost of the wells.

It seems probable that an eight inch well with pump connected directly to it would supply as much as two six inch wells separated by a distance and worked by one pump.

If we itemize the cost and expenses of a pumping plant with an eight inch well, exclusive of reservoir, we shall have results about as follows:

Eight inch well 100 feet deep.....	\$175.00
4-horse power gasoline engine	400.00
Centrifugal pump and fittings.....	50.00
Cost of plant.....	\$625.00
Interest on plant at 7 per cent.....	\$43.75
Deterioration at 10 per cent.....	45.00
Fuel, oil and attendance for 20 acre-feet.....	30.00
Total.....	\$118.75

Such a pumping outfit as this could easily serve ten acres of cranberries or a similar area of other fruits or of garden vegetables.

THE DESIRABILITY OF DEVELOPING A LARGE NUMBER OF SMALL MARSHES.

I am fully persuaded that the best interests of the counties under consideration will be through any effort which shall make it possible to develop a very large number of small marshes which shall be the property of those whose permanent homes are upon the land. Let us suppose that each quarter section of the marsh lands in Cen-

tral Wisconsin could be owned by intelligent farmers and that each was able to develop upon his farm only five acres of thoroughly good cranberry marsh. I believe that the number of such homes may easily exceed 2,000 and these would represent in the aggregate 10,000 acres of berries. These small cranberry marshes under the thorough culture which they could easily and cheaply receive should yield not less than thirty barrels per acre of salable berries on the average each year, or a total of 300,000 barrels, which if sold at \$5.00 per barrel would bring into the counties \$1,500,000, and for each owner \$750.

IS IT PRACTICABLE FOR FARMERS TO DEVELOP FIVE ACRE
MARSHES ON THEIR HOMESTEADS?

I am well aware that the expense of developing even so small an area as five acres of cranberry marsh is really large if the necessary labor is all hired at a cash price. But if the work is begun in a small way and allowed to extend over eight or ten years all of the work may be done at odd times and at a trifling cash outlay. It would of course be necessary to have the well to begin with but by starting with half an acre or an acre the engine could be replaced for a number of years by a windmill and cheap pump. Then with one acre well started it would soon be possible to procure the engine and to use the vines from the initial piece to plant the balance of the area. While this work is going on the balance of the land would be brought under improvement for general farming.

I do not wish to be understood that the cranberry is the only crop for which an effort to utilize the water of this region should be made, for it seems to me much more than probable that there are large possibilities in the direction of certain lines of market gardening if not also in the direction of small fruit farming.

DISCUSSION.—J. A. Gaynor said that if it paid to irrigate in countries where there was no rainfall, it would surely pay as well, if not better, where there is some rainfall, since it assured the crop and made the farmer in a great measure independent of the weather.

Mr. Remington stated that many years ago he had levels taken and surveys made, which convinced him that it was practicable to secure water from the east fork of the Black river sufficient to irrigate a large extent of cranberry lands in Jackson and Wood counties. In his opinion authority should be obtained from the legislature to use the waters of both the Black and Yellow rivers for this purpose. Even if there were a scarcity of water in the rivers during July, August and early September, when frosts are likely to damage the crops, yet there would be ample water later

on to provide a winter flood and prevent injury to the buds or winter killing of the vines, such as we have had during the past two seasons. Besides, the water could be stored in reservoirs. He urged unity of action among the growers, and that the work be projected upon such a scale as would result to the benefit of the greatest possible number.

Messrs. Arpin, Kruger, Bennett and Braddock took part in the discussion. Prof. King advised combination of the growers in the matter of procuring a water supply and especially in sinking wells of sufficient capacity to make a practical test of the water supply beneath the surface; also promising the aid of the agricultural station in making examinations and tests.

On motion, Messrs. Kruger and Arpin were appointed a committee to prepare a testimonial to Prof. King on account of the paper which had been read to the association.

The treasurer then submitted his annual report as follows:

RECEIPTS.

1895.		
January 8,	To cash on hand.	\$158.84
October 28,	To money received from state treasurer.	250.00
1896.		
January 14,	To money received from secretary.	24.00
		<u>\$432.84</u>

DISBURSEMENTS.

1895.		
March 8,	By order to O. H. Kruschke.	\$ 18.60
March 20,	By order to Centralia Enterprise.	35.00
1896.		
January 14,	By order to W. S. Braddock, secretary's salary.	40.00
January 14,	By order to W. S. Braddock, postage and envelopes.	2.35
January 14,	By order to A. Searls, work, help and construction of Experimental station.	249.65
January 14,	By order to James Gaynor, Experimental station.	50.00
January 14,	By order to Brundage Bros., printing.	5.75
		<u>\$401.35</u>
January 14,	By cash on hand.	31.49
		<u>\$432.84</u>

A. E. BENNETT,
Treasurer.

J. A. Gaynor and C. F. Kruger were appointed a com-

mittee to examine the treasurer's books and accounts and did so, reporting that the vouchers agreed with the secretary's accounts and that the balance reported on hand was correct, whereupon the orders were destroyed.

The following resolution was then unanimously adopted:

Resolved, By the Wisconsin State Cranberry Growers' Association that we hereby extend our thanks to Prof. F. H. King and the department of the University which he represents for his able address this day delivered before our association, and for the interest that department has shown in the development of the agricultural interests of central and northern Wisconsin.

C. J. KRUGER,
E. P. ARPIN,
Committee.

The subject of marsh fires and the law passed at the last session of the legislature was then briefly discussed by the members, after which, at six p. m., the meeting adjourned.

E. P. ARPIN,
Secretary.

