fruit and seed. The first five joints within the terminal bud do not develop the hooks, but these usually come out from the 6th, 7th, 8th, 9th and 10th joints in the terminal bud.

The blossom buds within the terminal will not form in the fall;—

1. If growing conditions are very strong,
2. If the vines are laid in a horizontal position before the terminal bud has ripened and matured within it the blossom buds,
3. A frost before August 15th, and even last year as late as Sept. 1st, may destroy the terminal germ of the late upright.
4. The tip worm may produce an effect very much like that of an early fall frost.
5. Winter exposure to long continued cold dry winds and sunshine, with the temperature below zero, may dry the life out of the bud and upright and kill the vines.
6. Frost on the swelling bud as explained above.
7. Frost on the open bud.
8. Strong growing conditions in the spring that stimulate the terminal germ may cause it to absorb the nourishment that should go to develop the blossom buds.
9. Late spring frost.
10. Blight
11. Fruit worms.
12. Scalds caused by leaving the growing shoots under water too long when flooding against spring frosts.

John A. Gaynor.


Wisconsin State Cranberry Growers Association and State Cranberry Experiment Station.

Pursuant to the preliminary work of purchasing a pump and constructing a galvanized casing 25 ft. long by 30 inches in diameter for the purpose of utilizing and making it possible to put in a filter of coarse sand, 12 inches thick, outside of the 6 inch, 6 foot well screen which was to be used, work was carried out along this line during the past season.

As was reported at the August meeting, the actual work was started July 6th, the sand bucket being used to remove the sand from within the casing and weights were used in helping the casing down. It was estimated that at one time we had about two tons weight on the casing to overcome the friction of the sand against the sides of it. The weight was increased with the depth of casing.

The first attempt was fruitless, as the casing was not sufficiently
reinforced to withstand the lateral pressure of the sand and when down about 18 ft., it commenced to collapse and when dropped to about 22 ft. would no longer permit the working of the sand bucket.

The 6 inch well pipe with the 6 ft., 6 inch screen at the bottom was lowered and a 4 inch sand bucket was used to lower this pipe to the clay at a depth of 28 ft. The casing was withdrawn for repairs and a test of the screen with no sand filter was made with the result that 48.24 gallons of water per minute lifting 22.08 ft. were obtained August 2 and 3. (Gallons per minute—G. P. M.)

After repairing the casing by putting iron hoops on the inside at intervals of five feet, the pipe was withdrawn and the casing was again lowered, this time successfully, to the clay, and the pipe set in the center. Sand was hauled from the R. R. cut at Port Edwards, and the finest part screened out and the gravel poured into the casing to a depth of eight or ten feet and the casing then gradually drawn as the filling progressed. The pump was then coupled on again and the results were a flow of 92 G. P. M., with a lift of 21.85 ft. The maximum flow being 11.24 G. P. M. and the maximum lift 24.5 ft. on August 10, 11, 12 and 13. Rains at this time raised the ground water 2 feet and tests on Sept. 22 and 23, gave a flow of 94.84 G. P. M. on a 21.2 ft. lift. During these tests it was found that the ground water just outside of the well pipe dropped at the rate of 2 in. per hour, probably owing in in the main to the fact that the coarse sand filter extended to the surface of the well. The pump outfit was shipped to Mather the nineteenth of October and on the 26th work was commenced at the Cranberry Peat and Moss Co. bog on their well drilled in 1894.

The ground through which the drilling was done was as follows:—
At 10 ft. shell rock was encountered, with a seam at 13 ft., a second seam at 30 ft. and a third seam at 60 ft. Solid rock was reached at 23 ft. The black iron pipe was driven to a depth of 26 ft., that is, 3 feet in the solid rock. From this point there was open drill through the rock to a depth of supposedly 91 feet, and as the drillers encountered clay at that depth, they did not go deeper for fear of losing the drill. The part in which this well was drilled was curbed to a depth of about 6 feet, and also floored as it was found that the water would rise within about 18 inches of the surface when the pipe was standing within the curbing, the pipe was cut off later to the floor of the curbing to permit the water to run in, while the Menge pump which was connected to the curbed area was operated consequently giving a flowing well when water was kept quite low in the curbing. A second well had also been drilled within same curbed area, but not nearly so deep.

This main well was also dynamited a little later, but it was supposed that the article in which the dynamite was contained was caught part way down in the well somewhere between 20 and 30 feet and the explosion occurred at this place instead of at the bottom as had
been the intentions In the cleaning of this well it was quite evident that the explosion of dynamite had occurred at least at a depth of 3 feet as the pipe seemed to be entirely in tact to the full depth to which it had been driven; but a short distance below this there appeared to be somewhat of a cavity. This well also save some trouble in connecting up where the pipe had been cut 6 feet below the surface of the water, but a satisfactory union was made and the pump placed for operation. Mr. C. R. Treat kindly loaned us a Fuller and Johnson 6 H. P. engine.

We could not clean this well with the sand bucket, as some peat had settled into it, but after pumping for an hour the water cleared and the flow was 210 G. P. M. lifting 19 feet. The well cleared to 61 feet and after two days test the well was sand bucketed and cleaned from 61 to $89 \frac{1}{2}$ feet and a flow from 216 to 234 G. P. M., averaging 225.15 G. P. M. in an 18.66 ft. lift or about 1 acre inch in 2 hours.

The 6 H. P. engine was then taken off and Mr. H. S. Delong's 2½ H. P. engine was tried, but it lacked in power. and when taken at its best it would lift 154 G. P. M. from 10.7 ft. This 2½ H. P. engine under this test labored so hard, that explosions only missed once in 14 strokes.

A four H. P. would probably have handled the pump with the water yielded by this well.

December 15, 16 and 17 the pump was tested on a 15 ft. well on the Appleton bog. The results were poor as a flow of only 59.65 G. P. M. with a 23 to a 24 ft. lift. This is a greater average than should be had as it included read just after stops, while the average for the longest continuous flow was 58.27 G. P. M. and is more nearly representative of the capacity of the well. The 22nd of Dec. the second Station Well was connected on to the first one, and the wells yielded about 175 to 2 G. P. M. lifting 18½ to 19 ft. (this flow is estimated however, as we did not have the weir in use at this time, having left it at Mather.)

This second Station well was about 15 feet to the north of the first one, and had also been drilled at the same time in the ninety's. This well is curbed 8 feet down, the curbing being 6 ft by 12 ft., and the pipe beginning at the floor of this curbing and extending 14 ft. down. The four inch suction pipe was put down within ten inches of the bottom of this well. While pumping, considerable water from the floor of the curbed area (probably 2 G. P. M.) ran in at the top of the piping.

It will be seen from the foregoing, that the first test of the Station Well, where no gravel was used around the screen, would only yield water enough to flood one acre one inch, in 9 hrs., 32 minutes and the flow from the graveled well, an acre inch in 4 hrs., 52½ min., while the test of the to Station Wells, when coupled together would yield sufficient to flow an acre one inch in 2 hrs., 25½ min., when not taking into account the seepage.
The test of the Cranberry Peat & Moss Co. Well when only open 61 feet yielded a flow of 310.25 G. P. M. or an acre inch in 2 hrs., 9 min. and after cleaning to the depth of 89½ ft. the flow was increased to 225.15 G. P. M. or an acre inch in 2 hrs. on an 18.66 ft. lift, with a 6 H. P. engine, while with the use of a 2½ H. P. engine, (both being of the Fuller and Johnson, Happer cooled type) a flow of 154 G. P. M. on a 10.7 ft. lift, on an acre inch in 2 hrs., 56 min.

The Appleton Well, the deepest of any tested by nearly 50 ft., only gave the flow of 59.86 G. P. M. on a 23 ft. lift, or at the rate of an acre inch in 7 hrs., 35 min.

A better idea of these figures will be had when we remember that:—
One acre inch—27152.4 gallons
One acre inch—3630 cubic ft. of water.
One acre inch—225 gallons per minute, for 2 hr. and 1 min., or 1 A. foot in 24 hrs.
One acre inch—12 inches of water running over a 4 ft. sluice in 4.5 min. or at rate of 6005 G. P. M. (approximately) Can be pumped in 22½ min. with a No. 6 Centrifugal pump (which is a quite common size, and has 8 inch suction and 6 inch discharge) their capacity being 1100 gallons per min.

At that rate it should put ten inches of water on ten acres in 42 hours; but as was the experience of the Cranberry Station, and also by some growers who pumped to hold water on shallow peat underlaid with sand it took from two to three times this length of time of continual pumping to get a ten inch head of water on ten acres.

**Cost of Experimental Well Outfit.**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Well screen 6 ft. 6 in. bored 6 in. pipe covered with 60 on 5 mesh screen</td>
<td>$25.00</td>
</tr>
<tr>
<td>1 Plug for same</td>
<td>3.00</td>
</tr>
<tr>
<td>1—No. 3 Type A Horizontal centrifugal pump</td>
<td>49.00</td>
</tr>
<tr>
<td>1—3 inch gate valve</td>
<td>7.00</td>
</tr>
<tr>
<td>308—6” Standard black iron pipe</td>
<td>19.50</td>
</tr>
<tr>
<td>1 cistern pump for priming</td>
<td>3.50</td>
</tr>
<tr>
<td>2’—6” couplings</td>
<td>2.00</td>
</tr>
<tr>
<td>28’—4” Standard black iron pipe</td>
<td>11.50</td>
</tr>
<tr>
<td>1’—4” coupling</td>
<td>.50</td>
</tr>
<tr>
<td>15’—3” Standard black iron pipe</td>
<td>4.75</td>
</tr>
<tr>
<td>2’—3” elbows</td>
<td>.75</td>
</tr>
<tr>
<td>2’—3” coupling</td>
<td>.60</td>
</tr>
<tr>
<td>2 pair chain tongs</td>
<td>13.10</td>
</tr>
<tr>
<td>1 pair slide tongs</td>
<td>5.50</td>
</tr>
<tr>
<td>1—4” Sand pump</td>
<td>6.50</td>
</tr>
</tbody>
</table>

**Total**                                                | $151.70 |
Dealers bill for same $151.50

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity/Measure</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanized casing 25x2 1/2 ft.</td>
<td></td>
<td>$50.00</td>
</tr>
<tr>
<td>Hardware, repairs, castings and belting</td>
<td></td>
<td>$27.33</td>
</tr>
<tr>
<td><strong>Total cost of material (special quotations)</strong></td>
<td></td>
<td><strong>$228.83</strong></td>
</tr>
<tr>
<td>Labor on installing outfit and testing Station Well</td>
<td></td>
<td>62.75</td>
</tr>
<tr>
<td>Labor on testing Cranberry Peat &amp; Moss Co. Well</td>
<td></td>
<td>25.25</td>
</tr>
<tr>
<td>Labor on testing Appleton Well</td>
<td></td>
<td>5.00</td>
</tr>
<tr>
<td><strong>Total expenditure for supplies and labor</strong></td>
<td></td>
<td><strong>$331.83</strong></td>
</tr>
</tbody>
</table>

The 5 H. P. Fairbanks Morse gasoline engine, fuel, oil, repairs, and much time of two men were supplied by the Cranberry Station.

The committee feels that the work has brought out some facts concerning pumping which the not conclusive calls for an opinion and recommendation as to the feasibility of pumping from wells. The committee feels that from the tests made it is entirely feasible to put in wells by means of the removable casings so as to have gravel filter outside of the well screen for securing water to keep up seepage or more particularly for insuring a winter flood; especially for small bogs, but that a better well screen should be procured, than was used at the Cranberry Station.

Where rock is encountered, as at Mather, the gravel filter of course, is not needed, nor is the screen as the pipe can run into the rock far enough to keep out any material from above. We further feel that by the use of a battery of wells or points the lift will be greatly reduced, and as it has been suggested by Professor D. W. Mead of the University of Wisconsin, that tests with 2 1/2 inch well screens or points, used in batteries may prove cheaper and fully as efficient as 6 inch wells that were tested. The committee would recommend that some of these points be tried at the Cranberry Station during 1911, to find if this proves out in practice, and also that a more improved point (6 inch) also be tested. As the equipment at the Station is now quite complete, this should not incur a very large expense.

We would also recommend the testing of some more wells at Mather, to be done in 1911 as there are some drilled wells that have not been tested and that the well on the Arpin Cranberry Co. Bog be tested and then the effect of a dynamite charge exploded at its bottom be noted by a re-testing after the explosion.

For convenience, we herewith, give our estimate of the cost to be incurred in putting in a well with gravel filter, also an estimate of cost of additional wells of same type when the equipment for the first one has been secured. The Committee wishes farther to state that the experimental casing could be rented if desired by any grower, for installing any such wells.

Probable Cost to the Individual for a 30 ft. 6 in. Well with 6 ft. screen at bottom. (Assuming that power and belting is on place.)

1 Casing 30x2 1/2 ft., 18 gauge galvanized iron casing reinforced at

—31—
bottom, 3', 7', 12' and 17 ft. and top, by 2''x'1/4'' strap iron $55.00
1—6''x6'' well screen (Special bare or brass) iron pipe bored then
covered with 60 on five mesh (preferable 40 or 45) .................. 35.00
24 ft., 6 inch standard pipe for well ................................ 16.00
27 ft. 4 in. standard pipe for suction .............................. 11.00
15 ft. 3 in. standard pipe for discharge ............................. 5.00
3 in. gate valve for discharge pipe ................................. 7.00
6 in. sand bucket or pump (can be made from 6''x6'' pipe) .... 8.00
1 sliding wrench .................................................. 6.00
1 chain wrench (4 in. for holding suction pipe) .................. 77.00
1 No. 8 Centrifugal pump (list price $100.00) .................... 70.00
1 Cistern pump (for priming centrifugal pump) .................... 4.00
Labor for assembling and installing outfit, also withdrawing
casing, 3 men 4 days at $1.75 .................................. 21.00
3 timbers and other material for derrick ............................

Total cost of first outfit ......................................... $345.00
Possibly this can be reduced to ($300.00)
Additonal Wells may be installed at about ......................... $100.00

Respectfully submitted
O. G. Malde, for Cranberry Station and Secretary for Committee
A. Searls, Chairman
J. A. Gaynor
C. R. Treat
M. O. Potter
No. I—Close view of Zinc Casing and Derrick.

Sinking casing; six inch five ft. to sand bucket being emptied—
derrick 24 ft.
Mr. C. D. Searls at windless control, Mr. Kissinger at the sand bucket—notice six inch well pipe and screen (to the extreme left) at the front of view.

No. III—Centrifugal pump over First Well.

Also showing four inch pipe leading to well No. 2 and valve to shut off same—notice arrangement for priming for both wells with moving priming pump.
Six H. P. engine left on wagon during test—Notice one pole, three rope derrick ("Jim pole") 26 ft. high.

We are indebted to Mr. O. G. Malde of the Station for the use of the cuts.

J. W. Fitch, Sec'y.