UNIVERSITY OF MINNESOTA.

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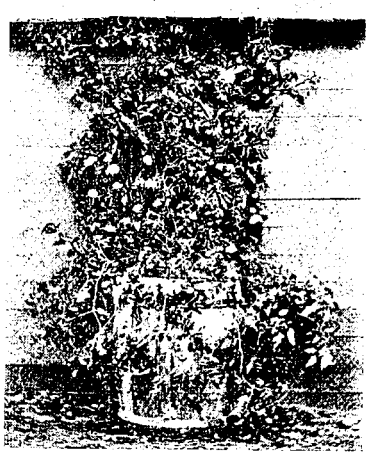

(See Page 318.)

POTATOES—VARIETY TESTS, TREATMENT FOR POTATO SCAB AND BLIGHT, INTERNAL BROWN ROT. TOMATOES—VARIETY TESTS, TREATMENT FOR ROT. SMALL FRUITS—VARIETY TESTS. SPRAY PUMPS—A NEW FORM OF AND STRAINER FOR.

ST. ANTHONY PARK, RAMSEY COUNTY, MINNESOTA.

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UNIVERSITY OF MINNESOTA.

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☞ The Bulletins of this Station are mailed free to all residents of the state who make application for them.

POTATOES; VARIETY TESTS.

SAMUEL B. GREEN.

The potato crop has for many years been a remunerative one in this section, and the present low prices for potatoes should not discourage the planting of them by those who are favorably situated for so doing. The soil and climate of Minnesota are especially favorable for growing this crop. There is an increasing demand for potatoes from the South and East, while the increased expense of growing them in the older potato growing sections of the country, due to the necessity of using high priced manures and to the increasing liability to diseases and insect pests there, make it very certain there will seldom be a season when we cannot depend on having a good market for our surplus potatoes. For a number of seasons it has been the practice of the Horticultural Division of the Experiment Station to grow about fifty varieties of potatoes on which to make a report each year. This has seemed a good custom from the fact that the farmers and gardeners of the State seemed interested in the reports and also because it kept the Division posted on the latest improvements in varieties. In selecting the best varieties each year much discrimination has been shown and as soon as a variety has been well tested and found to be not among the best, it has been discarded, except in cases where it has seemed desirable to grow well known kinds for the purposes of comparison.

Repeated experiments, made on a large scale and with many kinds show that all varieties of potatoes rapidly deteriorate in yield, size of tubers and vigor when planted continuously at University Farm. On this account, in order to have a fair basis for comparison, it has become necessary for us to get new potato seed stock for our experiments here each year, from

stock grown on a different soil or in a widely different climate. But this is not true of much of the soil of this State, since in some sections varieties of potatoes have been grown for many years on the same soil with very little signs of "running out." This is notably true of the old Early Rose variety, which still remains a popular sort in some sections. On account of this variation in the adaptability of potatoes to different soils, the Horticultural Division commenced in 1894 the practice of trying its list of varieties of potatoes in the widely different localities in the State that the results might be the more valuable to planters. In 1894 the varieties of potatoes were tried at University Farm on open clay loam, and in Anoka county on a sandy loam, which is typical of much of the best potato land in that section of the State. In 1895 the trials were made in McLeod and Marshall counties as well as on University Farm.

The method of cultivation closely followed in each of these sets of experiments varied slightly, though not sufficiently to impair the results. It was as follows: The varieties were planted in May about sixteen inches apart in rows three feet apart and covered about four inches deep. The land was thoroughly dragged with a slanting tooth harrow, just as the potato sprouts commenced showing above the ground. This loosened the soil and killed the weeds that had started. This was repeated when the tops were about three inches high. Further cultivation consisted in loosening the soil between the rows with a one-horse cultivator. The land was kept nearly flat, though it was found necessary to throw a little soil towards the plants to keep the tubers from crowding out of the ground. Further notes on cultivation will be referred to in the reports from the different sections in which the crops were grown.

At University Farm, (St. Anthony Park,) the potatoes were grown on open clayey land that had for two years been in timothy and clover. The sod was broken up in the fall of 1894. In the spring of 1895 it was cut to pieces with a cutaway harrow, then cross plowed and harrowed until the soil was made compact. The varieties were planted the 10th of May with a Robbins potato planter. The rows of each kind were 150 feet long and there were from one to several rows of each variety. Table LIV shows the results from this plat calculated in yields per

acre. Columns 1, 2 and 3 explain themselves. In column 4 the figures are arranged in the order of greatest total yield of each kind mentioned in the table. For instance, Acme is numbered 40 which shows there were thirty-nine kinds that produced more potatoes at this Station.

TABLE LIV.—Potatoes; Variety Tests at University Farm.

	Marketable. Bus.	Small. Bus.	Total Bus.	Consecutive No. in yield.
Acme	184	20	204	40
American Wonder	263	36	299	10
Arizona	285	23	308	7
Brownell's Winner	183	32	215	37
Burbanks	247	25	272	21
Carman No. 1	219	17	236	33
Carman No. 3	168		168	42
Delaware	239	39	278	19
Early Ohio	139	10	149	44
Early Everitt ?	300	43	343	3
Early Six Weeks	235	18	253	28
Early Oxford	289	39	328	4
Early Minnesota	256	38	294	14
Early Harvest	162	43	205	39
Early Norther	260	29	289	15
Early Rose	227	30	257	27
Early Burpee	241	40	281	18
Freeman	268	39	307	8
Good News	265	24	289	16
Great Northern	224	13	247	31
Howe's Premium	137	32	169	41
Ideal	180	36	216	34
Irish Daisy	264	37	301	9
Irish Cobbler	295	30	325	5
Lee's Favorite	327	22	349	2
Maggie Murphy	256	13	269	22
Montana Rose	238	60	298	11
New Queen	265	32	295	13
Ohio Jr.	217	10	227	34
Pearl of Savoy	219	33	252	29
Polaris	246	21	267	23
Pride of the Valley	258	5	263	26
Prizetaker	223	28	251	30
Reed's Eighty Six	259	36	295	12
Rural New Yorker No. 2	365	23	388	1
Rural Plush	207	19	226	35
Red Ohio	145	17	162	43
Snowflake	220	20	240	32
Summit	179	32	211	38
Vaughan	144	26	170	40
Vick's Champion	115	15	130	45
Victor White	223	44	267	24
World's Fair	226	50	276	20
World's Fair (Old's)	256	33	289	17
Woodbury White	290	25	315	6

At Coteau Farm, (Lynd, Lyon Co.,) the potatoes were grown on a clay loam of apparent even composition, slightly sloping to the north. For several years previous this land had been in grain crops, and at a depth of two feet the clay is very compact and very dry. The potatoes were here planted by hand 15 inches apart in rows four feet apart, while at University Farm they were grown in rows only three feet apart. The

hills of each kind varied in number, but the results are all calculated per acre for a distance of four feet between the rows and 15 inches in the rows. It is probably fair to assume that had these been planted three feet apart the yield would have been larger since it is very doubtful if anything is ever gained by planting in rows wider apart than three feet.

Table LV shows the yields in detail from this planting. Column 1 gives the number of hills grown of each kind for comparison. Columns 2 and 3 the actual yield in pounds. Columns 4, 5 and 6 the yields calculated for one acre. Column 7 gives the consecutive number in order of yield, Number 1, having the largest yield. It will be noticed that the yields in this table are larger than in tables LIV or LVI.

TABLE LV.—Potatoes; Variety Tests at Coteau Farm, Lyon County.

Variety.	No. of Hills.	Yield lbs. Marketable.	Yield lbs. Small.	Yield per acre in bus.			Consecutive number in order of yield.
				Large.	Small.	Total.	
American Wonder	55	186	19	521	48	528	2
American Wonder	234	753	54	467	33	500	2
Arizona	98	226	31	334	46	380	13
Burbanks	288	656	55	317	27	344	18
Delaware	104	274	9	376	12	388	12
Early Oxford	326	973	85	433	37	470	4
Early Minnesota	108	267	28	358	37	395	10
Early Rose	144	269	36	270	36	306	20
Early Burpee	52	127	14	354	39	393	11
Freeman	150	348	33	337	32	369	15
Great Northern	150	377	9	365	6	371	14
Irish Daisy	80	265	20	480	30	510	3
Lee's Favorite	144	408	28	375	30	405	9
Montana Rose	36	61	8	246	32	278	21
Ohio Jr.	77	89	14	166	26	202	22
Pearl of Savoy	27	77	11	408	59	467	5
Polaris	216	507	40	340	26	366	16
Pride of the Valley	93	228	2	355	3	357	17
Reed's Eighty Six	58	115	15	290	37	327	19
Snowflake	260	713	38	407	20	427	8
Summit	32	96	9	434	32	466	6
World's Fair	129	463	26	521	30	551	1
Late Rose	96	273	25	401	38	439	7

Subsoil Plowing for Potatoes. At Coteau Farm a part of a piece of land in potatoes, not previously referred to, extended across a piece of land that had been subsoiled for trees. On this part the vines and tubers were considerably larger than on land not so treated, and though the results were in such shape that it would perhaps be quite unfair to attempt to state them in figures, yet they were prominent and seemed to speak well for this method of preparing such land. But it

should be remembered that this land is a clay loam underlaid with a stiff, compact, hard-pan, through which the surface moisture has not appeared to penetrate for several years. While it was probably a good treatment in this case, it would, very likely be worse than useless in case of porous open subsoils. In this case when the potatoes were dug the land was well moistened as far as the subsoil plow penetrated while in near by soil generally it was moist only down to the hard-pan.

POTATOES, VARIETY TESTS IN MCLEOD COUNTY.

In McLeod county the varieties were grown on the farm of Hon. W. W. Pendergast at Hutchinson. The land used was rather light and poor. It had quite a decided slope and the rows were laid out up and down the hill to insure uniform conditions. They were planted sixteen inches apart in rows three feet apart. The yields from this planting are given in Table LVI.

TABLE LVI.—Potatoes; Variety Tests in McLeod County.

Variety.	Yield per acre.	Consecutive number in order of yield.	Variety.	Yield per acre.	Consecutive number in order of yield.
Acme	153	20	Irish Cobbler	173	13
American Wonder	213	5	Lee's Favorite	187	10
Arizona	93	30	New Queen	133	25
Brownell's Winner	146	22	Pearl of Savoy	180	14
Delaware	140	23	Polaris	166	15
Early Burpee	187	11	Pride of the Valley	187	9
Early Everitt	133	27	Prizetaker	207	7
Early Harvest	180	12	Rural New Yorker No. 2 ?	126	28
Early Minnesota	160	18	Rural Blush	200	8
Early Norther	227	2	Summit	227	1
Early Ohio	133	24	Vaughan	120	29
Early Six Weeks	160	17	Vick's Champion	220	3
Freeman	146	21	World's Fair	160	19
Howe's Premium	86	31	World's Fair (Old's)	166	16
Ideal	133	26	Woodbury White	213	4
Irish Daisy	207	6			

The foregoing tables show a great difference in the yields of the various varieties of potatoes at each station and also in the yield of the same varieties at different stations as compared with the whole list grown.

It will be noted that the whole list of varieties grown at each station was not exactly the same and consequently cannot be compared as lists, but a large part of the list was grown at all three stations, and the yields of these varieties may be com-

pared. This was a matter that seemed unavoidable under the circumstances and does not seriously detract from the value of the results. Table LVII shows the ten most productive kinds at each station where tried in yield of total bushels per acre.

TABLE LVII.--Potatoes; Ten Most Productive Kinds.—University Farm.

VARIETY	Yield per acre in bus.	VARIETY.	Yield per acre in bus.
Rural New Yorker No. 2	388	Woodbury White	315
Lee's Favorite	349	Arizona	308
Early Everitt	343	Freeman	307
Early Oxford	328	Irish Daisy	301
Irish Cobbler	325	American Wonder	299

Potatoes; Ten Most Productive Kinds.—Coteau Farm.—Lyon County.

VARIETY.	Yield per acre in bus.	VARIETY.	Yield per acre in bus.
World's Fair	551	Summit	466
American Wonder	528	Late Rose	439
Irish Daisy	510	Snowflake	427
Early Oxford	470	Lee's Favorite	405
Pearl of Savoy	467	Early Minnesota	395

Potatoes; Ten Most Productive Kinds.—McLeod County.

VARIETY.	Yield per acre in bus.	VARIETY.	Yield per acre in bus.
Summit	227	Irish Daisy	207
Early Norther	227	Prizetaker	207
Vick's Champion	220	Rural Blush	200
Woodbury White	213	Pride of the Valley	187
American Wonder	213	Lee's Favorite	187

POTATOES, DESCRIPTION OF THE NEWER VARIETIES.

On this and the following pages is given descriptions of the newer varieties of potatoes grown by the Experiment Station in 1894. The common kinds are not referred to since their value is generally well known. The notes on quality are by Miss Mary C. Thomson, instructor of domestic economy at the School of Agriculture and lecturer on that subject in the Farmers' Institute in this State.

Acme.—Season, early; form oblong, short and thick; eyes

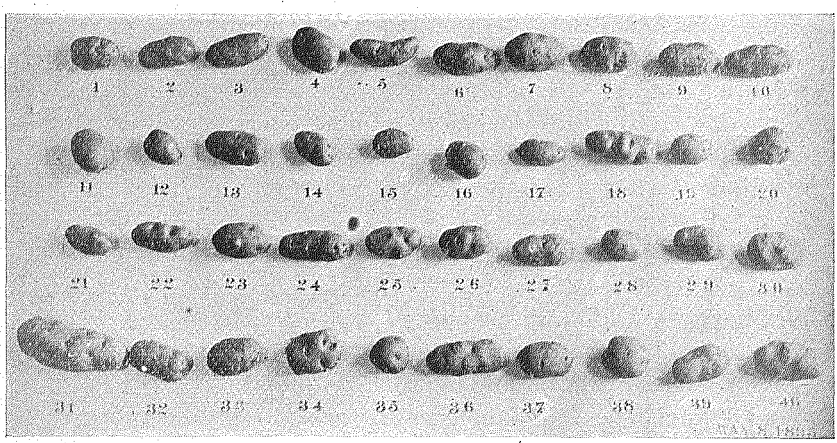

Fig. 68.—Varieties of potatoes grown in 1895.

1. Acme.
2. American Wonder.
3. Arizona.
4. Brownell Winner.
5. Burbank.
6. Burpee's Earliest.
7. Carman No. 1.
8. Delaware.
9. Early Ohio.
10. Early Everitt.
11. Early Six Weeks.
12. Early Oxford.
13. Early Minnesota.
14. Early Harvest.
15. Early Norther.
17. Freeman.
18. Good News.
19. Great Northern.
20. Howe's Premium.
21. Ideal.
22. Irish Daisy.
23. Irish Cobbler.
24. Lee's Favorite.
25. Maggie Murphy.
26. Montana Rose.
27. New Queen.
28. Ohio, Jr.
29. Old's World's Fair.
30. Polaris.
31. Pride of the Valley.
32. Prizetaker.
33. Rural New Yorker No. 2.
34. Rural Blush.
35. Snowflake.
36. Summit.
37. Vanghan.
38. Vick's Champion.
39. World's Fair.
40. Woodbury White.

shallow; skin slightly rough. This variety is not holding out as well in yield as we expected from its behavior in several previous years; cooking qualities fair when boiled or baked.

American Wonder.—Season late; form rather long; flesh white; skin white and very smooth; a very good potato and a general favorite wherever grown. Very productive cooking qualities very fine when boiled or baked—very white and mealy.

Arizona.—Season late; form oblong; eyes shallow; skin smooth and white; a good yielder; of excellent flavor either baked or boiled, white and mealy.

Brownell's Winner.—A mid-season variety; fairly large, oblong with medium eyes; moderately productive; cooking qualities fair—fine grained.

Carman No. 1.—A mid-season variety; form oblong; eyes few; skin nearly white; a very good medium late potato; cooking qualities fair.

Carman No. 3.—Season late; form similar to No. 1; a very late potato and it appears to be a good yielder. As this is its first year here the report should not be considered conclusive. Cooking qualities fair.

Delaware. A mid-season variety. This potato continues to be popular, although not as large a yielder as some; cooking qualities excellent in flavor; very white, mealy.

Early Norther.—Season early; form long and not very large, although it yielded very well; skin yellowish, smooth; eyes shallow; when cooked the flesh was white but slightly discolored.

Good News. — Season late; form long and cylindrical, usually very regular; skin smooth; eyes shallow; color yellowish white. A promising new variety; cooking qualities fair either baked or boiled, flesh white and mealy.

Howe's Premium. — A mid-season variety; form round, small. A very good potato as far as quality is concerned but undersized and unproductive here; cooking qualities very good.

Irish Daisy.—Season late; a rather long potato; skin very thin and smooth; eyes rather deep; very productive, and apparently worthy of being planted on a larger scale; of excellent flavor, when baked fairly well, when boiled very mealy.

Irish Cobbler.—A mid-season variety; form short, oblong, somewhat flat; eyes medium deep; skin and flesh white; a very

productive potato; quality excellent when baked or boiled, very white and mealy.

Lee's Favorite.—Season late. Described in bulletin No. 39. Cooking qualities very good.

Maggie Murphy.—Season late. Described in Bulletin No. 39. Cooking qualities, white—rather coarse grained, but of good flavor.

Prizetaker.—Season late; form oblong; eyes few and shallow; skin quite smooth; cooking qualities fair, not as dry as some, and discolored somewhat in cooking.

Rural Blush.—Season late; similar in form and outward appearances to World's Fair; cooking qualities very good.

World's Fair.—Season late; form broad, oblong; skin yellowish white very finely netted; cooking qualities very fine; flesh very white and mealy.

POTATOES; TREATMENT FOR THE PREVENTION OF SCAB IN 1895.

At University and Coteau Farms experiments were repeated to test the value of corrosive sublimate as a remedy for scab of potatoes. At both places all the seed planted with few exceptions showed some scab and was treated with this material and the crop was very free from scab. At each place a small amount of seed was left without being treated as a check. At University Farm the results in this case were worthless on account of an accident, but in several previous years the good results from this treatment have been very manifest. At Coteau Farm, however, the results showed plainly the effect of this treatment. There, Early Ohio treated and not treated for the prevention of scab were planted with the result that those treated were very free from this disease and were nice, well developed tubers, while those not treated were very rough and scabby.

The illustration herewith shows how the tubers appeared. The contrast is only a fair representation of this difference and in no way exaggerates it.

This treatment for potato scab was given in Bulletin No. 39, but as we have had many inquiries in regard to it we again give it in detail. But perhaps it is well to say that we have thus treated our potato seed on a large scale for two years and think it a matter to which every potato grower should give his attention.

The method of treatment adopted this year for potato seed was as follows: Two ounces of powdered corrosive sublimate were dissolved in a wooden bucket, the liquid was poured into fourteen gallons of water contained in a barrel and thoroughly stirred. The potatoes were put in sacks and were thus soaked in the corrosive sublimate solution for one and one-half hours. They were then

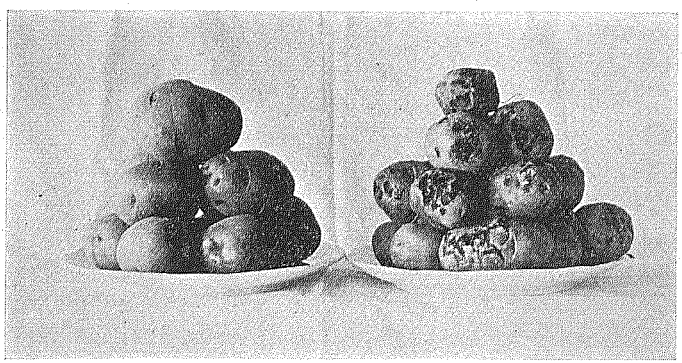

Fig. 69.—Potatoes Grown From Treated and Untreated "Seed."

taken out, dried, and cut into pieces for planting. It was found that soaking them for two hours did not injure the growth in any way, but that one and one-half hours was sufficient time to kill the scab fungus where the tubers were only slightly affected. In one case where the tubers were excessively covered with the scabs, so that even the eyes could not be discerned, soaking for one and one-half hours was not long enough to kill the scab fungus. I would recommend that, where the potatos are excessively rough, they be soaked in the corrosive sublimate solution for at least two hours. But potatoes that are excessively scabby should, if possible, be avoided for planting purposes. The expense of the treatment

above referred to for the prevention of scab should never exceed $1 per acre, including the cost of the material and the labor of treatment.

As the peculiarities of this disease, which we commonly call "scab," are not as well known as they should be, I give below a short abstract from Bulletin No. 32 of this Station, in which its peculiarities and characteristics are treated at considerable length:

"(1) Scab of potatoes is caused by a fungus plant working in the surface of the potato. The germs of it are very abundant and live for many years in the soil and also over winter on the potatoes. If these germs are fed to stock, they undoubtedly grow in the manure, and the use of such manure may often be a cause of infection. Also, they may be spread in the soil by the natural drainage and land receiving the drainage from infected fields may become infected even without ever having potatoes on them.

"(2) Scabby seed, when planted on new or old potato land, will generally produce a scabby crop, but the amount of the disease will generally be much more on the old than on new land.

"(3) Perfectly clean seed planted on land which is free from scab fungus will always and in any season produce a crop of smooth, clean potatoes, no matter what the character of the land. But seed potatoes apparently clean may have the germs of the scab fungus on their surface. This is often the case where they have been sorted out from a lot that is somewhat infected with the scab. In this latter case, the tubers should, at least, be thoroughly washed in running water, to remove any germs that may be present, or, what is better yet, be treated with corrosive sublimate (mercuric bichloride), as recommended.

"(4) Land infected by the germs of this disease will produce a more or less scabby crop, no matter how clean and smooth the seed used.

"(5) Scabby potatoes should be dug as soon as mature, since the scab fungus continues to grow on the potatoes as long as they are in the ground.

"(6) Scabby potatoes may be safely used for seed, provided they are first treated with corrosive sublimate, as recommended.

The cost of this treatment is a mere trifle, not exceeding one cent a gallon for the solution used."

POTATOES; INTERNAL BROWN ROT.

In 1894, many potatoes in Eastern Minnesota, New York, and in a few other sections of the country were affected with some trouble which, without injuring in the least the skin or external appearance or the keeping qualities of the potatoes, discolored much of the fleshy, starchy matter within, causing it to appear as if just beginning to rot and making them unsalable. This year tubers that were badly affected with this disease were thrown out of our seed for general planting, but a badly discolored lot were planted by themselves at Coteau and University Farms. The result in each case was a good crop of good potatoes without a discernible trace of this peculiarity at the time the tubers were dug, neither did this trouble show itself in other plantings in the fall but by the first of March, some varieties stored in cellars showed it quite largely, and there are occasional reports of it from dealers. It would certainly seem a reasonable precaution in view of the abundance of potato seed, for potato growers to avoid planting this year any tubers showing even a trace of this disease. We reproduce the cut used last year to illustrate this trouble.

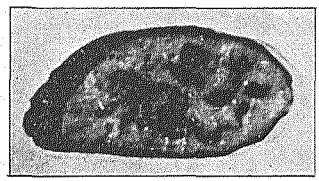

Fig. 70.—Internal Brown Rot of Potatoes.

POTATO BLIGHT.

During the last two years the loss from potato blight in this State has been almost nothing. In some previous years we have had good returns from the use of fungicides to prevent this disease, but in 1894 and 1895 the results from the application showed no advantage and in a few cases they appeared a hindrance rather than a help. It is, consequently extremely doubtful if it will pay to use these preventives under the present circumstances. However, we may have a succession of years when this disease will become so abundant that it will be desirable to use fungicides to prevent it. Table LVIII shows the returns which we received from spraying potato

foliage with Bordeaux mixture in 1895. In each case the work was carefully done and in no case was the foliage burned by the application.

TALE LVIII.—Potatoes; Spraying to Prevent Blight of the Foliage at University Farm.

	DATES WHEN SPRAYED.				Actual yields.			Calculated for yield per acre in bushels.		
					Marketable Lbs.	Small Lbs.	Total Lbs.	Marketable Bus.	Small Bus.	Total Bus.
BURBANK SOUTH PLOT										
Sprayed 4 times	June 22	June 22	July 11	July 24	215	55	270	129	33	162
Sprayed 3 times	June 22	July 11	July 24	.....	210	64	274	126	38	164
Sprayed 2 times	June 29	July 24	.....	.....	214	61	275	128	37	165
Sprayed	July 11	.....	.....	.....	216	59	275	130	35	185
Not sprayed	.....	.....	.....	.....	302	62	304	181	37	218
BURBANK NORTH PLOT										
Sprayed 4 times	June 22	June 29	July 11	July 24	406	47	453	243	28	271
Sprayed 3 times	June 22	July 11	July 24	.....	451	42	493	270	25	295
Sprayed 2 times	June 29	July 24	.....	.....	338	32	370	209	20	229
Sprayed	July 11	.....	.....	.....	400	37	437	240	22	262
Not sprayed	A	.....	.....	.....	463	40	503	278	24	302
" "	B	.....	.....	.....	428	48	476	257	28	285
IRISH DAISY										
Sprayed 2 times	June 29	July 24	.....	.....	491	48	539	221	22	243
Not sprayed	.....	.....	.....	.....	485	42	527	291	25	316
ACME.										
Sprayed 2 times	.....	.....	.....	.....	252	.....	252	151	.....	151
Not Sprayed	.....	.....	.....	.....	258	.....	253	155	.....	155
RURAL N. YORKER NO. 2										
Sprayed 4 times	June 22	June 29	July 11	July 24	299	18	317	269	16	285
Sprayed 3 times	June 23	July 11	July 24	.....	307	15	322	263	13	276
Sprayed 2 times	June 29	July 24	.....	.....	309	21	330	278	19	297
Sprayed	July 11	.....	.....	.....	315	13	328	281	12	293
Not sprayed	.....	.....	.....	.....	307	15	322	263	13	276
EARLY OHIO.										
Sprayed 2 times	June 29	June 24	.....	.....	327	39	366	196	23	219
Sprayed 2 times*	June 29	June 24	.....	.....	318	44	362	190	26	216
Sprayed 3 times	June 22	July 11	.....	.....	294	60	354	176	36	212
Not sprayed	.....	.....	.....	.....	324	38	362	194	23	217

The Bordeaux mixture used in this experiment was made as follows:

Bordeaux Mixture:—

5 lbs. blue vitriol (sulphate of copper).

5 lbs. quicklime.

50 gallons water.

Perhaps the simplest method of making it is as follows: slack five pounds of the best quicklime in three gallons of water; dissolve five pounds of blue vitriol, by frequent stirring, in three gallons of hot water in a wooden vessel. When both are cool, pour the slacked lime through a gunny sack strainer into two barrels containing twenty-two gallons

*Molasses was added to the Bordeaux mixture in this instance.

of water each, and then pour in the blue vitriol solution. The result should be a sky-blue colored mixture that will settle to the bottom in a few hours. In use, it must be kept well stirred. If cold water is used, it will be found that the blue vitriol will dissolve most quickly if it is kept suspended at the surface of the water, as solutions of it are heavier than water. Of course, if it is stirred all the time, nothing would be gained by this treatment. When a large amount of Bordeaux mixture is to be used at the University Farm, we dissolve about twenty pounds of blue vitriol in twenty gallons of water, and in making the mixture, instead of weighing out the blue vitriol, we measure out one gallon of the solution.

SUMMARY.

1. The yield of varieties of potatoes varies very much in comparison with standard sorts according to the land and locality in which they are grown.

2. The subsoiling of heavy clay land seemed to increase the yield of potatoes in 1895.

3. Treating the "seed" of potatoes at Coteau Farm (Lyon County) with corrossive sublimate greatly lessened the effect of scab. Where the seed was not treated there was much scab. This was in the case of potatoes on land that had never grown potatoes before.

4. The disease of potatoes termed "Internal Brown Rot," which was so common in the season of 1894 was not observed this year until the latter part of the winter.

5. Potato growers should carefully avoid planting potatoes having even a trace of "Internal Brown Rot" in the flesh.

6. Results obtained from the spraying of potato vines to prevent their blighting have shown little if any increase due to this treatment during the last two years.

TOMATOES; VARIETY TESTS, FREEDOM FROM ROT, TREATMENT FOR ROT.

SAMUEL B. GREEN.

The experiments with tomatoes have consisted of the trial of quite a number of kinds with the main object of noting their susceptibility to the disease known as "tomato rot," and also to determine the value of several fungicides in preventing it.

This disease is a frequent cause of loss to the tomato grower and is worthy of much study and experiment, since the tomato is almost universally grown in home gardens and is in general demand in its season and also from the fact that the canning of this vegetable is an industry that promises to reach considerable proportions in the southern half of this State.

Table LIX on the next page, gives the yield and per cent of rotten and good fruit of the different varieties of tomatoes grown at University Farm in 1895, and herewith is a list of the principal varieties grown with a brief reference to the chief qualities of interest here.

DESCRIPTION OF THE PRINCIPAL VARIETIES OF TOMATOES GROWN ON UNIVERSITY FARM IN 1895.

Acme.—As usual the Acme produced a large quantity of nice fruit. The fruit of this variety is quite susceptible to rot, yet allowing for this source of loss it is generally a profitable kind since it is very prolific, and in color, form and other characteristics it is almost an ideal tomato, and while its first fruit does not ripen as early as those of some other kind, yet some strains of it produce a good picking of early tomatoes as early as any other kind and it is far better in quality than the so-called early sorts.

Atlantic Prize.—An inferior early sort. Color red; fruit round oblong. There are several other varieties that are very much better.

TABLE LIX.--Tomatoes; Variety Yields and Ability to Resist Rot.

VARIETY.	Aug. 24		Aug. 30		Sept. 6.		Sept. 12		Total.		Percentage of rotten fruit.	Percentage of good fruit.
	Good.	Rotten.	Good.	Rotten.	Good.	Rotten.	Good.	Rotten.	Good.	Rotten.		
Acme	8	10	22	7	30	19	47	6	107	42	28	72
Atlantic Prize	8	1	14	10	24	2	30	5	76	18	17	83
Autocrat	1	....	6	3	9	....	25	4	41	7	15	85
Beauty	2	....	28	25	37	24	27	8	94	57	37	63
Belmont	33	5	47	1	84	2	14	8	178	16	8	92
Bond's Early Minnesota	8	....	30	....	44	2	35	6	117	8	6	94
Buckeye State	....	....	....	1	1	4	26	6	27	11	30	70
Cardinal	2	3	4	9	18	6	12	3	36	21	37	63
Cumberland Red	....	9	1	6	6	16	47	11	54	42	44	54
Comrade	6	15	11	17	32	17	36	5	85	54	39	71
Crimson Cushion	....	....	....	1	3	5	15	1	18	7	28	72
Democrat	1	2	3	....	10	9	8	5	22	16	42	58
Dwarf Aristocrat	4	....	13	3	33	4	20	2	72	9	12	88
Dwarf Champion	5	2	34	4	35	3	38	7	114	16	18	82
Early Advance	10	....	30	2	120	2	75	10	235	14	6	94
Early Michigan	2	3	11	37	20	18	33	6	66	37	32	68
Early Ruby	27	....	50	....	50	5	26	4	153	9	6	92
Earliest of All	36	1	25	....	52	2	24	7	137	10	7	93
Fordhook First	....	39	16	9	30	13	23	2	69	53	43	57
Favorite	....	1	12	8	33	14	37	8	82	31	27	73
Hovey	13	1	29	11	22	15	12	3	76	30	28	72
Ignotum	7	11	17	31	24	16	26	5	74	63	46	54
Landreth's No. 1	10	....	33	1	54	3	25	3	122	7	5	95
Landreth's No. 6	....	5	7	7	19	6	9	2	35	20	36	64
Longkeeper	6	3	10	23	31	26	11	6	58	58	50	50
Liberty Bell	3	2	13	12	15	5	28	4	59	23	28	72
Lorillard	7	5	12	12	37	8	30	5	86	30	26	74
Lemon Blush	....	....	5	3	15	4	36	4	56	11	16	84
Maule's Earliest	23	5	60	4	40	3	30	6	153	18	10	90
Mitchell's Early	15	2	40	7	47	7	23	4	125	21	14	86
New Imperial	10	11	15	4	29	3	21	8	75	46	25	75
New Jersey	1	2	8	10	25	14	16	6	50	32	38	62
New Stone	....	....	5	20	16	10	8	1	29	31	51	49
Optimus	9	....	14	6	21	10	18	3	62	19	26	74
Paragon	4	9	9	21	18	22	16	5	47	37	44	56
Puritan	....	....	15	1	28	3	43	2	86	6	6	94
Ponderosa	5	....	5	....	22	2	41	6	73	8	8	92
Perfection	8	2	23	26	17	16	29	11	78	55	41	59
Royal Red	....	....	8	10	21	10	24	6	53	26	33	67
Rane's Seedling	....	....	1	1	....	1	5	2	7	4	36	63
Red Apple	7	6	15	11	14	18	10	5	46	40	46	54
Shah	7	2	13	1	23	....	9	2	52	5	8	92
Table Queen	2	1	24	14	48	10	14	7	88	32	29	71
Tree	8	....	31	12	43	14	53	7	135	43	24	76
Trophy	3	3	12	7	25	5	34	7	74	22	23	77
Volunteer	....	....	15	27	19	30	28	4	62	61	50	50

Autocrat.—Vines medium to large; fruit usually irregular; form round flat; color pink, nearly red; last picking September 19. It has no special value.

Beauty.—The Beauty seems to keep its reputation as high as formerly. It is a little larger than the Acme, but otherwise closely resembles it. In susceptibility to rot about the same as the Acme.

Belmont.—A productive, early variety with medium to small vines; color red; usually small in size. It is a promising kind for early use in the home garden.

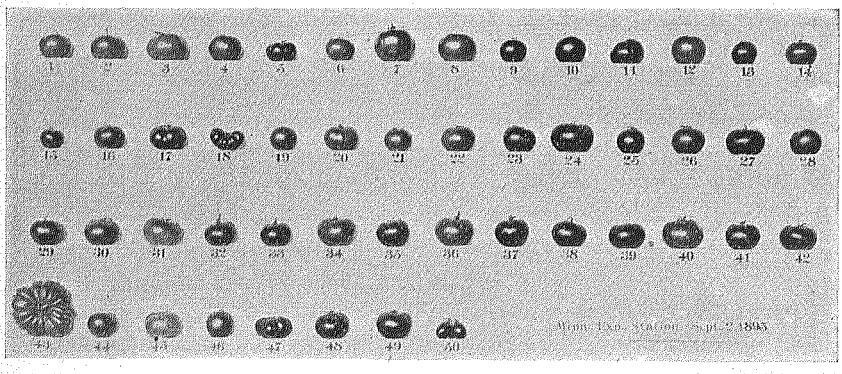

Fig. 71.—Varieties of tomatoes grown in 1895.

1. Acme.
2. Atlantic Prize.
3. Autocrat.
4. Beauty.
5. Belmont.
6. Bond's Early Minnesota.
7. Buckeye State.
8. Cardinal.
9. Cumberland Red.
10. Comrade.
11. Crimson Cushion.
12. Democrat.
13. Dwarf Aristocrat.
14. Dwarf Champion.
15. Early Advance.
16. Early Michigan.
17. Early Ruby.
18. Earliest of All.
19. Fordhook First.
20. Favorite.
21. Hovey.
22. H. & M*. No. 1.
23. H. & M. No. 2.
24. H. & M. No. 3.
25. Ignotum.
26. Landreth's No. 1.
27. Landreth's No. 6.
28. Longkeeper.
29. Liberty Bell.
30. Lorillard.
31. Lemon Blush.
32. Maule's Earliest.
33. Mitchell's Early.
34. New Imperial.
35. New Jersey.
36. New Stone.
37. Optimus.
38. Paragon.
39. Puritan.
40. Ponderosa.
41. Perfection.
42. Royal Red.
43. Rane's Seedling.
44. Red apple.
45. Shah.
46. Table Queen
47. Tree.
48. Trophy.
49. Volunteer.
50. Yellow Plum.

Bond's Early Minnesota.—Vines medium in size and rather open in habit; fruit of medium size and smooth, skin pink. Not as early as "Earliest of All," but of much better quality and form. A desirable early sort.

*From Hoover & Moore, Antlers, Colorado.

Buckeye State.—Has not proven of value here on account of its being too late in ripening. Where the season is longer it is evidently a very desirable variety.

Cardinal.—Ripening season is very short, many specimens very irregular; color red; form round and flat.

Cumberland Red.—Vines large and vigorous, form round, flattened; color red; many other varieties very much superior.

Comrade.—A small, red tomato of no special merit.

Crimson Cushion.—Vine medium to large; color scarlet; fruit large; form round flat, slightly scalloped. An inferior sort.

Democrat.—Vines medium in size; fruit large; color pink; form round oval. Of no special value here.

Dwarf Aristocrat.—Vines similar to Dwarf Champion, but the fruit is red in color, otherwise very much like Dwarf Champion. A good red tomato of dwarf habit, but in no way surpassing Dwarf Champion and we think not so productive.

Dwarf Champion.—Vines dwarf and compact; leaves very broad and green in color; fruit usually medium to large; skin a beautiful pink color very smooth; flavor of the best. In some respects the fruit excels the Acme which it resembles in many ways. For home planting very desirable and largely planted for market. Though not as productive as the Acme it does not rot so much as that variety.

Early Advance.—Vines medium in size, a nice, smooth, early red tomato, producing a large amount of very good small fruit. On account of its smooth fruit it is superior to "Earliest of All," which is a well known popular early kind with rather irregular fruit, very desirable for early use.

Early Michigan.—Vine medium in size; fruit small; skin red; very susceptible to rot; not desirable.

Early Ruby.—Resembles "Earliest of All;" fruit small, red; very productive; a good early sort.

Earliest of All.—A very early variety, with small vines; fruit very irregular; only desirable for very early use, and where the growing season is very short. Several other early sorts, such as Maule's Earliest and Early Advance are more desirable.

Fordhook First.—Very much like Bond's Early Minnesota, but perhaps not so productive. Very little fruit left on the vines September 19.

Favorite.—An old variety, and quite a popular red sort; vines large and vigorous; form flat and round. Good quality.

Hovey.—Vine medium to small; fruit small and regular; color red; slow to ripen at stem and rotted badly.

Ignotum.—Form irregular, roundish; size of fruit medium; color red. Not desirable here.

Landreth's No. 1.—Vines medium in size; leaflets small; fruit a round oval, small to medium in size; color nearly red; nearly all ripe by the 19th of September.

Landreth's No. 6.—Vines medium to large in size with leaflets finely cut; fruit round somewhat flattened; skin pink, very smooth; quality very good, a promising kind.

Long Keeper.—Vines medium to large and spreading, stems very strong; skin light pink in color; usually of good form, but many somewhat irregular; rotted badly; not desirable.

Liberty Bell.—Color red; flat oblong. Of no especial merit.

Lorillard.—Vines medium in size and vigorous; color red; form flat, rather round; rotted badly.

Lemon Blush.—Vines large and dense; skin bright yellow with a sprinkling of red; productive and good; a desirable yellow sort.

Maules Earliest.—Vines medium in size with the leaflets finely cut, smoother and of much better quality than Earliest of All; color red; in form it is somewhat scalloped, rather flat; medium in size; promising for an early variety.

Mitchell's Early.—Vines medium to large; fruit ripens very early, small and somewhat irregular; color red.

New Imperial.—Vines medium to large; fruit usually of good form; color pink; promising and worthy of trial.

New Jersey.—Color red; form round, somewhat flattened and scalloped at stem; soft and of little value.

New Stone.—Vines large and vigorous; fruit roundish, very smooth; medium to large in size; skin pink. Its chief drawback is that it rots badly.

Optimus.—Vines large and vigorous; color red; fruit small, round and flattened.

Paragon.—A well known old red variety that has generally been superseded.

Perfection.—Vines medium in size; skin red; form round, somewhat flattened, usually of good form and ripens well to stem.

Ponderosa.—Vines large and vigorous; fruit very small, but generally quite rough and on this account not desirable for marketing.

Puritan.—Vines large and vigorous; fruit large; form flat and round; skin pink with much red; a medium late variety.

Royal Red.—Color red: size medium to large; not especially desirable.

Rane's Seedling.—Vines very large and vigorous; leaflets finely cut and not very close; fruit of enormous size; very irregular, but it does not ripen well at the stem; apparently of little value. A Seedling from West Virginia Experiment Station.

Red Apple.—Color red; of little use.

Shah.—Vines very large and vigorous, with potato shaped foliage; fruit very large, but quite irregular; color yellow. Lemon Blush seems a much better yellow sort.

Trophy.—Vines medium to large, formflat oblong and often wrinkled; color red; rather late.

Volunteer.—Color red; fruit usually irregular and in form a flattened oval.

Yellow Plum.—A well known, small, yellow tomato, chiefly valued as a novelty and for pickling or preserves.

TOMATOES; FORCING IN BARRELS.

(SEE COVER ILLUSTRATION.)

The figure on the cover is a suggestion to those growing the tomato. In the case photographed these plants were grown in an old sugar barrel in the bottom of which was a foot of well-rotted horse manure. The plants were trained up the south side of a building. When plants are grown in this way they should be near the house so they may be properly cared for as in dry weather they need much water. Treated thus, the plants have good chances of growing and ripening their fruit even in very unfavorable years and in very unfavor-

able locations. The soil in the barrel warms up quickly in the spring and when placed against the south side of a building the plants have the most favorable conditions for ripening their fruit. The barrel should have plenty of holes in it for drainage. Several barrels so treated will furnish quite a supply of tomatoes.

TOMATOES; SPRAYING.

For three years we have experimented in the use of Bordeaux mixture and for two years in the use of potassium sulphide as a preventive of rot in tomatoes. These experiments were made a matter of special consideration in 1895, but the results obtained here at any time have not been such as to warrant the use of either of these fungicides in a commercial way. Judging from these results it would seem as if we must still be satisfied with avoiding loss from tomato rot by selecting varieties that are resistant to it and by using land which has not grown tomatoes for at least several years. It would seem that the oft recommended practice of gathering and burying deeply all diseased tomatoes was a good one, and yet so far as we know there is no recorded observation that proves this to be a fact. The common practice of leaving them to rot on the ground is undoubtedly a means of spreading the disease. The practice too, of feeding the rotten fruit to animals is not safe if the manure is to be used on tomatoes as it is very probable that the spores of the disease will pass through the intestines of the animals without serious injury and may thus be carried to, and infect new land by the manure.

In the experiments made at University Farm, Bordeaux mixture was made of 5 pounds lime, 5 pounds sulphate of copper (blue vitriol) and 50 gallons of water. The potassium sulphide (liver of sulphur) was used at the rate of one ounce to two gallons of water.

The application of these fungicides was begun as soon as the first flowers opened, and was persistently used with the object in view of keeping the flowers and young fruit protected at all times from infection and much careful work was done to accomplish this result. It should be borne in mind that the tomato is probably infected while yet in the flower and to do any good the fungicides must be employed previously as pre-

ventives, as the flowers are small, often bend downwards and are protected by foliage and stems, it is very difficult to reach them with a spray. Besides as the flowers continue to open in succession all the season they require to be sprayed frequently, and after part of the fruit ripens this cannot be done without getting some of the fungicide on the ripe fruit which is very objectionable. These are some of the difficulties in the way of spraying the flowers thoroughly and successfully.

SUMMARY.

(1.) Varieties of tomatoes vary much in their susceptibility to the rotting of the fruit.

(2.) Spraying the tomato vines with Bordeaux mixture or a solution of potassium sulphide has not proven a satisfactory preventive of the tomato rot.

(3.) The following varieties seem best adapted for general planting in favorable locations in this State for commercial purposes: Acme, Dwarf Champion and Beauty.

(4.) For sections where the seasons are short and very early sorts are needed the following are recommended: Early Ruby, Maule's Earliest, and Earliest of All.

(5.) The best varieties of very early tomatoes are, as a rule, inferior in quality to the best varieties ripening later in the season.

SMALL FRUITS; VARIETY TESTS.

SAMUEL B. GREEN.

The yield of small fruits in Minnesota in 1895 was much less than usual. This difference is to be ascribed chiefly to the injuries which the plants sustained during the very dry season of 1894. This is also the case with perennial plants here generally, and it will be noticed that even the growth of our hardiest trees was less in 1895 than in 1894 undoubtedly on account of injuries they received in 1894. Blackcap raspberries seemed to be less injured than other kinds at University Farm and produced a good crop in 1895. The Lucretia dewberry also did well. Of the older varieties of raspberries, those that are still especially popular and generally doing well in the State are: Nemeha, Gregg, Souhegan and Older of the blackcap class and Turner, Marlboro and Cuthbert of the red sorts propagating by suckers; Schaffer's Colossal is also doing well.

The strawberry crop was quite seriously injured at University Farm by a hail storm that occured when the crop was beginning to ripen, which together with the weakened condition of the plants due to the drouth of the previous year made the crop a very light one. However, a few varieties of strawberbies have done fairly well, and the plants bearing a second or third crop in old beds have done far better than the same kinds in new beds bearing their first crops. The varieties that have done best are: Haverland, Warfield, Crescent and Beder Wood. Timbrell produced better than any other sort in the new beds. It is late in the season, but does not color up well.

The new varieties of small fruit bearing a crop in 1895 at University Farm that are especially worthy of notice are as follows:

Royal Church.—This new red raspberry is a little soft for shipping, but it is apparently well adapted for the home garden and near market. The bushes are large, healthy, vigorous and productive of bright red berries of excellent flavor. The season is long. The first fruit was picked July 3rd and was produced abundantly until July 25th. Thus far it has been remarkably healthy.

Kenyon's Seedling.—Has been very productive of good red fruit for several years, but has finally succumbed to the disease known as cane rust and leaf curl.

King.—A red raspberry received from Thompson's Sons, Rio Vista, Va., in 1894, it is a vigorous, healthy plant producing a good crop of large bright red, rather firm berries; season a little earlier than the Cuthbert, very promising.

Columbian.—Is a raspberry of the Schaffer type. A very strong grower and very productive. Fruit dark red, very closely resembling the Schaffer. We have fruited it two years and it shows itself to be well worthy of trial by berry growers. It is especially recommended for canning purposes and when thus preserved has a flavor of rare excellence.

Lucretia Dewberry.—For six years we have grown various kinds of dewberries at University Farm without getting a satisfactory crop, while growers of this fruit on sandy land near by have reported good results. With us the plants have flowered well, but have failed to set perfect fruit. In 1895, for the first time, we got a heavy crop of Lucretia dewberries. The fruit was large and was produced in large clusters. It commenced to ripen July 12th, and continued to produce fruit over two weeks.

Logan Berry.—This is a novelty among fruits, and is represented to be a hybrid between the dewberry of the pacific coast and some raspberry. In habit of growth and methods adapted to propagating it, it resembles the dewberry since it reclines on the ground and is increased by layers about as easily as the dewberry. But the leaves are closer together and both leaves and stem are larger than those of the common

dewberry. The fruit resembles the blackberry in having the fruit solid i. e. the core (receptacle) is attached firmly to the fruit. The fruit is of a red color, rather lacking in flavor but not unpleasant. The plants have been grown two seasons at University Farm and came through the winter of 1894-95 without injury, although covered with earth as it is customary

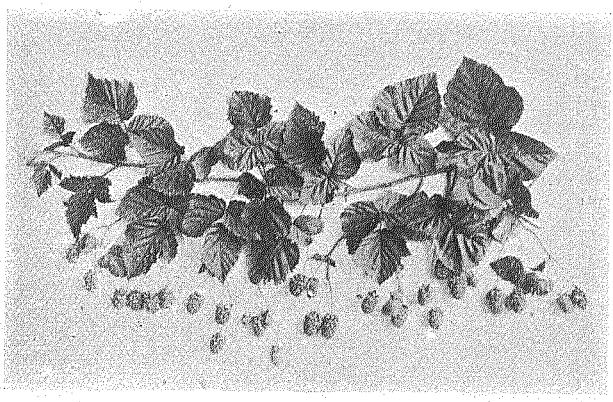

Fig. 72.—Logan Berry Foilage and Fruit.

with us to treat all our raspberries. It has so far been only moderately productive and while worthy of trial in a small way is not anything especially promising. We regard it with very much interest as a curiosity and as a possible forerunner of something good in new fruits. On this account we have raised about three hundred seedlings from it. The figure of it herewith shows the vine and fruit as grown here.

DISEASES AND INSECTS AFFECTING SMALL FRUITS.

During the last five years the disease known as "leaf curl" has seriously affected almost every variety of red raspberry on the grounds of the University Farm. Almost nothing is as yet known of the life history of this disease, although its ravages are very wide spread over this country. It is, however, well known that the land once infected with it retains the infection for several years. Of the older sorts of the red raspberry, the Turner seems to have the power to resist the disease better than any other grown on the University Farm. The new variety,

known as Royal Church, also has shown very desirable resistant qualities in this respect. This disease has not affected the blackcap varieties so far as observed. Anthracnose or cane rust, of the raspberry, injures to some extent almost every variety belonging to the blackcap class as well as many red kinds. It has, however, been very successfully held in check at the University Farm, by spraying the canes with Bordeaux

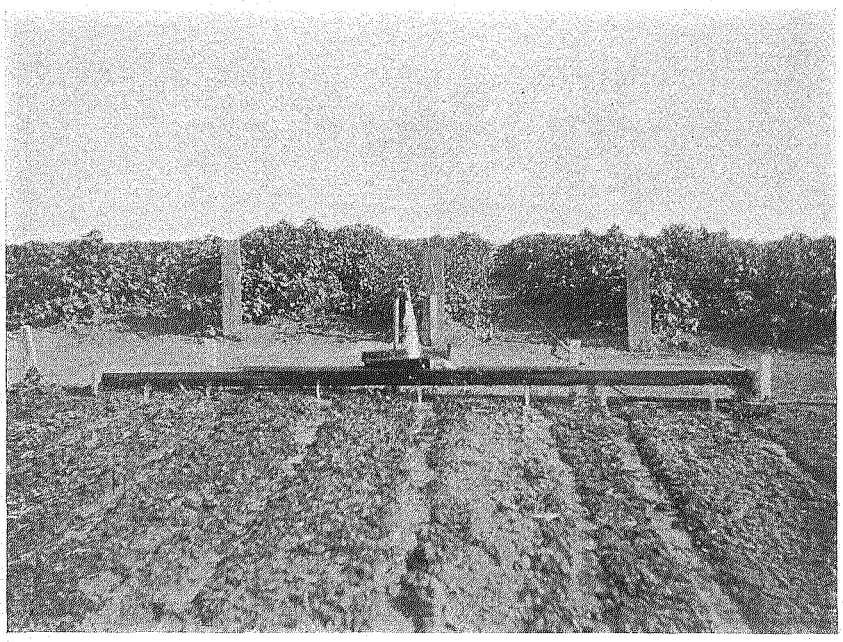

Fig. 73.—Irrigating Strawberry Plants.

mixture. But the injury from this disease has not been nearly as serious a matter as that from "leaf curl," and blackcap raspberries have consequently come to be regarded as more reliable than the red sorts. A detailed report of our successful treatment of this disease was given last year in Bulletin No. 39 of this Station.

There has been very little injury done to small fruits by insect pests the past year.

IRRIGATION.

The garden at the University Farm has recently been equipped so that about three acres of it can be irrigated. Provision was made in 1895 for experiments in sub-irrigation as compared with surface watering, but the well distributed rains furnished sufficient water for growing crops so that there was little advantage gained from that artificially applied. But we found it very convenient to have water near at hand when transplanting and when renewing our old strawberry bed. In the case of the old strawberry bed, each row was watered as soon as cultivated after burning and this was a great help in giving the plants a vigorous start. The illustration, herewith shows the method followed in watering. Iron pipes bring the water to the land and it is then distributed by means of "V" shaped wooden troughs which are shown in the illustration with holes so arranged that they supply several rows with water at one time which is often a great advantage in irrigating. In this case the water is pumped into an elevated reservoir which connects with the system of pipes in the garden.

SPRAY PUMPS.

The demand for good spraying apparatus has generally been well met by manufacturers and there is now on the market a great variety of pumps, tanks and nozzles from among which it would seem that almost any one could find an outfit suited to his needs. In selecting spraying apparatus we have found no trouble in getting a knapsack spray pump adapted to our wants, but we needed a more powerful pump, such a one as

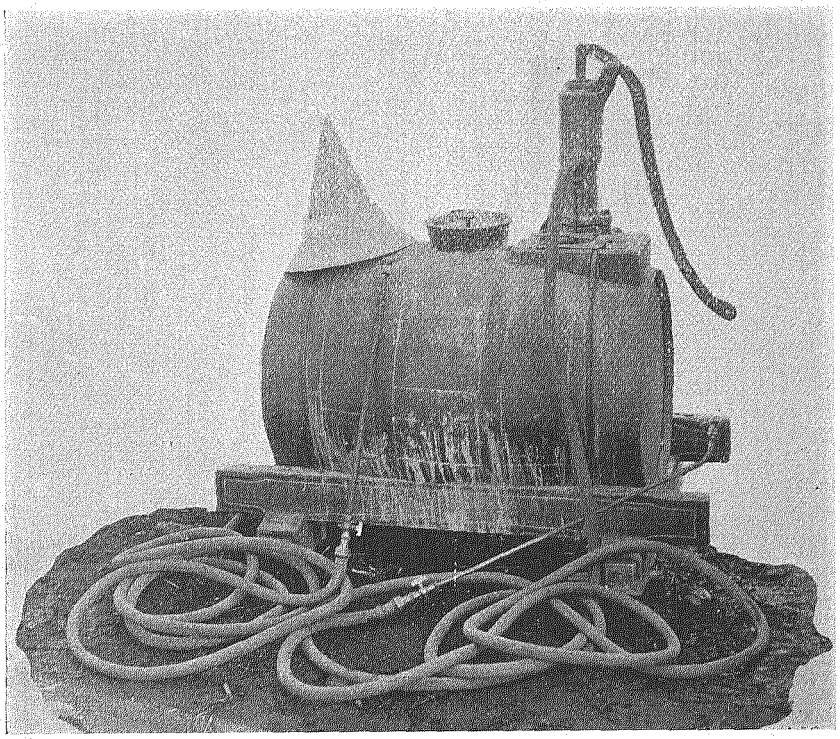

Fig. 74.—Barrel Spray Pump.

could be used successfully in spraying plum, apple and ornamental trees in a small way. Such a device is shown in figure 7, and is described as follows: The essential parts are a good hardwood barrel, such as a linseed oil barrel mounted on and securely fastened to a light framework of oak. On the barrel and at one end is mounted a powerful force

pump with attachments capable of throwing one or two fine strong sprays at one time. The liquid in the barrel is kept agitated by a small stream of water passing through a one-fourth inch pipe with a one-sixteenth inch wide opening to the feed pipe of the pump in the bottom of the barrel. This plan is desirable in many cases.

The lower end of the feed pipe is covered with a fine copper screen. In the center of the top of the barrel is an opening, eight inches in diameter with a tight fitting cover. This is so large that the barrel may be easily cleaned. The whole expense of making this machine was as follows: One linseed oil barrel, $1; pump $6.50; 50 feet of ½ inch hose, $3; strainer $1.50; 2 nozzles, $1.25; bolts, etc., 50 cents. Total cost not including labor of above $13.75. This is much cheaper than any similar good spraying machine which is offered by manufacturers.

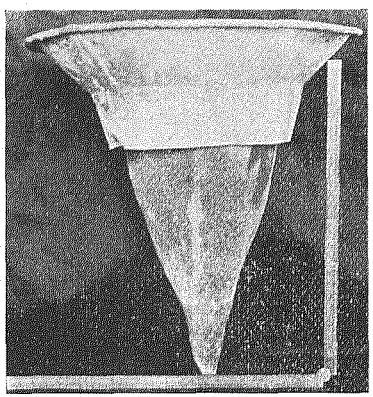

Fig. 75.—Improved Strainer for Bordeaux Mixture.

We claim for it the following advantages: It is a powerful machine and well adapted for the purposes of the heavier work required for spraying trees for protection against insects and fungus diseases. It is sufficiently powerful for spraying willow or other windbreaks or hedges infected with the larva of the saw-fly, and trees of similar size. It is easily carried about by one horse either on a stone-boat or in a wagon, which is a great convenience. The machine is simple in construction and is easily made by any good mechanic.

The Strainer.—Figure 75 plainly illustrates the form of strainer which we have hit on as being most desirable for straining Bordeaux mixture and similar materials. It is made of copper wire gauze with 20 spaces to the inch soldered together and to a rim of galvanized iron. It has the merit of not clogging as quickly as the ordinary flat strainers since all the sediment collects in the lower end leaving the sides always free for the liquid to pass through. This is a very important matter for those using Bordeaux mixture which must be strained and is often very troublesome about clogging the common flat strainer. We heartily commend this idea in a strainer as being very practical. The credit of adapting this form of a strainer to this purpose is entirely due to Mr. R. S. Mackintosh of the Division of Horticulture.