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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Special Agent in Charge.

REPORT OF
THE ALASKA AGRICULTURAL
EXPERIMENT STATIONS.
1914.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

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**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA,
RAMPART, FAIRBANKS, AND KODIAK.**

[Under the supervision of A. C. TRUE, Director of the Office of Experiment Stations, United States Department of Agriculture.]

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LETTER OF TRANSMITTAL.

ALASKA AGRICULTURAL EXPERIMENT STATIONS,
SITKA, ALASKA, *February 3, 1915.*

SIR: I have the honor to submit herewith a report on the work of the Alaska Agricultural Experiment Stations, 1914.

Very respectfully,

C. C. GEORGESON,
Special Agent in Charge.

Dr. A. C. TRUE,
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Publication recommended.

A. C. TRUE, *Director.*

Publication authorized.

D. F. HOUSTON,
Secretary of Agriculture.

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REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS, 1914.

SUMMARY OF WORK AT THE STATIONS.

By C. C. GEORGESON, *Special Agent in Charge.*

CLIMATIC CONDITIONS.

Successful farming in Alaska depends, in a very large measure, on favorable weather conditions. In these northerly latitudes the weather plays a much more important rôle in the life of the farmer than it does in the States. The season is short at best, and when it is still further shortened by early fall frosts, or what is equally disastrous, by much cloudy and wet weather during the season when crops should mature, the results are naturally unsatisfactory. This was the case the past season. While the early spring was comparatively dry, with more than the normal number of clear days, it was not really warm enough to stimulate vegetation to much growth, and later on in the summer when there should have been bright sunshiny weather, the skies were overcast and in addition to lack of sunshine there was too much rain for the best results in farming. This held true for all parts of Alaska. Complaints were received from nearly every settlement in the coast region that the summer was so wet that only a few varieties of vegetables did well. These conditions are equally true for the interior stations.

At Rampart Station the spring and early summer, particularly the month of June, were so dry that crops of all kinds, especially grains, became stunted. Instead of making a vigorous growth from the start, as they normally should, they were at a standstill for three weeks during the latter part of June, and when rains finally did come, they were so far in excess of the needs that the grain crops continued to grow and remain green from two to four weeks beyond the date when they should have ripened. Many varieties that in normal seasons would ripen in the latter part of July, did not ripen until the latter part of August, those that normally should ripen by the middle of August did not ripen until the beginning of September, and some few late varieties did not ripen at all.

At Fairbanks Station, and, of course, throughout the Tanana Valley, the conditions were the same. The early summer drought was not so marked there as it was at Rampart, but the overcast skies

and the rainy weather continued through July and August with the inevitable result that all crops matured very late and some did not mature at all. It was the most unfavorable season for farming that Alaska has had during the writer's experience.

At the Kodiak Station, these conditions were not so disastrous for the reason that no cereals are grown except for hay and silage and the rains stimulated their growth. The spring months of March and April were dry and windy and the volcanic ash was blown from the tops and sides of the hills in unending clouds, which settled on the lower lands, adding to the already deep layer of ash. The chief drawback to the work at that station was the interference of the wet weather with the haying, but owing to the purchase of modern machinery which can handle the hay rapidly, a sufficient amount was saved for the need of the herd.

Vegetables everywhere suffered for the lack of sunshine. Cabbage did not head up properly; potatoes were small and inferior as a general rule. Only those vegetables whose chief values consist in their leaves and tops did not suffer. Lettuce grew enormous heads and was crisp and tender. Peas reached double their normal height and yielded large crops. Flower gardens all over the Territory suffered from these adverse weather conditions, and only the hardier varieties made a normal showing.

SITKA STATION.

It goes without saying that at the Sitka Station, which is representative of the whole coast region, the wet summer was a great drawback to the work in hand. The soil is naturally peaty and wet, with poor drainage, and the almost continuous rain was a great handicap in subduing weeds as well as in all forms of cultivation. The moist atmosphere stimulated fungus diseases peculiar to this region. Berry crops of all kinds suffered greatly and particularly the experimental work with strawberries. Cherry blossoms and apple blossoms, though produced in profusion, failed to set the normal crop of fruit, and much of the fruit that was set fell off before it reached normal development.

Nevertheless, it is a pleasure to report that the work did not meet with complete failure. The projects outlined in former reports were followed, and some new ones were inaugurated. Among the latter are botanical investigations which have been begun by J. P. Anderson. They will be confined chiefly to the study of the native flora, with special reference to its economic value and also with special reference to the plant diseases, some of which are spreading and must be kept in check by preventive measures. One of the chief lines of work is plant breeding. It is clear that it will be necessary to create

new varieties, particularly among the fruits and berries, in order to meet the climatic conditions.

Repeated introductions of fruit trees and berry plants from the more salubrious climate of the States have proved that one can not expect to find plants that will become important additions to those now under culture. Experiments have repeatedly proven that hardiness and earliness can not be bred into cultivated crops by mere selection, at least during the span of the average active life of man. It is true, that in some few instances, varieties have been obtained from other sections of the earth, which promise to be adapted to certain sections of Alaska, as, for instance, species and varieties of Siberian alfalfa; also certain varieties of Siberian grains, the latest introduction of which is a spring wheat which matured at Rampart, even during the past unfavorable season. It, nevertheless, holds true that it will devolve upon the Alaska experiment stations to create varieties of all sorts of economic plants which will be better adapted to the climate and environment found here. This fact furnishes the motive for plant breeding work.

At the Sitka Station, experiments are under way in (1) strawberry breeding and testing; (2) breeding and testing of small fruits, currants, gooseberries, and raspberries; (3) breeding and culture testing of blueberries and cranberries; and (4) breeding and testing of tree fruits, mainly apples.

STRAWBERRIES.

Referring briefly to these lines of work in the order named, it is a pleasure to report that the hybridizing of strawberries has been continued with success. About 150 numbers were added to the already long list of fruiting seedling plants the past season, while about an equal number were discarded from culture. A few which excelled in size, quality, and productivity were retained and propagated for further testing. The fruits illustrated in Plate I, figures 1 and 2, show a feature of much importance in strawberry breeding. No. 1503 has four normal berries and to the left of it a barren branch on which the berries were entirely abortive. This variety produces but little pollen. The branch that has no fruit was covered to ascertain if the berries would develop under self-fertilization. Results proved that it must be fertilized with pollen from other varieties. The four normal berries were fertilized by hand and used as a check. In figure 2 are shown berries from another hybrid plant, No. 320, this being one of the first good plants produced at the station. The branch on the left was covered to compel self-fertilization. The plant is staminate and normally produces much pollen. It will be noted that the berries are very small as a result of selfing. The branch on the right was fertilized by hand from hybrid No. 94, and the

berries are noticeably larger than those on the left branch. The squares represent 1 inch.

It is further of interest that the plants Nos. 320 and 1503 are now 6 and 5 years old, respectively, and still the old plants continue vigorous, with large crowns. The original plant, No. 1503, produced 238 berries the past season and another plant of the same age, No. 1537, produced 280 berries; still another plant, 6 years old, produced 285 berries, but many of them were small and inferior. It is apparent that for the best success with these hybrids they must be planted near other varieties which can fertilize them.

It has been pointed out in a former report that these hybrid plants must be given plenty of room and cultivated in hills. In matted rows they do not reach their best results. The foliage is so abundant and so vigorous that but very few of the berries are ever exposed to the sun. On the hill system of culture, the clusters lie in a wreath about the plant, exposed to the full effect of the air and the sun. Moreover, in this wet climate, the berries are practically never dry when shaded by the leaves, and therefore they become soft, are poor shippers, and decay quickly.

Many crosses have been made between these hybrids and the work will be continued with hybrid seedlings, selecting the best and discarding all that are not equal to the best already produced.

BREEDING AND TESTING OF SMALL FRUITS.

CURRENTS.

Currants and raspberries are at home in Alaska. Both fruits grow wild nearly all over the Territory south of the Arctic Circle. Most of the cultivated varieties, both of currants and raspberries, that have been tested at this station have done well. This is particularly true of the currants. The bushes are vigorous and productive, as a rule. The native species of the red currant is more or less abundant in the coast range where the bushes attain large size. North of the coast range in the Yukon and Tanana Valleys the same species is still relatively abundant, but the bushes, as a rule, are small and the branches often trailing. The berries appear to be alike in both sections, however. On some bushes, particularly in the mountains, a large number of berries are pear-shaped, the same bush producing round berries also. These wild berries mature early, are of a darker red color and decidedly more acid than any of the cultivated sort, but they have not done as well under cultivation as they apparently do in their native haunts. They are attacked by a leaf spot early in the season, which apparently weakens the growth, and this is the case when cultivated varieties grown alongside are not attacked at all. Attempts have been made to cross this wild species with the cultivated varieties; with what result can not yet be stated.



FIG. 1.—HYBRID STRAWBERRY No. 1503, SITKA STATION. CLUSTER ON LEFT SELF-POLLINATED, THAT ON RIGHT HAND-POLLINATED.



FIG. 2.—HYBRID STRAWBERRY No. 320, SITKA STATION. CLUSTER ON LEFT SELF-POLLINATED, THAT ON RIGHT HAND-POLLINATED. (SQUARES = 1 INCH.)



FIG. 1.—LEE BLACK CURRANTS, SITKA STATION, 1914. (SQUARES=1 INCH.)



FIG. 2.—CHAMPION GOOSEBERRY, SITKA STATION, 1914. (SQUARES=1 INCH.)

There are three species of black currant indigenous to the coast region which are of value. They are *Ribes bracteosum*, which in favorite locations produces great bushes, 6 feet in height, and some seasons produces heavy crops of large black berries covered with a blue bloom. These berries are of superior value for jams and jellies and are much sought after by Alaskan housewives. Another species is the *R. laxiflorum*. It differs from the foregoing in that the racemes are very much longer, but most of the berries are abortive. The few berries that are produced differ but little from those of the preceding species. Another species which appears promising is *R. lacustre*. It is a thorny bush and appears to be more closely related to the gooseberry than it is to the currant, but, like the currant, it produces fruit in racemes. The berries are black and covered with stiff hairs, rather an objection to their use. This species is more particularly at home in the mountains along the coast. The writer has never seen it wild near the shore, where the two foregoing are found. It is grown at the station and is used in hybridization work. Under cultivation it suffers from attacks of a fungus, which covers the leaves with yellow spots early in the season, in a large measure destroying their ability to functionate. The plant fruits abundantly. Two other species are found in this region. They are *R. hudsonianum* and *R. prostratum*. Neither of them are of any economic value at all comparable with the foregoing.

Of the cultivated varieties at the station, Fay and Victoria have, on the whole, done the best, but other varieties which also do well are the Red Cross, Ruby Castle, and Wilder. Of the black varieties, Lee and Champion are the only named sorts which fruited last year. Plate II, figure 1, is a branch of Lee black currant, showing how profusely it fruits. The squares are inch squares.

The varieties Perfection, Cherry, London Red, North Star, Pomona, Prince Albert, and Versailles were secured by the station last spring as 1-year-old rooted cuttings, but they have borne no fruit. Four white varieties were also secured, namely, White Dutch, White Grape, White Imperial, and White Transparent. Boskoop Giant is a black variety which was added to the collection.

GOOSEBERRIES.

So far as known to the writer, the only representative of the gooseberry indigenous to the Territory is *Ribes lacustre*, mentioned above, but all the cultivated sorts tried here have done fairly well. The growth is more vigorous, the bushes more productive, and the berries larger than they are in the States, at least in the Central West. Moreover, the plants do not suffer from mildew, as is the case throughout large sections of the United States.

The varieties grown at the station at the present time are Champion (see Pl. II, fig. 2), Whitesmith, Pale Red, Carrie, Columbus, Industry, Red Jacket (Josselyn), Smith Improved, and Triumph. These have been grown here for several years. Houghton, Pearl, Crown Bob, Keepsake, and Lancashire Lad were added to the collection this year. The plant breeding with this berry so far consisted in saving the best of berries from selected varieties and sowing the seed. Several hundred seedlings have been produced in this manner, none of which has fruited.

RASPBERRIES.

As above noted, the raspberry is indigenous to all parts of Alaska, even far north of the Arctic Circle. Most of the cultivated varieties which have been introduced at this station have done fairly well, but the best of them all is the old Cuthbert, which may be regarded as a standard. It grows more vigorously and yields more and larger fruit here than it does in the Mississippi Valley. The Cuthbert being so far ahead of others, it has been decided to discard the Champion, Fuller, Turner, and Superlative, while two other sorts, King and Orange, will be retained for further trial. The native salmonberry (*Rubus spectabilis*) has been crossed on the Cuthbert raspberry. The results have been stated in former reports. There are still a number of these hybrid plants in the test rows. Their chief characteristic is that there are no two of them alike. They differ in vigor of growth, size, and shape of leaves, and also in their blossoms. Some of them resemble the raspberry and others resemble the salmonberry; but they are nearly all sterile. They have been under observation now for three years, and very few of them produce any fruit at all. The blossoms drop without setting fruit. Some few have produced berries, but they were not equal to either the salmonberry or the raspberry. Seed had been saved from some of these berries, and it is expected that the second generation of hybrids may show further variation and, perchance, be inclined to produce better fruit. During the season the native thimbleberry (*Rubus parviflorus*) was crossed with the raspberry and the seed has been planted.

BREEDING AND CULTURE TESTING OF BLUEBERRIES AND CRANBERRIES.

BLUEBERRIES.

A beginning has been made in blueberry culture. The station is indebted to F. V. Coville, of the Bureau of Plant Industry, for some hybrid plants of his breeding. Several of the native species have also been transplanted to the test grounds and some have been started from cuttings. This work has not yet progressed far enough to report results, but it is to be noted that there are at least two species indigenous to the coast region which give much promise of usefulness in plant-

breeding work. They are *Vaccinium ovalifolium* and *V. parviflorum*. The latter has red berries of fine quality for jams and jellies. It is planned to raise seedlings and to cross the several species and varieties with a view to testing the capacity of these berries for improvement.

CRANBERRIES.

The eastern cranberry (*Vaccinium macrocarpon*) is not indigenous to Alaska. Attempts have been made to grow it here in former years, but without success. The attempt has been repeated this year by securing vines of three varieties from O. G. Malde, of the Cranberry Experiment Station at Grand Rapids, Wis. They have not made a remarkably good start, but most of them have lived. A diminutive species (*V. vitis-idaea*) is indigenous to nearly all sections of Alaska. It grows alike (and apparently equally well) on the swamps in the coast region and on the drier lands of the interior. It is an evergreen, with small shiny oval leaves, and produces little round berries of a delicious flavor; it is very much prized by both settlers and natives. Another species which is comparatively rare, and, so far as known to the writer, is found only on the lowlands of the coast region, is *V. oxycoccus*. The plant is weak and trailing. It produces oblong berries, intermediate in size between the foregoing, or low-bush cranberry, and the cultivated eastern berry. Seed from these two species has been collected and planted, and attempts will be made to cross them with cultivated varieties if the latter produce blossoms.

It appears to the writer that there is a broad field for the plant breeder in improving these native species. The great point in their favor is that they thrive in this climate.

ORCHARD FRUITS.

APPLES.

Some years ago, 40 varieties of apples were planted in the little test orchard maintained at the Sitka Station. Year by year one variety after another has either died or been discarded for lack of thriftiness. Those which are now left that give any promise of usefulness are the Yellow Transparent, Raspberry, Hyslop, Sylvan Sweet, and Whitney, and an English variety, the Keswick Codlin, is represented by two trees, which may yet prove to be valuable. The Yellow Transparent and Raspberry produced fruit last season. The apples were small as compared with the normal size of these varieties, but they were of very good flavor. Hyslop, Sylvan Sweet, and Whitney have produced fruit in former years. The Keswick Codlin set fruit the past season and the apples grew to good size, but they were stolen before they were ripe.

It has often been mentioned in these reports that the native crab apple (*Pyrus rivularis*) is indigenous to the coast region, and it is the

writer's judgment that if the apple is ever successful in any part of Alaska this will result from a cross containing a strain of this native crab apple. Efforts have been made to cross this native species with pollen from hardy cultivated varieties. The work has, in large measure been unsuccessful, but some seedlings have been secured from these crosses which may have possible value. At first the pollen was imported from the States. This did not prove to be a success, as the pollen grains had lost most of their vitality on their arrival. Now reciprocal crosses are made with the foregoing named varieties, which bloom in the test orchard, but the majority of the apples drop before they are fully developed and therefore but little seed is produced. Some seed was, however, secured the past season and the work will be continued until results are obtained.

CHERRIES.

The varieties grown at the station are Early Richmond, English Morello, Dyehouse, and Ostheim. The trees have been in the orchard for 10 years and they are stunted compared with trees of the same age and varieties grown in the States, but they continue to make moderate growth and all bloom profusely every spring. For some reason, however, possibly for lack of insects to aid in fertilization, 90 per cent of the blossoms drop off without setting fruit. A few cherries of all these varieties were, however, produced the past season, but the wet summer caused them to crack badly when they reached maturity. No attempts have been made at hybridization. The sweet cherries which do so well in Washington, Oregon, and California, have not been tried at the station, but trees are found in a private garden at Sitka, where they make a moderate growth and produce an abundance of bloom every year, but they set very little fruit and the fruit that is set never reaches maturity.

PLUMS.

Many supposedly hardy varieties of plums have been grown during the past few years, but not one of them has produced a bloom. The station has a number of these plum trees, many of them Prof. Hansen's hybrids, but they are not doing well. A further effort will be made to introduce other varieties, particularly varieties which have sprung from Northern European species. If these should prove to be failures, plum culture will be abandoned.

NURSERY STOCK.

The station maintains a small nursery for the purpose of propagating such varieties of fruit trees as give some promise of success. The trees thus produced are distributed to settlers who request them,

and sent to all parts of Alaska for further test. So far nothing has been found that can be called successful anywhere beyond a small section of southeastern Alaska. The region about Haines and northward to the boundary of British Columbia is the most promising fruit belt so far discovered. Many apple trees were distributed among settlers in this region in the spring of 1914. It is, of course, too early to pass judgment on their success. Some reports from the planters of these trees will be found under "Letters from settlers."

During the spring of 1914 the following stock was mailed to planters in Alaska who requested them: Apple trees 315, currants 178, gooseberries 238, raspberries 575, strawberries 1,250, rugosa roses 98, basket willows 124; also some rhubarb, horse-radish, and mint.

The following stock is available for distribution in the spring of 1915: Apple trees 800, currants 1,000, basket willows 3,200, gooseberries 500, rhubarb 350, raspberries 2,500, horse-radish 1,000, mint 200, strawberry plants, and a few ornamentals.

VEGETABLE TESTING.¹

POTATOES.

The potato work at the station is limited to the testing of varieties for the purpose of finding those best suited to the climate. In the latter part of August or the beginning of September of each year, a few pounds of tubers of new varieties are sent to the experiment station at Rampart where they are wintered and planted the following spring for the production of a stock to be further tested there and at Fairbanks.

The potatoes did not yield so well as in more favorable seasons. The highest yield was made by Knowles Big Cropper, with an average of 4½ pounds per hill; or, with hills 2 by 3 feet, at the rate of 565 bushels per acre. Seventy-five varieties were grown. Those proving most desirable because of a combination of good characteristics are Burpee Superior, Extra Early Ohio No. 1, Knowles Big Cropper, White Beauty, Green Mountain, Rural New Yorker No. 2, Early John, Gold Coin, Irish Cobbler, Snowball, State of Maine, Rust Proof, Norway No. 1, and Clark Alaska.

The following gave yields of more than 2½ pounds of tubers per hill, but on account of form, color, or quality are not considered so desirable: Noroton, Extra Early Pioneer, Dakota Red, Junior Pride, and Keeper. There were found to be two distinct varieties labeled Early Six Weeks. One of these is a very desirable white variety grown at the station for many years. The other is a pink variety obtained later and which this season yielded less than one-third as much as the white variety. The descriptions of the Early Six Weeks give the

¹ Based on notes by J. P. Anderson.

color as pink. Additional varieties which have been grown at the station for two or more years are as follows: Bliss Triumph, California Golden Russet, Columbus, Early Beauty of Hebron, Early Fortune, Early Ohio, Epicure, Extra Early, Great Divide, Hamilton Early Rose, LaFollette, Mammoth Pearl, Norcross, Noroton Beauty, Peach Blow, Piqua Chief, Pride of France, Pure Early Rose, Red River White Ohio, Roosevelt, Russian, Thorburn, Uncle Sam, White Harvest, and White Ohio.

Among the 30 varieties tried at the station for the first time the following seem promising: Admiral Dewey, Burpee Extra Early, Good Times, New Queen, Rose of the North, Scotch Rural, and White Star. Other varieties were as follows: Beauty of Hebron, Bovee, Clyde, Early Puritan, Early Thoroughbred, Early White Albino, Extra Early Sensation, Extra Early Wabounsie, First Early, Freeman, Happy Medium, Livingston, May King, New Snow, Northern King, Old's Prolific, Pride of the South or White Bliss, Red River Acme, Rusty Coat, Sir Walter Raleigh, Snowflake Jr., Spaulding No. 4 Rose, and Uncle Gideon's Quick Lunch.

CABBAGE.

The station conducted tests of a number of varieties of cabbage and allied plants as follows: Cabbage 24, cauliflower 6, broccoli 3, Brussels sprouts 7, collards 2, kale 3, kohlrabi 2, besides marrow cabbage and Chinese cabbage. All of these were planted in flats March 26, transferred to other flats April 20 and 21, and planted in the field May 12 and 13. They were planted in rich garden soil 2 by 2½ feet apart.

Among the cabbage Jersey Wakefield again proved its superiority. Other good kinds were Charlestown Wakefield, Copenhagen Market, Early Winningstadt, and First Early or Eureka. Early Baseball headed well, but the heads were small. Early Spring, Einkhuitzen Glory, Extra Early Express, Stein Improved, American Flat Dutch, and Market Gardener's Private Stock Flat Dutch proved fairly satisfactory. Early York and Large Early York produce heads which do not become solid. Danish Ballhead is too late, as but few heads mature before November. Four strains of this type were grown, some of the seed coming direct from Denmark, but all were quite similar. Another objection to it is the long stem. Fottler Brunswick, Large Late Drumhead, and Large Late Flat did fairly well. Early Stonehead was wholly unsatisfactory.

Two varieties of red cabbage were grown: Danish Round Red and Dark Red Large Stonehead. These headed well. Heads were small but very solid.

Early Ulm and Early Vienna Savoy cabbages were equally good. They headed well. Heads small to medium and solid. Perfection

Late Drumhead Savoy produced large heads, but less than one-half the plants headed.

Pe-tsai, or Chinese cabbage, is a distinct species from the ordinary cabbage. Seeds from three different lots were sown, but all ran to seed without forming even the semblance of a head.

Marrow cabbage is a hybrid of the cabbage group in which the enlarged stalk is the part used. It is grown mainly for stock feed. It attained a height of from 2 to 3 feet.

CAULIFLOWER.

The cauliflower is more at home in southeastern Alaska than any of the cabbage family. All kinds did well. Many plants made marketable heads, although the roots were almost entirely eaten by maggots. Almost every plant made a head and some plants developed heads from side shoots after the main head had been removed. Cauliflower comes on early, before the cabbage is ready. Burpee Best Early had a slight advantage in earliness, while Extra Early Paris was somewhat later than the others and Early Snowball was rather the best. Early Dwarf Erfurt and Early London were other varieties grown. Stockholm Torg, introduced by the Office of Seed and Plant Introduction, United States Department of Agriculture, was planted a month later than the others. As grown this year, it proved to be a small cauliflower.

BROCCOLI.

Broccoli resembles cauliflower, and by most persons would be mistaken for that vegetable. It is coarser and lacks the delicate flavor of the cauliflower and did not head so well. Early White and Mammoth White proved similar and headed quite well, but Early Purple all ran to seed without forming a single good head.

BRUSSELS SPROUTS.

These all did quite well. The varieties grown were: Danish Prize, Dakkeith, Dwarf German, Hercules, Improved Half Dwarf, Long Island Improved, and an unnamed sort from the United States Department of Agriculture.

COLLARD.

Two varieties of this vegetable were grown, the Georgia and the North Carolina Blue Stem. They proved to be not adapted to Alaska conditions, but ran to seed at once.

KALE.

Dwarf Curled Scotch and Tall Green Scotch made excellent growth and are looking fine. This vegetable is hardy, and remains out all

winter. Thousand-Headed kale is quite different from the others, and is grown as a forage plant. It also made a good growth.

KOHL-RABI.

Early Purple Vienna made but few good heads. Most of the plants ran to seed with only a slight enlargement of the stem. Early White Vienna did much better.

PEAS.

All peas did remarkably well, growing to nearly twice the height given for the varieties in the seed catalogues. They were also remarkably productive, all kinds continuing to bear until weakened by fungi and killed by the frost. The later varieties matured but few of the pods which set. There were 13 varieties on trial. They are here given in order of maturity. The first four matured almost at the same time: Thorburn Extra Early Market, Burpee Best Extra Early, Alaska, Dwarf Gray Sugar, Gradus, Senator, Improved Strata-gem, Duke of Albany, Hosford Market Garden, Dwarf Blue Imperial, Telephone, Dwarf Champion, and Carter Daisy. Arranged according to size of pod and pea, beginning with the largest: Duke of Albany, Gradus, Carter Daisy, Telephone, Dwarf Champion, Improved Strata-gem, Senator, Hosford Market Garden, Alaska, Dwarf Gray Sugar, Burpee Best Extra Early, Thorburn Extra Early Market, and Dwarf Blue Imperial. The small early varieties produced the most peas, but the large, wrinkled varieties are so superior in quality that they will not be discarded. The three varieties that proved most satisfactory are Alaska, Gradus, and Duke of Albany. The Dwarf Gray Sugar is an edible podded sort.

BEANS.

Garden beans were a failure, as usual. Lima beans did not even germinate. The English broad bean, represented by the variety Broad Windsor, did remarkably well, some plants growing 6 feet high and carrying a large number of pods. They matured well for use as shelled beans, but did not ripen. This bean is entirely different from the common garden bean, belonging to a different genus.

TURNIPS.

Ten varieties of turnips were grown. Common varieties, represented by Early White Flat Dutch, Purple Top White Globe, and Purple Top Strap Leaf, showed much injury by maggots. Imported varieties, represented by Bortfelder (S. P. I. No. 33682), Ostersundom (S. P. I. No. 33684), Petrowski, Purple Top Finland, Red Finland, Yellow Finland, and White Green Top Finland, were injured but little. The varieties Ostersundom and Bortfelder were long and

parsnip-shaped, the former being somewhat shorter and lighter in color than the latter. Fresh Alaska-grown seed of Petrowski produced somewhat larger roots than old seed that had been imported directly from Finland (S. P. I. No. 22755).

The trial rows of turnips extended across a rather sterile spot of ground. On the richer soil they grew luxuriantly, but on the poor soil the tops were very small. There was less difference in size of roots than of tops.

RUTABAGAS.

The rutabagas were badly damaged by root maggots. No variety seemed immune. Six varieties were grown. Purple Top White Globe grew to be the largest. Other varieties grown were Bangholm (S. P. I. No. 33687), Purple Top Yellow Globe, Yellow Perfection, and Yellow Swedish (S. P. I. No. 33686). All varieties tended to be globe-shaped, the Bangholm being the longest.

BEETS.

The garden beets, mangels, and Swiss chard were almost a failure. They grew very slowly. As an example of their behavior, the large-growing mangels on reaching a diameter of from 1 to 3 inches began to throw up seed stalks.

RADISHES.

Nine varieties of radishes were grown. The early varieties, planted April 25, were more satisfactory than later ones. Summer varieties, represented by Chartier and White Strassburg, were only moderately satisfactory, while all the early varieties did very well indeed. Burpee Hailstone was the earliest. This is a white, turnip-shaped variety, with an exceedingly small top and a slight pungency. The best variety was the Icicle. This is a long, white sort, early, tender, and good. It grows to quite large size before becoming strong or pithy. Well-known varieties grown were French Breakfast, Early Scarlet Turnip, White Tip, and Crimson Giant Globe. These were all quite satisfactory. Burpee Surprise proved to be a hardy, russeted, olive-shaped variety of rather sweet flavor and growing to a large size. It may become tough, but never strong. Sakurajima radish was a failure. What the maggots did not take soon ran to seed.

CARROTS.

Carrots were planted on April 25, on rather poor soil composed mostly of volcanic material. They did well. Danvers Half Long was the best. Chantenay was fine but not so large as Danvers. Oxheart grew to be the largest, but many of them burst. Short Scarlet proved to be a small round variety.

PARSNIPS.

Parsnips did only moderately well. Guernsey, Hollow Crown, and Offham Market were grown. The Hollow Crown proved slightly superior to the others.

SALSIFY.

The roots produced by this vegetable were rather small and fibrous. Black salsify or scorzonera did better and produced larger and smoother roots but not so large that its culture could be called a success.

ONIONS.

The Perennial Tree onion grows very successfully, but it is the only variety that can be considered successful.

An attempt to grow bottom sets resulted in the following percentages for the plants maturing sufficiently to be fit for sets: White Portugal or Silverskin, 15 per cent; Yellow Danvers, $3\frac{1}{2}$ per cent; and Red Wethersfield, $\frac{1}{2}$ per cent.

Onions started from seed in the spring failed to mature marketable bulbs but did reach a stage where they made excellent green onions for late summer and fall use. White Portugal or Silverskin was by all odds the best and the others followed in about the order named: Yellow Globe Danvers, Prizetaker, Silver King, Gigantic Gibraltar, Red Wethersfield, Australian Brown, Extra Early Red, Red Bermuda, and White Bermuda. The last four showed almost no enlargement at the base.

CHIVES.

These are members of the onion group. They are small, grow in tufts, and are of a mild onion flavor. They do well and are left out all winter, being perfectly hardy.

SALAD PLANTS AND POT HERBS.

LETTUCE.

Lettuce is very much at home in the climate of Alaska and most varieties do well. Giant Glacier seemed to die off soon after germination and hence was a failure. All the varieties grown were of the heading type. Arranged in the order of percentage of plants which made good heads the varieties grown were as follows: Iceberg, Dwarf White Heart Cos, Black-Seeded Tennis Ball, California Cream Butter, Hubbard Market, Big Boston, Deacon or San Francisco Market, and Butterhead. Iceberg was smaller and later than the other varieties but very crisp and tender. Every plant headed. The Black-Seeded Tennis Ball was the earliest and is a very desirable variety. All varieties were good.

CELERY.

The celery was planted in flats March 26, transferred to other flats early in May, and set in the field in June. All varieties made a fairly satisfactory growth but Dwarf Golden Heart, Giant Golden Heart, Kalamazoo, Perfection Heartwell, Fin de Siecle, and Winter Queen. All began to send up seed stalks when sufficient size was attained for blanching. White Plume proved to be the best. It was smaller than the other varieties but of fine quality and blanched easily, while only a few of the plants sent up flowering stems. Golden Self-Blanching and Rose-Ribbed Golden Self-Blanching were intermediate in behavior between White Plume and the other varieties.

CELERIAC.

Erfurt and Giant Prague were the sorts grown. They made fair-sized roots.

PARSLEY.

The parsley was planted, transferred, and set out in the field at the same time as the celery. It made satisfactory growth. Moss Curled and Extra Curled Dwarf proved to be quite similar. New Fern-Leaved proved quite distinct and a little more vigorous than the others. Turnip Rooted or Hamburg did not form very large roots but is of most excellent quality.

CRESS.

Upland cress, eured cress or peppergrass, made a good quick growth and remained in good condition for several weeks before throwing up seed stalks. Attempts to establish water cress along the water courses proved a failure.

CORN SALAD.

Corn salad, also known as fetticus, vetticost, and lamb's lettuce, proved very satisfactory indeed. The seed was sown in June, but this proved too early for fall, winter, and early spring use. This plant is an excellent substitute for lettuce when the latter is out of season. It is entirely hardy and may remain in the garden during the winter, requiring but little protection. Seed sown late in July or in August should give plants of proper size for fall, winter, or early spring use.

SPINACH.

Victoria was the only sort planted. It ran to seed early without making much foliage.

ENDIVE.

Giant Fringed and White Curled were the varieties on trial. The two were quite similar, the most noticeable difference being in color. Growth was quite good.

WITLOOF CHICORY.

This vegetable forms roots similar to a parsnip and these roots are forced in the winter. The roots attained an average diameter of about three-fourths of an inch. At the time this report is written the forcing has not progressed far enough to report results.

AROMATIC HERBS.

Anise and eoriander failed to make good.

Balm made a fair growth but did not reach the flowering stage.

Dill made good growth and blossomed freely but failed to set seed.

Hoarhound made a fairly good growth.

Lavender made a rather weak growth and failed to reach the blossom stage.

Mints, both peppermint and spearmint, did excellently.

Sage did moderately well.

Summer savory made a very good growth.

Sweet marjoram grew finely but did not reach the blooming period.

Thyme was quite satisfactory. The English broad leaved was the variety grown.

MISCELLANEOUS.

ASPARAGUS.

Seed of the Palmetto and Bonavalette Giant were sown. The plants made comparatively little growth.

HORSE-RADISH.

Horse-radish made a very fair growth at the station.

RHUBARB.

This vegetable did excellently, especially where fertilized. The largest stalk produced by a spring-set plant heavily manured was more than 2 feet long, $1\frac{3}{8}$ inches in diameter, while the leaf was 3 feet broad.

INSECT PESTS.

The only insect pests of any consequence were the root maggot of cruciferous plants. They were most destructive on cauliflower, but all the cabbage allies were more or less badly damaged. The rutabagas and varieties of turnips commonly grown in the States were much damaged, but the Petrowski and other turnips from Finland and Sweden suffered little. The Sakurajima radish was almost totally destroyed by them, but the common varieties showed few indications of the presence of maggots.

ORNAMENTALS.

It is the plan to test all the hardy ornamental shrubbery and herbaceous perennials which are likely to thrive in Alaska. It is deemed of importance that future settlers should be informed in regard to the shrubs and plants which they can employ to beautify their homes. The list that can be recommended up to the present time is limited, but it is expected that it will be added to from time to time. In this respect the testing at the Sitka Station will, of course, not apply anywhere except in southeastern Alaska. In the rest of the Territory the summers are either too cold, as in the westward coast region, or the winters are too severe for cultivated ornamentals to thrive.

SHRUBS.

The following shrubs and vines have proven to be adapted to southeastern Alaska conditions. Lowell cotoneaster, high-bush cranberry, Tartarian honeysuckle, honeysuckle, rhododendron, *Spiræa vanhoutii*, and *Viburnum tomentosum*. The Siberian pea tree is only a partial success, while Japanese quince and lilac have not done well. Some others were planted during the spring but it is too early to report on them.

Among the ornamentals which thrive none surpass the native elderberry (*Sambucus pubens*), commonly known as the red-berried elderberry. It thrives luxuriantly everywhere in the coast region, forming a stout forked bush with leaves of a rich green, trusses of white flowers in the latter part of May, followed by clusters of bright red berries in September. Plate III, figure 1, gives a close view of the top of one of the bushes and figure 2 shows the ornamental effect of a grove of these bushes in front of the station main building.

ROSES.

The rugosa and its hybrids are the only roses tried at the station that have proven satisfactory for outdoor culture. *Rosa rugosa* has been crossed with the wild rose (*R. nutkana*) of this section and with some pot roses in the hope of producing useful varieties.

BASKET WILLOWS.

Eight varieties of basket willows have been tried. All make very good growth.

PERENNIALS.

In addition to the list of hardy perennials given in the 1911 report the following have proven entirely satisfactory: *Campanula carpetica*, *Campanula medium* (Canterbury bells), English daisy (*Bellis perennis*), Shasta daisy (*Chrysanthemum* sp.), and African poppy (*Papaver* sp.).

ANNUALS.

The following annuals or perennials that blossom the first year from seed were found to do reasonably well last year: Antirrhinum (snapdragon); asters, Comet, Simple Branching, and Southeote Beauty; Calendula, in variety; candytuft (*Iberis*), Giant Hyacinth Flowered and mixed; *Centaurea cyanus* (cornflower), in variety; *Dimorphotheca aurantiaca* (African orange daisy); Esehsholtzia (California poppy), 3 varieties; Kenilworth ivy (*Linaria cymbalaria*); *Lobelia erinus*, Crystal Palae; Lobelia, Star of Isehl; French marigold; *Matthiola bicornis* (evening scented stock); mignonette, 3 varieties; dwarf nasturtium, 3 varieties; climbing nasturtium, 3 varieties; pansies, 5 different varieties and mixtures; phlox (*Phlox drummondii grandiflora*); poppies, Burbank and Shirley; Ten Weeks stocks, 3 varieties; verbena, Burbank and Mayflower; *Dianthus chinensis* (Chinese pinks), *Dianthus nobilis* (Royal pinks). African marigold and sweet peas did only moderately well and the following were not at all successful: Dolichos, *Lobelia tenuior*, Medicago, Defiance Large Flowering petunia, and salvias.

FUNGUS DISEASES.¹

The summer of 1914 lacked only the one element—heat—for making ideal conditions for the spread of fungi. The work on plant diseases has progressed far enough to make only a partial report. Control work will be carried on the coming season.

BOTRYTIS DISEASE.

This was the most common and destructive disease at the Sitka Station. It is a gray mold due to a fungus known as *Botrytis cinerea* or *B. vulgaris*. This mold has been connected with a perfect form known as *Sclerotinia fuckeliana*. This was collected or observed on at least 25 species of plants, including most of the ornamental and small fruit plants grown at the station. It seems to be the chief damping-off fungus. It is a facultative parasite and does not seem to be able to infect healthy green tissues directly from spores. Parts that have had their resistance weakened are first attacked. In nearly all the ornamental plants the petals of the flowers were first infected. Wherever a diseased petal touched a leaf the mycelium of the fungus would spread and infect the leaf and from the leaf would spread to other parts of the plant until in some cases the whole plant would be killed. A few days of sunshine would noticeably check its ravages. It was most destructive late in the season.

¹ By J. P. Anderson.

NECTRIA.

Nectria cinnabarina has been reported as a disease of currant canes in various parts of the country. It is found in abundance at Sitka, but it is very doubtful if it causes much damage. It attacks dead or diseased wood and may spread to healthy tissues. It develops in abundance on prunings of currant, gooseberry, cherry, apple, willow, and many other species of deciduous woody plants.

GOOSEBERRY MILDEW.

The gooseberry mildew (*Sphærotheca mors-uvæ*) affects some varieties of the English gooseberries, but others seem quite resistant. The worst sufferer from the disease was *Ribes lacustre*, a native species intermediate between gooseberries and currants. All tender parts of the plant were affected.

GOOSEBERRY RUST.

The gooseberry rust (*Æcidium grossulariæ*) occurred rather sparingly on gooseberry and red currant, but was quite destructive to three species of native currant. These are *Ribes bracteosum*, *R. lacustre*, and *R. prostratum*. Leaves, petiole, stem, and young fruit were attacked.

APPLE SCAB.

This fungus, known as *Ventura pomi*, was very common on the cultivated apple, particularly on some of the more susceptible varieties. Some varieties, like Martha and Transcendent, have been stunted through its effects. Yellow Transparent and Raspberry are among the more resistant varieties. Some trees of the wild crab apple were affected while others were not.

CLUB ROOT.

Enlargements on the roots of cabbage and its allies, due to the slime mold known as *Plasmodiophora brassicæ*, were common. This disease stunts the plant and decay is liable to take place in the galls as the season advances. This disease was also quite common on the turnip.

OTHER DISEASES.

Among other diseases may be mentioned *Septoria rubi*, a leaf spot on the salmonberry (*Rubus spectabilis*) and its hybrids. *Phragmidium rubi*, a rust on the thimbleberry (*Rubus parviflorus*); leaf spots on plum, cherry, strawberry, etc. Peas suffered from several diseases, one probably being *Ascochyta pisi*, which causes spots on the leaves and pods.

FAIRBANKS STATION.

The Fairbanks Station was visited in the beginning of September. The season had been cool and wet, and only the earliest varieties of grain had been harvested. The station was found to be in excellent condition, the soil was in a high state of cultivation, and scarcely a weed could be found on the whole cultivated area. Mr. Neal deserves much credit for the energetic manner in which he prosecutes the work, and his management of the affairs of the station has been all that could be desired.

DEVELOPMENT WORK.

The development of the station has of necessity proceeded very gradually. Since work was begun in the early spring of 1908, some land has been cleared every year and added to the cultivated area; buildings have been erected or improved year by year, and in like manner the equipment in the line of implements and machinery has been acquired gradually. During the past season perhaps the most important improvement was the boring of a well. Procuring water for the stock, as well as for household purposes, has been a serious question, both winter and summer. A well about 40 feet deep was sunk some years ago, but it did not furnish water enough to supply the horses. In the summer time water had to be hauled from a creek nearly a mile away, and in the winter time water could be secured only by melting snow or ice. A well had been dug in the barn, with a view to protecting it from freezing during the winter, but after going as deep as appeared safe the project was abandoned because of failure to find water.

This fall Mr. Neal secured the use of a well-boring machine, and it is a satisfaction to report that at a depth of 80 feet good water was struck, which rose to a height of 30 feet in the pipe. The casing is 4-inch pipe, screwed together, and the job is thoroughly satisfactory. This will permanently relieve the distress caused by lack of water.

INTRODUCTION OF HOGS.

In May the writer purchased six pure-bred Duroe-Jersey hogs from breeders at Sunnyside, Wash. They were shipped to Fairbanks, and after a strenuous trip of three weeks arrived at the station safely on June 16.

The plan is to furnish pure-bred pigs for sale to settlers in interior Alaska at reasonable prices and thus help to stock the country with good hogs. Two or three of the farmers in the neighborhood of Fairbanks are raising hogs, but they have no pure-bred stock.

A further object in introducing them is to use them in a system of rotation for the purpose of maintaining soil fertility. The fact has been frequently mentioned that it is necessary to let the land lie

fallow at least once in three years if only grain is grown. The idea is to introduce potatoes as a crop instead of letting the land lie fallow. The working of the soil in raising the potatoes will practically have the effect of a fallow. This applies more particularly to the lands on the north slope of the ridge. Here the yield of potatoes would be but small, and owing to the fact that the land is older than on the south slope it might be expected that most of the potatoes would be too small to put on the market, and, indeed, there might not be a market for them, for potato growing at Fairbanks is on the point of being overdone. The idea is to raise hogs which can be fed largely on these potatoes. The station has an excellent potato cellar, and they can be kept frost free the year around.

Whether or not hog raising as planned can be made a practicable feature of farming at this station remains to be demonstrated. At the time of the writer's visit all the hogs and pigs were in excellent health and thrifty, but Mr. Neal has since reported that one of the gilts died suddenly from some cause, the nature of which can not be determined. Every precaution will be taken to make the venture a success.

CLEARING LAND.

Five acres of land which had been cleared a year ago was cleaned up in the spring, broken and planted to potatoes, and 5 acres more was cleared during the summer and made ready for the plow. Some 20 acres was slashed between the station and the railway. When dry the slashings will be burned and the clearing converted into a pasture. This clearing is all on the south slope of the ridge running parallel with the railway. It is heavily timbered, but constitutes the best land on the station. It cost \$75 per acre to clear the 5 acres cleared during the summer, but the contractors did not make wages at this rate. There is a very marked variation in the cost of clearing land. Places can be found which are covered only with blueberry bushes and other small scrub which can be torn out with a 4-horse team and a strong breaking plow. In other places where the timber is heavy, as on the land here referred to, it may cost from \$75 to \$150 per acre to remove the stumps. The smaller stumps are pulled with a stump puller, which is operated by one horse on a sweep; the larger stumps can be economically blown out by dynamite.

The plan is to continue clearing year by year as much as station funds will permit until there is at least 200 acres, or preferably twice that area, under culture, to demonstrate farming on a reasonably large scale.

BUILDING PROGRAM COMPLETED.

With the exception of replacing the temporary roofing with corrugated iron the building program at this station is practically completed. The station now has a substantial and commodious barn,

with implement shed attached, a hay barn, a large and excellent potato cellar, hog house, blacksmith shop, a good well, and two log cabins built close together, which serve as a dwelling for the superintendent. These two cabins are the poorest and least satisfactory buildings on the place, and the time will come when an increase of personnel will be needed and something better in the way of a dwelling must be provided, but the cabins will answer for the present.

GRAIN CROPS.

As has been intimated above, the season was very unfavorable, not because of premature killing frosts, but because of too much rain and too little sunshine during July and August, which conditions kept the grains growing instead of bringing them to normally early maturity. However, in spite of an unfavorable season, some 250 bushels of barley, oats, and wheat matured. It is not likely that any season will be much more unfavorable than the past, and it may be reasonably expected that all of these crops will mature in normal years.

Three varieties of spring wheat matured. Two of these were obtained from the experiment station in the Province of Irkutsk, Siberia. They were designated as H. G. spring wheat and Ulka spring wheat. Romanow spring wheat has been grown and has ripened at this station for several years.

A variety of spring rye named Gesselberg was obtained from the Siberian experiment station above named. It was ripe enough to grow when the freeze came.

A variety of winter rye known as No. 19556, matured perfectly and was harvested August 10, but it was seeded July 25, 1913. This variety can be depended on to mature a crop every year whenever the snowfall is from 2 to 3 feet deep.

Thus far no winter wheat has been found that is hardy enough to give a good stand in the spring. The stand is always reduced by from 50 to 75 per cent, but, on the other hand, there is always a portion of the grain that survives and matures seed. Continued selections of these surviving grains have failed to develop a hardy strain. The plants that survive and mature are just as liable to be winterkilled when seeded again as are grains of the same variety grown elsewhere. A very thin stand of winter wheat of the Kharkov variety matured.

Buckwheat has always matured at least a portion of its seed every year. The same was true the past season. In Alaska, buckwheat is a continuous bloomer, and while the earliest blossoms mature seed the late ones are apt to be caught by frost. Such was the case this year. Ripe buckwheat shatters badly when handled, with the result that wherever it is grown there is always a volunteer crop the following year.

ALFALFA AND CLOVER.

These crops have never successfully wintered at the Fairbanks Station. There has not been enough seed of the hardy varieties of alfalfa, however, to give them a test at this station. The alfalfas and clovers that have been grown have been of the common sorts, but it is to be noted that alfalfa will make a fine growth the first season from seed. It will afford considerable pasturage as it is, and it will, of course, make excellent green manure for plowing under after it has been pastured.

Common red clover, which was seeded in the beginning of June and three months later stood 2 feet high, was in full bloom, and made a very dense growth, which would yield 4 or 5 tons of hay to the acre.

These facts prove that it may be profitable to seed clover and alfalfa to get a crop of either pasture or hay the same season, and it certainly demonstrates the practicability of using these crops as a means of enriching soils which stand in need of fertilizers. This is doubtless the most important result of the experiment. Although these plats were not plowed under, the plow could have been started in the latter half of August and the soil would have received a heavy application of green manure for the benefit of future crops.

It is, as yet, impracticable to ship artificial fertilizers to the interior of Alaska, except on a small scale and for experimental purposes. The freight will more than double the original cost and the returns in fertility will not justify such a large outlay in common farm practice. These legume plats prove that the fertilizers can be produced on the land with only a nominal cost for seed, to which is to be added the cost of cultivation.

POTATOES.

Some 7 acres were planted to potatoes. The crop was not large, but this was chiefly due to the fact that the ground was new and had not been put in good tilth. It has often been pointed out in these reports that the first crop on newly cleared land is usually small and unsatisfactory. However, this new land produced marketable potatoes at the rate of 150 bushels to the acre. Rich ground in good tilth will sometimes produce three or four times that much under ordinary culture.

The station has grown potatoes for market for several years past. The main object was to demonstrate that good potatoes could be grown in the interior, and the farmers in the vicinity have taken the hint and nearly all of them now grow a considerable acreage of potatoes, one estimating his crop as high as 50 tons which, at 4 cents per pound, or \$80 per ton, the lowest price at which potatoes have

been sold up to the present time, would bring the grower some \$4,000. Potatoes are usually classed as a money crop. The trouble now is that so many farmers in the vicinity of Fairbanks are growing potatoes that competition must of necessity bring down the price.

In the future the experiment station will continue to grow potatoes but on a much smaller scale, and more attention will be paid to the testing of varieties, so that growers can be advised as to those best suited to the climate and soil.

TURNIPS.

Turnips are and always will be a very important crop for Alaska. They reach full development in a short season and can, therefore, be grown everywhere, even to 100 miles north of the Arctic Circle. Of the many varieties which have been tested at the Alaska stations none compare in quality with the smooth yellow-rooted turnip named Petrowski. It was originally introduced from Finland by the Office of Seed and Plant Introduction, of the United States Department of Agriculture, and has stood the test of several years' trial in all parts of Alaska. Nearly all settlers report that the Petrowski turnip is the best they have ever grown. It does not suffer so badly from the root maggot as do other sorts. The explanation probably is that it spreads its leaves out flat on the surface of the ground, and when the fly lays its eggs on the leaves the instinct of the maggot seems to be to reach the ground by wiggling down on the leaf stem; they thus reach the soil, but not the root. This turnip is not exempt from the attacks of the root maggot, but the great preponderance of testimony is that it suffers very little from the attacks compared with other varieties. Aside from this, the Petrowski is the best flavored turnip known to the writer. The roots are smooth, uniform in shape, and almost spherical or slightly flattened, with a slight depression in the bottom where a single small root reaches into the soil.

Last year some 3 tons of these turnips were grown at the Fairbanks Station for the purpose of planting them for seed in 1915. The object is to grow turnip seed for the use of the station and enough to supply to settlers as well.

LIVE STOCK.

The pure-bred Duroc-Jersey pigs mentioned above and a team of work horses are at present all the live stock kept at this station. No cattle have been introduced as yet. That cattle will thrive in the Tanana Valley is demonstrated by two dairy herds kept by farmers at Fairbanks. To be sure, these dairy cows are kept warm and comfortable in winter, while in summer they run at pasture for about three or four months. They are not especially adapted to the climate,

but the price of milk, 50 cents a quart, justifies the cost of their care and keep. The calves are not raised. A few gallons of milk are worth as much as a good veal calf. The herd is replenished by new cows from the outside as the old ones cease to pay.

There are no herds of beef cattle in the interior. Even the Galloway is scarcely hardy enough to stand the winters without incurring too great expense for their food and protection against cold. The beef that is consumed consists almost wholly of cold-storage meat brought from the outside. Occasionally also a herd of steers is driven in across country from the coast, such steers having been bought on farms in the States of Oregon and Washington. By starting them on the trail in June and driving slowly, taking a month or six weeks for the trip, such steers can be landed in Fairbanks without loss of flesh, and some will even gain in weight on the trip.

For a detailed account of the work of the Fairbanks Station, see page 42.

NEED FOR A HARDY BEEF ANIMAL.

There is need for a hardy beef animal in the interior, and it is thought such an animal can be developed by making reciprocal crosses between the yak and the Galloway.

The objection has been raised that hybrids between the yak and common cattle are not fertile. While this is true to a large extent, it is also true that some of the hybrids are fertile, especially when the bull is crossed on the female yak.

The following letter, received from Mr. Victor Pisareff, director of the experiment station in the Government of Irkutsk, Siberia, is of interest in this connection. This letter will, it is believed, set at rest all questions about the practical results of such an experiment. It shows that the yak is frequently crossed on common cattle in Mongolia; that both the yak and his hybrid offspring are exceedingly hardy; that they obtain their feed through the long and extremely cold winter, practically without the aid of the owners; and that they are much used for beef and for milk, as well as for work animals.

Mr. Pisareff writes:

You have asked me if we used the yak (*Bos grunniens*) in Siberia as a domestic animal, and in reply I will say that in the Government of Irkutsk the yak is not kept for breeding purposes, but it is used as a work animal. In the neighboring country of Mongolia the yak thrives in a wild state as well as domesticated. The yak and the crossbred offspring with ordinary cattle I have seen many times in the city of Irkutsk, where yaks are brought with cattle from Mongolia to be killed for beef.

Mongolia is high and mountainous. It has, therefore, a severe continental climate. But the yaks are extremely hardy and enduring and not particular as to their food and shelter. The Mongolians are primitive cattlemen, and, of course, do not provide either covered shelter or food for their cattle in winter.

The cattle pasture through the severe winter under the open sky and obtain their feed from last year's dead grass, which they dig up from under the snow.

The yak is a very large animal with a broad flat forehead and with a long face, brain pan; the horns are thin and cylindrical; the body is wide and massive. He has short legs and a long tail, covered with thick hair up to the root, like the tail of a horse; the body is covered with thick hair, which is especially long on the lower part of the neck and on the sides of the belly.

As a domestic animal for the Mongolians the yak is very valuable. He furnishes a fine wool, delicious meat and milk, and, besides all this, he is used as a pack animal for carrying heavy loads.

With ordinary domestic cattle the yak makes rather easy crossbreeding.

In view of the above-quoted testimony to the hardiness and usefulness of the yak and his hybrid, and the ease with which crosses may be made with common cattle, it seems to the writer that an experiment for the purpose of developing a hardy beef animal for the interior would be justified.

It is a problem for the experiment stations to solve. It is not likely that private enterprise would take hold of the matter.

There is now a herd of yak in the Rocky Mountain Park at Banff, Canada, which, the superintendent informs me, is doing well. Before the war they could be imported from a breeder and dealer in England, who offered to deliver them at Baltimore for \$500 a pair. The war may have interfered with their importation into England and their breeding there, but they can probably also be obtained from other sources, and, in any case, they can be imported direct from Tibet or Mongolia.

The writer respectfully asks for authority to undertake this experiment in the near future.

RAMPART STATION.

The Rampart Station was visited in the latter part of August and the work in progress examined in detail. The superintendent, G. W. Gasser, deserves commendation for the order and system that prevailed everywhere, for the painstaking care which was evident in the prosecution of the experimental work, and for the fact that the farm was kept practically free of weeds. It is realized that it is easier and cheaper to exterminate the various species of weeds, inevitably imported with seeds, as soon as they make their appearance than to allow them to go to seed and multiply, when the task of subduing them will often be found to be onerous. This is a point that homesteaders and settlers everywhere would do well to bear in mind.

IMPROVEMENTS.

The work of developing the station has gone on slowly the past year, as heretofore. It consisted, first, in the clearing of 10 acres of land. Five acres of this clearing is on a high bench above the buildings. It is expected that this high ground will be the first to be ready to be seeded in the spring. The snow will blow off and

the water will drain away readily. It faces the southeast and should be a favorable location for early crops. The soil is poor and will have to be improved by fertilizing, chiefly green manuring, because of the expense of shipping in chemical fertilizers. Having no live stock except three head of horses, the amount of barnyard manure produced on the station is small.

It is expected also that this higher ground will escape some of the early frosts which are always more noticeable on the lowlands, where potatoes and all similar tender forms of vegetation are the first to suffer.

Five acres was cleared on the flat facing the river. This flat is the most difficult and expensive ground to clear at the station; lying low and almost level, it has always been moist. This has induced a heavy growth of moss, as well as a thick undergrowth of bushes. The timber is small, rarely more than 8 inches in diameter, but the black spruce which covers the ground has short branches and the trees stand so thick that in places a person can scarcely pass between them.

It takes at least two years to clear this land properly. The first year the timber is cut down and thrown into windrows, then when the moss dries sufficiently it is torn up with a specially constructed plow, in order to expose it to the air, and finally, the following June, when the driest and warmest weather usually occurs, the timber and moss are burned. Following the burning, the ashes are scattered, the stumps are dug out, and the ground is ready for the plow; but on this lowland the ice is near the surface and when the cover is removed it melts quite rapidly, rendering the ground so wet that drainage becomes necessary.

A shed 16 by 40 feet was built on the southwest side of the two-story barn, which is to be used for the storage of grain and for other purposes. The barn is now completed and, with the sheds, measures 50 by 70 feet. There is a driveway through the center, closed by sliding doors. This driveway will make an excellent thrashing floor and was planned for that purpose. The barn is roofed with galvanized corrugated iron and the sides of the sheds are of the same material, though the walls of the barn itself are built of logs and are 18 feet high to the eaves.

A circular water tank, 10 feet deep and 10 feet in diameter, built of heavy corrugated iron, was purchased and sunk so that the top of the tank was $1\frac{1}{2}$ feet below the level of the floor of the barn. This will make it possible to give it a thick covering as a protection against frost. The rain water from the roof of the barn will be conducted into this tank, and it is expected that it will furnish water enough for the watering of the teams throughout the year, and it is also expected that the water in this tank can be kept from freezing.

A beginning was made in the erection of a grain-breeding house, which is badly needed at this station. The material was purchased at Seattle, but the contractor failed to ship the glass on the last boat which could land it in Rampart. Therefore, only the lumber was shipped, and there proved to be a shortage in this, so no work was done in the erection of this house. It is hoped that it may be completed next summer.

When this grain-breeding house is erected, the building operations at Rampart will practically be completed. The clearing of land to extend the cultivated area will then be the only expense aside from the necessary work of cultivating crops.

CROP EXPERIMENTS.

The experimental work broadens year by year. No general farming is done except the growing of hay for the team and raising crops for soil improvement, all the crops grown being under definite experiment.

The problems assigned to this station are the production of varieties of grains which shall be suited to the climate and the production of forage crops, chiefly leguminous, adapted to the soil and sufficiently hardy to withstand the severe winters. These are the two main lines of work, but there are side lines, as, for instance, the production of seed, the testing of many varieties of potatoes and other vegetables, the culture of berry bushes, and the introduction and culture of hardy flowers and ornamentals.

GRAIN BREEDING.

As already briefly noted, the season was a very unfavorable one; first, because of the drought in June, which stunted the grain crops, and, secondly, because of the wet weather in the latter part of July and August, which kept them growing long beyond the periods when they mature in normal seasons. Nevertheless, nearly all the important crops under experiment matured sufficiently to produce viable seed, although some plats which had been intended for the increase of seed had to be cut for hay.

The hybridization and crossbreeding of barleys have been dwelt upon with some detail in former reports. Here it is noted that this work was continued successfully and with greater vigor than in any former year. The great number of variations which are produced by crossing has increased the plat work very much, and there have been developed several early varieties of barley which are better than the parent varieties. None of them, however, are sufficiently stable to be put on the market.

Several crosses of oats have also been made, some of which are promising. There is not as great a need for new oats, because there

are two or three varieties that it will be hard to surpass. One is the Finnish Black, originally imported from Finland by the United States Department of Agriculture. Another is the South Dakota, originally obtained from Prof. Hansen and which usually matures, and a third variety is the Copperfield, which is a heavy yielder and usually matures in normal years. Nevertheless, crosses have been made between these and other varieties.

There has been obtained a variety of spring wheat which will be useful as a parent, because of its earliness. Small quantities of several varieties of spring wheat, oats, and barley were secured from the director of the experiment station in the Government of Irkutsk, Siberia, and while all of these grains matured most of their heads during the past unfavorable season, there is one variety of spring wheat named Chogot which had perfectly matured 97 per cent of the small crop by August 26. This is far earlier than anything heretofore tried. A number of crosses were made between this and some of the larger later varieties of spring wheat, including Red Fife, Saskatchewan, Velvet Chaff, and others, and it is hoped from these crosses a vigorous, early variety of spring wheat may be developed which shall be suited to Alaska.

Three varieties of spring rye were obtained from the above-mentioned Siberian experiment station, and one of these, the Gesselberg, matured about one-third of its grain. Spring rye requires even a longer season than spring wheat and it has not been successful in the past. Some crosses were made in the hope that some earlier varieties may be developed.

Of the several varieties of winter wheat that have been grown at this and the Fairbanks Station for some years past not one has proved to be hardy. The hardiest of them is the Russian variety named Kharkov, but even this seldom has a 25 per cent stand in the spring. Enough for seed the following year is always matured, but it winter-kills equally badly when propagated from these selected surviving plants. An attempt will therefore be made to develop a hardy variety using the Kharkov as a parent.

The past year nine varieties of winter rye were grown, none of which came through with less than half of a stand and several with almost perfect stands, and an attempt will be made to develop varieties that will not only be hardy, but also mature earlier.

The drawback in growing both winter wheat and winter rye in Alaska is that it takes 13 months to mature the crop. To develop a good root system and make strong plants before the snow falls, all winter grains should be seeded the last of July or the beginning of August. Since they do not mature until the latter part of August, one season's crop can not be used for seed until the year following. If a variety can be developed which matures in July, so that the crop can

be used for seed the same year, there is greater probability that rye will become a popular crop. Winter rye can not stand the cold of the interior on bare ground; whenever the snow blows off it is completely winterkilled.

VEGETABLES.

But few vegetables are grown at this station; still some, such as potatoes, peas, cabbage, cauliflower, and turnips, are grown for the purpose of comparing a few of the most promising varieties with each other.

The potato is, by far, the most important and most universally grown vegetable in Alaska, and with proper care and culture excellent potatoes can be grown nearly everywhere in the Territory, but there is wide difference in varieties. A large number of varieties are grown at the Rampart Station, each on a very small scale, to compare their value. Care is taken that they are all grown on similar soil and under identical conditions, so that there may be a fair comparison. Fifty-three varieties were grown at this station the past season. They were planted May 18, and on August 18, just three months from planting, they were killed to the ground by frost. But, nevertheless, many varieties produced fairly good potatoes. There were potatoes ready for use in two months from time of planting, and if the frost had held off until the beginning of September there would have been a fine crop.

Attention is again called to the advantage there is in sprouting the seed before planting. If the seed potatoes are put into shallow boxes and covered over lightly with moist soil and the boxes are set in a warm light place from four to six weeks before planting time, the seed will produce stout green sprouts and also many roots. Planted with care, so that the sprouts are right in the surface of the soil and the roots remain undisturbed, the potatoes will start growing almost at once, and it amounts to lengthening the period during which they can mature by about a month. Sprouting seed in this manner is practicable in all cases for all potatoes grown for home use. When grown for market by the acre, it may possibly involve more labor than can be economically expended on the crop. Every potato grower, whether he grows the crop on a large or a small scale, should construct a frost-proof potato cellar. It may be most convenient to have such a cellar under his house, or it can be made by tunneling into a hill. The cellars, both at Rampart and Fairbanks, are entirely frost free and a success in every way, and they are built by tunneling into a hill in each case.

On very cold nights a common kerosene lamp or lantern placed on the floor of the cellar will give out enough heat to ward off frost. For large cellars it is necessary to provide a stove, which can be lighted in extremely cold weather.

Garden peas are grown with marked success at Rampart Station, as, indeed, they can be anywhere in Alaska, and for several years past the station has grown its own seed. To this end it is necessary that the first pods remain to ripen, or certain portions of a row be left for seed production. It has also been found that there is an advantage in sprouting peas before planting, in the same manner that potatoes are sprouted.

As has repeatedly been stated, the variety of turnips originally imported from Finland by the Office of Seed and Plant Introduction of the United States Department of Agriculture, and known as the Petrowski, is a favorite throughout Alaska. It has a smooth yellow globular root. It does not grow to large size, but it has an excellent flavor and is free from fibrous tissue, and, what is of much importance, it suffers less from the attacks of the root maggot than any other variety.

Owing to a misunderstanding, only a small number of roots of this variety were planted for seed the past season, but a few pounds of seed were matured, and it is intended hereafter to grow sufficient seed at both the Rampart and Fairbanks stations to supply home demand.

For detailed accounts of the work of the Rampart Station see page 54.

KODIAK STATION.

The station superintendent, M. D. Snodgrass, who spent the winter at Chehalis with the cattle, returned to Kodiak May 5. During the course of the spring and summer numerous improvements were made in the dairy barn, fences were repaired, a sheep barn was built, and experiments carried on on renovating pastures covered by the ash from Mount Katmai.

RENOVATING PASTURES.

The native grasses made a good growth wherever they could break through the ash, and in many places there was a heavier growth of wild grass than had ever been seen before the ash fall. These grasses seed freely, and they and many other native plants appear to reestablish themselves on the ashes and in the cracks and crevices which occur therein.

Some 60 acres were seeded with grains and grasses. The grains consisted chiefly of oats, also a little wheat mixed with the oats and some hull-less barley. With these grains a mixture of domestic grasses was seeded and a top-dressing of nitrate of lime to the amount of 240 pounds to the acre was applied. The grains were needed to supply sufficient hay and silage on which to winter the herd, the grass having not been sufficiently restored to afford much hay and

silage. As to the method of restoring the pasture, it has been found that when the ash can be mixed with a portion of the black soil underlying it grasses and grains alike make a better start and grow more vigorously than when seeded on soil not thus mixed.

To aid in this work a gang plow was constructed for the purpose, consisting of a subsoiler, which takes the place of the forward plow. This subsoiler will cut a furrow from 4 to 6 inches deep in the bottom of the furrow made by the after plow in the preceding round and raise a portion of the black soil to the surface. The after plow will throw a furrow of ashes into the bottom of the furrow made by the subsoiler. Where the ashes are not too deep, this proved to be a successful method of preparing the soil.

The areas that have been seeded to grasses last year did not show a very good stand except where stable manure had been applied. The erosion of the ashes by rain and snow water and the drifting of the ashes in dry windy weather has been a bar to the rooting of the rather feeble grass plants, but small areas here and there have taken root, and they will become centers from which grasses will spread. It will take some years before this work of renovating the pastures can be completed. The necessity of making a heavy application of some nitrogenous fertilizer, like nitrate of lime, makes the work expensive. However, with the native grasses, which have come up more vigorous than ever on the hillsides and gentle slopes where the ashes have partly been removed by wind and rain, and with the tame grasses that have been established, enough feed can be provided for the herd, both for summer and winter. It will not be necessary to buy hay; it is otherwise with grain feed. It will be necessary to purchase some 10 or 12 tons of grain feed every year to feed to young stock and to cows in the dairy work.

THE HERD.

It was found necessary to postpone the dairy work until the spring of 1915 for lack of sufficient cows in milk with which to begin work. The cattle which had been kept for almost two years at Toppenish and Chehalis, Wash., were returned to Kodiak Station in July last. They made the trip without accident and 51 head of all ages were safely landed in charge of Laurence Kelly. They were transported to Kalsin Bay as soon as convenient and will be wintered there. They went into winter quarters in excellent condition, being thrifty and healthy and in good flesh.

Sixty-seven head of the cattle were sold at Chehalis and the remainder, kept for experiment, were shipped back to Kodiak. Most of the cattle disposed of were sold at public auction, held December 22, 1913. They did not bring high prices, chiefly because they were offered for sale in a dairy country. Only dairy cows have much value in the

eyes of the farmers about Chehalis. Moreover, the Galloways were practically unknown and their merits not appreciated.

The cattle that were selected to be retained in the herd were mostly those which proved to have some milking qualities. None of them are ideal milkers, but some of the cows are fairly good milkers, and the problem which has been assigned to the Kodiak Station in connection with the producing of these cattle is to develop an all-purpose cow. The Alaska settler needs milk quite as much as beef. Inquiries from prospective buyers are mostly for family cows. By continually selecting the best milkers and by systematically stimulating the flow of milk it is expected to develop a fair milker from this breed, or, in other words, to restore the milking quality which breeders have sacrificed to the production of beef. It is not expected to make milkers out of the whole herd. A portion, and probably the larger portion, of the herd will remain distinctively beef animals, but part of the herd which it is planned to keep at Kodiak, at least during the milking period, will be handled as dairy cattle.

THE SHEEP.

The superintendent reports a disaster to the sheep that it will take years to repair. Four brown bears attacked the flock, late in 1914, and killed 41 head. At this writing the station has but 15 ewes, 3 wethers, and 1 crossbred ram.

To protect the brown bear by law is equivalent to prohibiting the live-stock industry by law in those regions which are dominated by the bear. Bear and live stock can not live peaceably together.

In the few years that the bear has been protected by law it has increased so fast in certain sections, one of which is the region about Kodiak, that neither man nor beast is safe from his attack. Nor can he be fenced out. On the Frye ranch, now abandoned, located but a few miles from the Kalsin Bay ranch, the bear has demolished the fences in many places, and so he has the fences on the experiment station. If the law gives no relief it will be necessary to employ armed guards to protect both cattle and sheep while at pasture. They can be safe only when locked up in a strong building. The practical destruction of the live-stock industry would appear to be a high price to pay for the pleasure that may be enjoyed by a few sportsmen from the States who make occasional visits to Alaska in search of trophies.

The law protects the bear during the summer season when it is most convenient to hunt him. The open season for brown bear is from October 1 to July 1. A large portion of this time he is in winter quarters and during most of the time the weather is so inclement that hunting is a hardship; but even though he can be hunted the poor natives, who must be depended upon to keep the bear in check, have no incentive to hunt him because there is no sale for the pelts. The

law provides that a fee must be paid for the privilege of shipping out bearskins, and no hunter can ship more than two skins in a season, under the license. The Aleuts and other natives who inhabit the region infested by the brown bear can not purchase licenses, and since the market for bearskins is not in Alaska, but outside of Alaska, they can find no incentive to hunt the bear.

An earnest plea is made for the exemption of Kodiak Island from the application of this law, or if the whole island can not be exempted, then exempt the northern half of it, where the population is mostly located. If the species must be preserved in its pristine purity, a bear reservation could be made on the Alaska Peninsula, where there are as yet few people, either white or native. There are other large islands as yet uninhabited where the bear could roam undisturbed, as, for instance, on Montague Island.

It is certain that live-stock breeding will be impossible on Kodiak and Afognak Islands if the bear is allowed to hold unrestricted sway.

REPORT OF WORK AT FAIRBANKS STATION.

By J. W. NEAL, *Superintendent.*

The work at this station continues along the lines of general farming in conjunction with a limited amount of variety plat work for the purpose of testing new grains that are procured from other countries and from the northern experiment stations of the United States. In addition to this work, new grain creations from the Rampart Station are seeded here with a view to increasing the seed for field work and commercial use.

The station continues to attract the usual attention and comment from tourists and travelers who visit Fairbanks from many parts of the globe during the summer months. (Pl. IV, fig. 1.) These visitors, with those who visit the other Alaska stations and private farms, furnish, perhaps, the greatest agency in correcting erroneous ideas of Alaska. It has been reported that the agricultural experiment station at Copper Center ripened oats only once in six years. The writer, who had charge of Copper Center Station from 1902, when it was established, until the beginning of 1907, would report that during four crop seasons, 1903 to 1906, several varieties of oats were ripened three years out of the four. In 1906 crops were killed by frost, but they were turned into hay and sold for \$240 a ton. Oats ripened in both 1907 and 1908, when the station was closed. Therefore oats failed to mature only one year in the six of the existence of the station. The reports of Fairbanks Station from 1908 until the present time show that several varieties of oats and barley have matured every year at this station since it was established, and at least one variety of spring wheat has ripened every year in the last three.

There is also a seeming lack of information regarding the effect of winter freezing. The tundras, while representing a small area of this vast Territory, may be frozen to a great depth, and it is a fact that the ground is frozen to bedrock in many places, but thousands of rich placer claims can not be worked because the ground is not frozen to bedrock. Such ground is called wet and entails too much expense to make mining profitable. On the south slopes of the Fairbanks Experiment Station, as well as many other similar slopes in this and other parts of Alaska, the ground is thawed from the surface to bedrock, as has been proven by shafts and drill holes. In winter these slopes freeze to a depth of about 5 feet, and this frost is practically all out of the cultivated ground by the middle of June or earlier.

Teaming, lumbering, logging, and quartz mining are the chief pursuits for winter employment, and few men ever stop work on account of the cold. The shortest days have about seven hours of light at this point, and by early March there is sufficient daylight for any man to do a day's work. The settler needs no lamp from April to September.

THE CLIMATE.

The weather condition is probably the greatest factor in farming in interior Alaska. From observations reported there seem to have been no two seasons alike within a reasonable period of years. Indeed, the variance is so great that one seldom fails to encounter some unexpected fault in the weather. When he has exhausted his entire scope of experience in preparing against former conditions unfavorable to the growing or harvesting of his crops, some new condition confronts him and he must set about to overcome the new difficulty. It has been possible, however, to overcome these varied conditions with slight losses, and while crops are light in some instances actual failures have never occurred.

The present season has been an exceedingly unfavorable one; yet the station ripened more than 250 bushels of grain of several varieties.

Spring seeding began several days later than usual, and the early summer was a little too dry for good crop growth. On June 19, 0.93 of an inch of rain fell in less than one hour, washing the hillside fields badly and packing the ground. A similar shower of 0.48 of an inch fell in less than 30 minutes on July 1.

After the middle of July there was sufficient rain for all crops, but the weather kept cool and cloudy, with frequent showers, so that the ripening period was much prolonged. Early seedings of barley and oats ripened and were harvested in August. Freezing weather set in on September 14, which continued for seven days. During that time the ground froze fully 2 inches deep, entailing great loss to potato growers all over the valley. Potato digging had begun about September 10, but rainy weather set in at night on September 11,

continuing for four days, when it cleared and the temperature fell to 26° F. at the station. On September 17 it registered 19° F. at the station up on the hillside, while it was several degrees colder in the lower parts of the valley. Freezing weather continued until September 21, after which the ground thawed out, and potato digging was rushed for four days, when it began freezing again, but the crop was then practically all out of the ground. From the first freeze the ground did not fully thaw out on the shady side of the house. Light freezing weather continued from September 25 into October, when the weather gradually became colder. Plowing was possible in the afternoons until about October 10. Light frosts occurred on August 18 and 19, September 5, 6, and 11, killing the potatoes in the lowlands early in September, while they remained uninjured at the station and other similar locations until the freeze of September 14.

The rainfall for the season totaled 10.15 inches, distributed through the season as follows: May, 0.59; June, 1.51; July, 4.63; August, 2.06; and September, 1.36. From the last week in September until November there was no precipitation whatever, and the ground froze dry. This condition is favorable for early seeding the following spring, as most of the snow water runs off before the ground thaws enough to absorb it, and when the soil thaws it dries out much faster, and therefore can be worked much earlier.¹

GRAINS.

Seeding began on May 22, which is somewhat later than usual, owing to the lateness of the spring (6½ inches of snow fell on April 29 and 30). The temperature stood at 50° F. on May 1. The snow left the south slopes on May 10, leaving the north slope fields 10 days later.

Five varieties of barley, seven of oats, one of spring rye, one of buckwheat, and ten of spring wheat were seeded from May 22 to May 28. Of these, each variety of barley and oats ripened some seed, while the earliest varieties matured the whole crop. (Pl. V, figs. 1 and 2.) Both the rye and the buckwheat ripened, and at least two varieties of spring wheat ripened good grain, while some others were matured enough for the seed to grow.

BARLEY.

Hull-less barley No. 19851, from home-grown seed, was seeded May 22 and began heading July 2 at 24 inches high. The grain fully matured and was harvested August 20. The average height was about 36 inches. This barley thrashed at the rate of 1,800 pounds per acre, actual measurement.

¹The 1913 report on the weather at this station gives a fair knowledge of the same, covering a period of seven successive seasons.



FIG. 1.—RED-BERRIED ELDERBERRY.



FIG. 2.—RED-BERRIED ELDERBERRY AT EDGE OF LAWN, SITKA STATION, 1914.



FIG. 1.—GENERAL VIEW OF BUILDINGS, FAIRBANKS STATION, 1914.



FIG. 2.—WORK TEAM, FAIRBANKS STATION.

Gray Mayle, a hull-less barley, seeded May 22, from home-grown seed, began heading July 2 at about 22 inches high. This variety ripened by August 15, the average height being 34 inches. While on this occasion it ripened a little earlier than any of the other varieties, it is not as good a yielder as the others. It is bearded, has short heads, and the upper glumes did not fill, as was the case last year.

Beardless barley No. 19852, seeded May 22, from home-grown seed, began heading July 4 at 30 inches high. This variety was ripe enough to harvest by August 20. It was cut on August 22. It stood 4 feet high. One acre yielded 1,275 pounds of thrashed grain.

Beardless barley No. 616, from University farm at Davis, Cal., seeded May 22, began heading June 30, and ripened by August 14, standing 40 inches high. This is the earliest of any variety tested this year, but it proved to be about half bearded and with small slender heads; a poor yielder.

Hybrid barley No. 4 A-1, Chittyna × Oderbrucker, seeded on May 22, from Rainpart Station seed, began heading July 1 at 26 to 30 inches high. This variety was ripe to harvest by August 20, averaging 48 to 50 inches high. About 10 to 15 per cent of this hybrid came bearded, but by culling the bearded heads out for two or three generations it will probably become constant as a beardless variety. It is early and a good yielder both in straw and grain, and no doubt will soon become a commercial variety.

OATS.

Banner oats, seeded from home-grown seed May 22, began heading July 8 at 20 inches high. Ripe enough to cut September 5, standing 42 inches high. This variety has been ripened in considerable quantity for the last three years and the station seed used for the main hay crop. The field plat did not mature this year and had to be cut for hay.

Sixty Day oats, seeded May 22 from home-grown seed, began heading July 4 at 18 inches high. This variety matured in culture and field plats and was harvested August 22. It thrashed 49 bushels per acre.

Finnish Black oats, seeded from home-grown seed May 24, began heading July 6 and ripened for harvesting August 25, averaging 5 feet in height, but patches of it were fully 6 feet tall. A 5-acre tract of these oats ripened on the north slope on thin land yielding 31 bushels per acre. Heavier soil on the south slope has yielded three times that amount per acre.

Apples Rust Proof oats, No. 339, from California Station, seeded May 24, began heading July 3. They ripened by September 1, standing 38 inches high.

Canadian oats, No. 444, from California Station, seeded May 24, began heading July 3, and ripened about with Sixty Day oats, which has been the earliest of all varieties tried. They were ready to cut by August 24, standing 45 inches high. Judging from one season's crop this variety gives evidence of being better than Sixty Day oats, as it is a better yielder and makes more straw, giving a large and heavier grain.

Burt oats, No. 293, from California Station, seeded May 24, was heading by July 4, and ripened by August 30, making a growth of 45 inches.

Beliak oats, from Irkutsk Province, Siberia, seeded May 24, began heading July 8, and ripened by September 1, standing 42 inches high.

SPRING RYE.

Gesselberg spring rye, from Tulun Experiment Field, Irkutsk Province, Siberia, seeded May 24, began heading June 25, 32 days after seeding. It was slow to fill and slow to ripen, finally maturing about September 13. It made a light crop and the heads and kernels were quite small. In length of straw it made but 50 inches.

SPRING WHEAT.

H. G. spring wheat, from Tulun Experiment Field, Irkutsk Province, Siberia, seeded May 24, began heading July 3. Some heads were fully ripe August 28. It was harvested September 5. The heads and kernels were small and it probably is a light yielder, but it is a quick maturing grain.

Romanow spring wheat, from home-grown seed, seeded May 25, was heading on July 7. This variety was ripe and harvested by September 5. Specimens that were removed to the barn show full and plump kernels, but those left in the field were not hard enough to stand the freezing weather from September 14 to 21 and the grain is somewhat shriveled. This variety has matured sufficiently for seed for several years, and good specimens have been secured by drying indoors. A sack of this wheat was received late in the summer of 1909, with instructions to treat it as either fall or spring wheat. A small plat was seeded in September of that year and only a fair stand came up, making but little fall growth. In the spring there was a very thin stand, but every head ripened by the middle of August. It has since been discovered that the spring stand was from kernels that did not germinate in the fall and that it is only a spring wheat. One acre of this variety was seeded in the fall of 1914, when the ground was freezing, to try out the feasibility of seeding spring grains late in the fall, with the view to earlier ripening. If this grain comes up it will be several days ahead of spring seedings.

Ulka spring wheat from Russia, Negro durum wheat (No. 1138), Texas Red wheat, and Early Baart wheat, all from California Station, were almost ripe enough to cut when the freeze came. Specimens of Early Baart wheat were cut for the station exhibit at the Panama-Pacific Exposition at San Francisco, together with 15 other varieties of matured grains.

BUCKWHEAT.

Buckwheat seeded May 28 was blooming by July 3. It was slightly damaged by a light frost on August 18. A fair crop of the grain ripened and was harvested the first week in September. (Pl. VI, fig. 1). While buckwheat is not a success in a commercial way, seed from the early settings always ripen and it reseeds the ground unless great care is taken in removing the crop, as it shatters off easily.

WINTER RYE.

Winter rye, No. 19556, from home-grown seed, seeded July 25, 1913, made an excellent fall growth, and was but little winterkilled, making a good crop. It was heading freely by July 15, and ripened by August 10. It stood from 5½ to more than 6 feet high. A plat of exactly one-eighth of an acre was cut separately and thrashed, showing a yield of 1,520 pounds to the acre.

WINTER WHEAT.

A Kansas variety of winter wheat, seeded July 25, 1913, made a good fall growth, covering the ground, but a large percentage of it winterkilled; what stood the winter was in full head by July 4 and was 3 feet high. It ripened very unevenly; portions of the plat were ripe August 15, while some remained green until harvested September 1. Several other varieties of winter wheat and rye were seeded with the two named, but all were winterkilled. Thirteen varieties of winter wheat and four of rye were seeded August 4, 1914, and nearly all had made a good start before winter.

It may be of interest to note that there now are in the region about Fairbanks three self-binders and two small thrashing machines. The writer does not wish the reader to infer by this that there is work for two thrashing machines here, but in addition to the station equipment there is one machine owned and operated by private enterprise, and a few of the farmers attempt to thrash their own seed.

The hay crop of this region in 1914 has been estimated at 1,000 tons, but the writer would cut that estimate in half.

LEGUMES.

The several varieties of alfalfa plants that were received from Sitka Station in August, 1913, were winterkilled. The alfalfas and red clover that had been seeded on the station, including a plat of alfalfa

2 years old, were also killed. New seedlings from new varieties were made on May 30, 1914. These did not make as much growth as did the seedlings of other years. The first blossoms appeared August 5 but no seed ripened. (Pl. VI, fig. 2.) Some new Siberian varieties were received the middle of June and seeded at once. They made very little growth. A plat was seeded to red clover early in June which made a thick growth of about 2 feet and blossomed freely from July 20. (Pl. VII, fig. 1.) No seed was found to ripen.

VEGETABLES.

Enough has been said on this subject in former reports to convince the readers that all hardy vegetables can be and are grown very successfully practically all over Alaska.

From the station garden this year (Pl. VII, fig. 2) the rhubarb was large enough to begin using it by June 10. Premium Gem peas were ready for table use in July. The first cauliflower was cut July 18. The first cabbage on August 1. Early Mohawk beans were ready for table use August 1. A light killing frost on August 18 damaged the bean and tomato vines, cutting the crop short.

The few hybrid strawberry plants that lived from those sent from Sitka Station last season made many new plants this year, but did not blossom.

FLOWERS.

It has long been known that Alaska is a land of flowers, and some of the most beautiful flower gardens can be seen about Fairbanks every season. These gardens require a great deal of attention, and there is little time at the station to devote to flowers. About all the attention they get is in the evening after the regular day's work is done. Therefore, only the hardy varieties and those of easy culture are grown, such as sweet peas, pansies, pinks, asters, poppies, marigolds, daisies, and a few others. The sweet peas this year made a growth of over 8 feet, being trained to poultry wire in front of the cottage, throwing out a great profusion of flowers of many colors. (Pl. VIII, fig. 1.)

A pansy wheel with 16 spokes and having a circumference of 75 feet decorated a large plat in the front yard, aided by four great stars and two anchors, comprising 1,000 volunteer pansy plants from seed that fell from pansies the year before.

POTATOES.

The potato crop in the vicinity of Fairbanks in 1914 is estimated to have been about 400 tons. The station crop amounted to 1,000 bushels. About 900 bushels were grown on 6 acres of south slope land, 5 acres being new ground broken in the spring, and 100 bushels



FIG. 1.—PORTION OF FIELDS SHOWING RIPE GRAIN, FAIRBANKS STATION, 1914.



FIG. 2.—RIPE BARLEY, FAIRBANKS STATION, 1914.



FIG. 1.—BUCKWHEAT FIELD, FAIRBANKS STATION, 1914.



FIG. 2.—ALFALFA, THREE MONTHS FROM SEEDING, FAIRBANKS STATION, 1914. POTATOES AND GRAIN IN BACKGROUND.

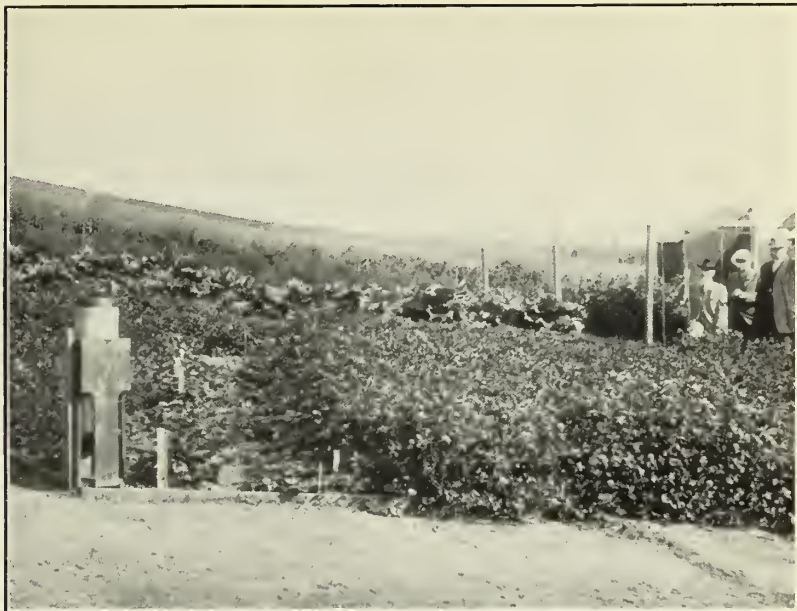


FIG. 1.—RED CLOVER, THREE MONTHS FROM SEEDING, FAIRBANKS STATION, 1914.



FIG. 2.—PARTIAL VIEW OF PLOTS, FAIRBANKS STATION, 1914. RHUBARB, TOMATOES, CORN, PEAS, ETC.



FIG. 1.—SWEET PEAS, FAIRBANKS STATION, 1914.



FIG. 2.—MOSS PLOW AT WORK, RAMPART STATION.

came from the thin north slope soil. An unusually early and prolonged cold wave visited this section of the country from September 14 to 21, 1914, damaging the potato crop all over the valley. Some farmers claimed a loss of half of the crop, others a loss of about one-fourth.

The station crop has been carefully sorted and 200 bushels of the 1,000 bushels dug have been discarded. It is expected that a very small percentage will be discarded at a subsequent sorting. Potatoes dug before the frost are of better quality than those that were still in the ground. The later dug tubers seem to have been injured, for many of them are not dry and mealy and have a slight sweetish taste, which was not perceptible before the freeze. At least it is so with much of the station crop.

Had the crop estimate materialized fully there would have been a considerable surplus of potatoes on the market, but under the circumstances it is thought that the entire crop will be cleaned up and that better prices will be maintained, which will offset in some measure the farmers' losses.

Much has been said in former reports on the culture of potatoes in Alaska, but for the benefit of those persons who may not find earlier reports available it is pertinent to repeat some of the very important points that the grower should know to obtain a good marketable potato in Alaska.

It is generally known that the conditions here are entirely different from those of more southerly farming countries. Everyone knows the seasons are short, and every advantage possible must be taken for an early start in the spring. Perhaps the most important point is to select high and dry soil, preferably with a southern exposure. To get a good yield rich soil is fully as important as in any other country. Rich soil induces rapid growth as well as an increase in the yield. Presuming the soil is in a good state of tilth, it will pay to plow it in the fall in very narrow lands, even in ridges, as for single or double rows. The snow water will disappear more rapidly in the spring. As soon as the soil is dry enough to work it should be turned back and cultivated deep and thoroughly, then planted north and south in rows $3\frac{1}{2}$ feet apart, the spaces between hills being governed by the richness of the soil. It also pays to fertilize liberally.

The seed pieces should lie 2 inches below the surface level. The ground is cold below and deep planting will not do; yet very shallow planting is dangerous, for the early summer is often dry and hot. Now, the seed should be sprouted before planting, and if the grower will take the trouble to root the seed pieces in boxes of earth, he will gain some advantage. It is the writer's opinion that the sprouting period should be of as short duration as possible. The tubers can be

left in the crate or sack and set in a very warm room with an abundance of moisture for two weeks, and nearly every eye will have started sufficiently for planting. The object in mind is to get all the eyes started together and not to let the sprouts get too long, as some would under other methods of sprouting. For some reason too many rough, knotty, and ill-shaped potatoes are found more or less all over the field in varieties that have been grown for several years. These rough, unsightly tubers are usually the very largest potatoes in the hill, often weighing more than all the rest of the hill. They are generally not fit for the market and have to be discarded as culls. Cultivation should begin as soon as the plants appear, and light ridging should be started with the second cultivation. The early part of the season is often too dry for early ridging, but it should always be done before the crop is laid by as a safeguard against an early freeze if for no other reason. It is better for the potato to stay in the ground until after the middle of September, but the weather is too uncertain then to take the chances. In 1914 digging started on September 11 at the station. It rained at night and continued wet until September 14, when it cleared and froze. For a couple of days it was impossible to dig in the afternoons, then the ground froze so hard that it did not thaw out all day. Freezing at night continued until September 21, after which the ground thawed and digging was resumed. Four days later it froze again, but most of the growers had finished digging. The effects of this unprecedented early freezing have already been noted (p. 43).

Eight of the better varieties from former plantings were selected and planted under field culture on the south slope. These comprised the Irish Cobbler, Extra Early Pioneer, Gold Coin, Burpee Early, Eureka, Ohio Jr., Extra Early Ohio, and Early Market. The red varieties, Burpee Early, Ohio Jr., and Extra Early Ohio, are very good yielders and cook better than any of the white-skinned varieties. They are a rather smooth, shallow-eyed potato, and the only objection to them is that the market demands a white-skinned potato, but many prefer these red varieties once they have tried them.

Extra Early Pioneer is a white, smooth potato of excellent quality here and promises to become a leading variety. Irish Cobbler has been the heaviest yielder, but Gold Coin did equally well this year. However, both produced a great many rough, knotty tubers unfit for market.

THE TURNIP CROP.

In the spring of 1914 about two-thirds of an acre of good soil was selected and seeded to yellow Petrowski turnips with a No. 4 Planet Jr. seed drill in rows 16 inches apart for convenience in cultivation. The crop was thinned and cultivated in season and amounted to 325

bushels. One hundred and fifty bushels of the choicest turnips were selected and stored in the cellar, while the discarded portion of the crop was set aside for hog feed during the winter months.

STOCK RAISING.

More or less has been said on this subject in former reports. The industry is developing very slowly, owing to the cost of production and market value of feed.

Hogs are the only animals raised on a commercial scale, and there is some doubt as to whether there will be any profit in raising them. Nearly all of the potato growers keep a few hogs to consume the culls and inferior tubers that can not be sold for table use, but more or less imported feed has to be bought and added to the potatoes, so it is doubtful if there is any profit left.

The station has imported six Duroc-Jersey registered hogs, including one male, for the purpose of introducing thoroughbred stock into the country and also to try out the profitableness of the industry from a commercial standpoint. Two of the oldest sows farrowed in August, and the station has seven sows and three boars from these two litters, now 11 weeks old, weighing 531 pounds, or about 53 pounds each. Two of the younger sows bred after the stock arrived and before substantial pens were erected. These sows farrowed at the end of October, which is considered too late for pigs to do well. Only two of one litter lived, while five of the second litter are still alive, but the sow will not be allowed to raise more than three or four of these. The sows will all be bred again to farrow late in March, which is considered early enough by those having experience in raising hogs in this country.

The old station team was sold last fall and a span of mares sent in over the trail in the spring. (Pl. IV, fig. 2.) Both of these mares proved to be in foal and one of them got seriously strained on the trail by breaking away from the trail and plunging in the deep snow. They were landed at the station late in April and the strained one foaled a mare colt six days after arrival, which was probably two months early. The colt died on the sixth day. The other mare foaled a mare colt on June 13. This colt is doing well and gives promise of making a good work animal.

There are two small dairy herds in the vicinity of Fairbanks, but the calves are sold for veal and the herd replenished by importing new stock.

STATION IMPROVEMENTS.

Five acres of newly cleared stump land was broken and prepared in the spring for potatoes. The stumps and rubbish were burned from 3 acres more. Stumps were blown out with powder from a couple of acres and the brush burned from about 3 acres of stump

land. The timber was slashed from 2 acres of hill land of deadened timber above the buildings. Also some 20 acres of small timber was slashed between the station south slope fields and the railroad. Five acres of stump land was thoroughly cleared ready for the plow; this was done by contract. In addition to the above some 10 acres of timbered land was slashed and the wood removed last winter by wood choppers. The same men will slash and remove the wood from 20 acres this winter, and it is the plan to clear the major portion of this land of stumps and rubbish, ready for the plow, before the end of the fiscal year 1915. It should be said that the fire has run over this section of the reserve, partially killing the timber, and inasmuch as the timber is small, it is to the station's interest to get the timber off the ground without cost. If the slashing of the timber could be done about two years previous to the actual clearing and pulling of the stumps, the clearing would cost only about two-thirds of what it will cost to clear the land next year.

The last season 375 linear feet of corduroy bridging was done on the station, crossing swales to the fields on the north side of the reservation. A hog house 25 by 40 feet was built of lumber by setting 6-inch studding in walls, boxed on both sides and filled in with earth. Then 2 inches of earth was placed on the ceiling floor to conserve the warmth. The building was covered with corrugated galvanized iron, a door put in either end, and three windows on either side. The interior was divided so as to give three pens on one side and four on the other, with an aisle down the middle. Space was reserved on one side and at the middle of the building for a stove and cooking furnace. It is found that the pens will have to be floored. This building makes comfortable quarters, with very little fire.

A 4-inch well was drilled in the fall to a depth of 80 feet. Four-inch galvanized casing was driven, a deep-well pump installed, and a winter house 6 by 7 feet built over it.

Thirty acres was summer plowed and 20 acres of new ground, broken the summer before, was disked and harrowed, the roots picked off, and put in shape for spring seeding.

FARM MANAGEMENT.

This is a study of the business side of farming and involves the factors that count for success or failure. It is probably more vital in Alaska than in the more favored divisions of the country. The first and perhaps the most important step will be to study the soils; then should follow the study of the climate, crop production, harvest, and market.

The fundamental principles involved in crop production are soil fertility, rainfall, and sunshine. In most parts of Alaska the soil is thin and comparatively new. It seldom produces a crop the first

year, except where the fire has run over it, burning the timber and moss. Fair results have been obtained by breaking the soil early in the summer and leaving it just as the plow turned it over until the following summer, so the sun and air can act more rapidly on it. Then, by seeding every other year and by frequently stirring the soil with some kind of a cultivator during the year the land is resting, fertility is maintained for some years at least. Similar results are obtained when the land is planted to potatoes or other root crops that require clean and thorough cultivation in rotation with grain crops. However, the grain crop is improved and not the root crop by this method. Infertility may be explained in part by the fact that the ground freezes in October and remains frozen until early May, or about seven months in the year, when little or no change takes place in the soil, and plant food does not become available rapidly enough to produce a fair crop every year.

On the heavier soils of the southern slopes, where the rays of the sun get more chance for action and where the vegetation has been more luxuriant, the decay of vegetable matter more rapid and more abundant, good crops have been obtained for five successive years under the method of crop rotation, with an increase rather than a decrease in yield. This soil, at the fifth year, has lost its loose, friable texture; it breaks up very lumpy and packs too closely for proper aeration, making it necessary to cultivate root crops after every rain.

Similar ground, planted to potatoes two years, wheat the third, potatoes the fourth, and wheat again the fifth year, made a crop that any farming country might well boast of, notwithstanding the fact that the soil, by nature and from the effects of very heavy beating rains, had run together and baked until it seemed as hard as a well-traveled road.

It is very apparent that such soils will frequently require some kind of a straw crop or other litter turned under. Fertility seems to be improving, however, as fourth-year ground seeded to oats following potatoes made so rank a growth that the whole crop fell soon after it headed, and wheat on the fifth-year ground made as good a crop as the writer has seen anywhere from Indiana to California.

Along the rivers on the more sandy soils the crops are usually light and more or less uneven unless some kind of a fertilizer is used. The gardens and farms in the vicinity of Fairbanks on these sandy soils are fertilized heavily, and as a result they produce crops almost if not quite as good as those of any State in the Union, according to statistics. Sixteen tons of cabbage have been taken from one-half acre in one crop, and potatoes at the rate of 25 tons per acre on town lots. At this station potatoes have yielded at the rate of 18 tons per acre, with one heavy dressing of stable manure, while the same kind of soil, under natural conditions, produced only 10 tons per acre.

On the lighter station soils the potato crop has been doubled in yield by a single dressing with nitrate of soda at the rate of 300 pounds to the acre, sown broadcast and harrowed in before the seed was planted. The same kind of soil has trebled the oat crop with a single dressing of nitrate of soda at the rate of 200 pounds to the acre, sown broadcast and harrowed in, after which the grain was drilled in. These and various other observations indicate that liberal fertilizing will be generally profitable in Alaska.

The climate and weather of Alaska have been treated in every annual report of the stations, for it is realized that they determine crop production to a large extent. If seeding can be done about the middle of May and the season is normally favorable for crop growth, early varieties of grains will mature, especially oats and barley, and early spring wheats usually will ripen under such conditions. Early varieties of oats and barley generally will ripen if sown any time in May, but it is well to sow all grains as early as the soil is dry enough to work. The earlier the seeding is done the earlier will be the harvest. Grain cut after September 1 cures very slowly and is more apt to be damaged by rain or frost, as it requires a longer period of time for curing or drying.

The market in the Fairbanks district is exceedingly limited and it is probably the same throughout the interior. The producer is dependent on the population of his own settlement or near-by mining camp for the consumption of his products. Farming under these conditions makes competition keen and often causes rivalry among the producers.

Vast quantities of farm products have been imported from the States which could and should be grown in the Tanana Valley. Many hundreds of tons of canned vegetables and meats, dairy and poultry products, grain, hay, and potatoes are imported annually to the discouragement of home industry. If the farm enterprises could be protected by eliminating these importations, at least as fast as the home industry can be developed to supply the country's needs, a new era would begin.

The coming of the Government railroad will bring many new settlers to the Territory and competition will become even more acute than it is now.

REPORT OF WORK AT RAMPART STATION.

By G. W. GASSER, *Superintendent.*

CLIMATIC AND GENERAL CROP CONDITIONS.

Normal winter weather prevailed except for windstorms, which were frequent and unusually severe during December, the temperature during such storms running as low as -30° F. Trails were obliterated and the snow from the wind-swept fields piled in deep

drifts about buildings and across trails. After the holidays quieter and steadier weather prevailed. The first thaw came early in April, the month continuing mild until the last week, when hopes of an unusually early spring were shattered by 10 days of cold. However, by May 1 much of the field was bare of snow. The higher portions were dry enough to cultivate as soon as the frost was out sufficiently deep to permit harrowing. On May 5 the harrow was started, when one-fourth acre was prepared and seeded to carrots. Three days later, on adjoining high land, eight crates of turnips were planted for the production of seed. From then on the weather continued mild and the ground was harrowed as fast as it dried off. Except for some low wet land, seeding was completed by May 26.

Compared with the previous years the growing season was not favorable. The latter part of May was cool and rainy. With June came clear, hot days and very little rain, only one-half inch. There were five days having a maximum temperature ranging from 90° to 92° F. in the shade. By the end of the month crops had received a severe setback. Fortunately, with July came more favorable and quite normal weather, and the change was timely, for the grain was headed and beginning to bloom. But the handicap carried by dry weather in June became more evident as August came on, for grain that usually ripens by the middle of the month this year ripened fully a week later. Again, the first frost of the season came earlier than usual (Aug. 18, one day earlier than last year). Potato tops were frozen to the ground. Cool, pleasant days then prevailed until well into September. As a result grain ripened slowly and the potato stalks started new growth at the surface of the ground.

GENERAL WORK OF THE SEASON.

During the summer 5 acres of land was cleared on the hillside back of the farm cottage. Fires had burned practically all of the moss, and most of the stumps were rotten, making clearing comparatively easy. The field slopes toward the river but is not cut up by draws. It will be valuable for very early seeding of grain and for potatoes. It was hoped that this high land would escape the early fall frost, but trial plats of potatoes and buckwheat were killed as early as on the lower land. On 10 acres of bottom land the wood and brush were piled in windrows and the "niggerheads" and roots piled on top. Next June, during the prevailing dry weather, the strips between the windrows will be torn up with a moss plow to facilitate the drying out of the moss. (Pl. VIII, fig. 2.) When thoroughly dry, fire will be applied. All this ground has been burned over three times and much moss destroyed, but in the wettest places where "niggerheads" and green moss constitute the covering, the method outlined above will obviate the tedious and expensive task of hand stripping with mattocks. A 5-acre strip of this bottom land wa

cleared off last year, but not fall plowed because it was too wet. Not until the middle of June could a team be put on the land. Two acres was then disked and seeded with a mixture of barley and oats for hay. About a half acre, the drier portion, made a good crop. Elsewhere the growth was short. This fall the field was laid out in lands in such manner that the dead furrows converge at the lowest point, draining the land, so that next year it will dry off earlier. As soon as possible this bottom land will be laid off into permanent fields, and, if necessary, subsoil drains made.

As planned last year, another shed was added to complete the barn. In this shed a room 16 by 22 feet was built up of logs to the eaves. The rest of the shed completes the driveway, 18 by 50 feet, which is used as a thrashing floor. In the log portion a galvanized storage tank 10 feet in diameter by 10 feet in height was sunk below the level of the ground into a corduroyed excavation. After the tank was in place moss was packed around it and between the top covering and the floor. This tank will store the rain water from the barn roof, 50 by 70 feet, and will be used to water the horses summer and winter.

A shed 9 by 40 feet was built along the front of the root cellar and ice house. This shed was needed because of the heavy drifts of snow that completely buried the doors and windows. It will be useful also as a place to store empty crates during the summer and wood during the winter, and can be used to lay out potatoes to sprout preparatory to planting.

ALFALFA AND OTHER LEGUMES.

The failure of most of the varieties to live through another winter has somewhat dimmed the rosy hopes of immediate success with alfalfa. The following varieties froze out: Yellow flowered—North Sweden, Cossack, Samara, and *Medicago ruthenica*; purple flowered—Grimm, Mongolian, Chernob, sand lucern, and Turkestan. The few that did winter successfully for the third time are *Medicago falcata*, Obb, and Gobi Desert. The last two are recumbent and did not ripen seed last year (1913), hence are less valuable than *Medicago falcata*, which grows erect, podded freely last year, and ripened considerable seed. This year there were plenty of pods but none ripened. This plat is as nearly perfect after three winters as it was the first summer, and the growth is vigorous; in fact, the stand is better because of the many young plants produced by last year's seed crop, some of which was shattered when harvested. Next spring these young plants will be transplanted into rows 28 inches apart and 18 inches in the row so as to permit of cultivation and to emphasize seed production.

The alfalfa seed that ripened last year was seeded thinly in rows 28 inches apart, covering about 1 acre, the greater part of which is

Grimm. (Pl. X, fig. 3.) Other varieties are sand lucern, Mongolian, Chernob, and *Medicago falcata*. With the exception of the last named a good stand was secured and a vigorous growth resulted, standing knee-high by the end of the season. The newly seeded plot of *Medicago falcata* is on a knoll and the poor stand and light growth are no doubt due to the drier and poorer soil.

Field plots of about one-eighth acre each were seeded to *Vicia cracca*, Semipalatinsk, and Disco. Of the latter, there were four plots of the same variety but different strains. *Vicia cracca* is a vinelike plant much resembling winter vetch. A small plot seeded four years ago made quite a satisfactory growth each season. A good stand was secured this year and a fair growth by the end of the season. Cossack and Semipalatinsk are yellow-flowered alfalfas. Previous seedings of these two lived over two winters but froze out last year (1913-14). Disco alfalfa is a purple-flowered strain grown in South Dakota and tried here for the first time.

Trifolium lupinaster again gave a good account of itself, ripening a fair amount of seed in a season so unfavorable that none of the alfalfas produced seed. A one-tenth acre plot was seeded this spring, using the seed ripened last year. While this plant is not as valuable as alfalfa from the standpoint of forage, its perfect winter hardiness and seed ripening propensity give it a permanent place in the experimental plots here. It is not improbable that these more desirable qualities could be combined with the more luxuriant growth of some allied plant.

It is expected that considerable time will be expended in the hybridization of alfalfa next summer. On the station farm are now several strong growing varieties of purple-flowered alfalfa, such as Grimm, sand lucern, Mongolian, and Chernob. None of these is perfectly winter hardy, although all wintered three years and ripened seed in 1913. In contrast with the above are the yellow-flowered varieties, notably *Medicago falcata*, Gobi Desert, and Obb, which so far have shown themselves to be perfectly cold resistant, but are not as strong growers as the purple varieties, nor do they seed as freely. The problem, therefore, is to combine these several factors by hybridization.

The plot of sweet clover, seeded in the spring of 1913 and which made such a fine growth that summer, winterkilled completely. From the behavior of several volunteer plants the year before it was hoped that sweet clover would winter and be valuable for a soiling crop and also for hay. But evidently it is not winter hardy under field conditions.

SPRING WHEAT AND SPRING RYE.

Thirteen varieties of spring wheat were grown in experimental plots. Of this number only five are worth further trial. Of these

five Chogot leads, ripening 97 per cent by August 26, followed closely by Irkutsk, with 85 per cent ripe grain. Both are Russian importations as well as spring wheat No. 82, the third best. The grain is quite similar, being small, dark colored, fairly plump, and flinty. The chaff of Chogot is dark colored, while Irkutsk has light-colored chaff. The straw of both, though sturdy, was quite short, bearing short heads. Awns are scanty and short on Chogot and more pronounced on Irkutsk.

Considering that this was not a favorable year for ripening grain, the results obtained with these two varieties are highly encouraging. Quite a number of heads of the earliest varieties were cross-fertilized. This is the first trial of these varieties and, of course, further trials will be necessary to determine their adaptability to conditions here. But even if these should not prove highly successful some of their hybrid offspring doubtless will.

Of the three varieties of spring rye none fully ripened. Spring rye No. 80 ripened 30 per cent, and doubtless in a more favorable year all would have ripened. The heads were large and well filled, especially those of No. 125. These also were grown for the first time and are more promising than any tried heretofore. Like the earliest spring wheat, they are of Russian origin. A number of heads were cross-fertilized.

The following table gives comparative data regarding the varieties of spring wheat and spring rye tested at the station in 1914:

Description of varieties of spring wheat and spring rye.

Name of variety.	Station No.	Date seeded, 1914.	Date ripe or harvested, 1914.	Days maturing.	Ripened.	Height.	Length of heads.
Spring wheat:					<i>Per cent.</i>	<i>Inches.</i>	<i>Cm.</i>
Ladoga.....	126	May 12	Sept. 4	115	10	37	7.5
Romanow.....	127	..do.	..do.	115	2	36	8
Early Java.....	128	..do.	..do.	115	3	35	8.5
Macaroni.....	129	..do.	..do.	115	1	35	8.5
Velvet Chaff.....	130	..do.	..do.	115	5	36	10
Marquis.....	131	..do.	..do.	115	10	31	8
Hybrid.....	24 a-1	..do.	Aug. 30	110	6	35	9
Chogot.....	133	..do.	Aug. 26	106	97	27	6.5
Irkutsk.....	134	..do.	..do.	106	90	27	6.5
Red Fife.....	135	..do.	Sept. 4	115	4	33	9
Saskatchewan.....	192-1	..do.	..do.	115	-----	37	9
H. G.....	82	May 26	Sept. 9	106	50	31	9
Ulka.....	81	..do.	..do.	106	1	28	9
Spring rye:							
Mammoth.....	125	May 12	Sept. 4	115	2	46	12.5
Irkutsk.....	132	..do.	..do.	115	5	46	9.5
Gesselberg.....	80	May 26	Sept. 9	106	30	44	9

WINTER WHEAT AND WINTER RYE.

Of the three varieties of winter wheat planted in the fall of 1913 only one survived the winter. (See table, p. 59.) Durum had not been tried before and Klondike but once before, when a small percentage survived and produced excellent heads, fully ripe. Kharkov wheat

has been grown for seven years, and while it has never failed entirely neither has it been entirely successful. The essential fact brought out by this experiment is that hardiness can not be bred into a plant by selection. Each year, for seven years, only the hardiest plants were selected for the next year's seeds and it might seem that the weaker, that is, less winter resistant being eliminated, in a few years a strain 100 per cent hardy would be secured, but in this case the facts show that there has been no improvement whatever. That is to say, as large a percentage of plants winterkilled from pedigreed seed as from the original importation. There is, of course, a seasonal variation, also a variation due to location. For instance, several of the rye plats extended up on a high knoll where the winter winds cut the snow off. In every instance where the ground was exposed the rye froze out completely. However, the plat of Kharkov winter wheat was always located on ground that held the snow, hence the locational factor does not enter into the deductions given above.

Winter rye again scored a success. (Pl. IX, fig. 1.) Of the nine varieties only two showed a low percentage of stand in the spring, and that may have been due to location rather than lack of hardiness. As stated above, on wind-swept knolls where the snow is continually blown off, the rye winterkilled, but when the snow lay until melted the stand was from 95 to 100 per cent.

Where the stand was thin ripening was delayed, resulting in some shrinkage when cured. Where the stand was normal the grain and straw ripened much earlier, making a plumper kernel and allowing more time to cure before the usual fall rains came. Winter rye should prove to be a valuable crop for this northland. If sown in low land it is practically a sure crop. If cut early enough it makes a fair quality of hay, or it may be pastured with most excellent results either in the fall or spring. The value of rye bread for a human food needs no comment here.

The essential data regarding the varieties of winter wheat and winter rye grown by the station are given in the following table:

Description of winter wheats and winter ryes.

Name of variety.	Station number.	Date seeded, 1913.	Date ripened, 1914.	Height.	Survived.	Length of heads.
				<i>Inches.</i>	<i>Per cent.</i>	<i>Cm.</i>
Winter wheat:						
Kharkov.....	253-5	July 31	Aug. 31	26	5	8
Klondike.....	254-1	..do..	..do..	..do..	0	..do..
Durum.....	255	..do..	..do..	..do..	0	..do..
Winter rye:						
Rye.....	256-2	..do..	Aug. 22	50	100	12
Do.....	257-2	..do..	..do..	50	100	12
Do.....	258-2	..do..	..do..	50	100	11
North Dakota.....	259-5	..do..	Aug. 31	48	98	11
Monster.....	260-2	..do..	Aug. 27	48	90	13.5
Excelsior.....	261-5	..do..	..do..	46	50	12.2
Amber.....	262-5	..do..	..do..	46	50	12
Giant French.....	263-5	Aug. 1	..do..	46	75	12
Brandon.....	266-2	..do..	Sept. 1	44	95	11.5

BARLEY.

A considerable area was given over to hybrid and pedigreed barleys, comprising some 57 varieties and strains. (Pl. X, fig. 1.) In comparison with previous years the season's crop was below normal, due to dry, hot weather during June. The principal effect noticeable was the short straw and late maturing. Varieties that ripened on an average of from 80 to 90 days required this year from 90 to 100 days, or as much time as is usually required to ripen oats. And in this respect it is interesting to note that the oats ripened at the same time as the barley this year. Just why the barley was longer than common in ripening the writer can not say, since soil conditions, location, and seeding were the same as in previous years.

Two fields, 1 acre and three-fourths acre, respectively, were seeded with barley for hay June 6. This was wet land and did not dry off sufficiently to permit of earlier seeding.

These fields made a fine growth and a good crop of hay. A coincidence of some significance occurred in connection with this barley. During July, just as the barley was in bloom, there occurred a very light frost, but sufficient to blight the blossoms. As a result, practically every head was completely sterile. Nothing else on the farm was injured. The temperature fell to 33° F. Since the thermometer is on slightly higher land than these particular barley fields, no doubt the temperature was lower at the latter place. On the Rampart side of the river, just across from the station, tender plants were somewhat injured.

In point of earliness Pamir and hybrid 20 B-1 were again first and on a par, ripening in 78 days, or 7 days later than last year. A number of other hybrids ripened in from 85 to 87 days, all of which are hooded and the majority of them, hull-less barleys. Hansen and Swedish are equally early, but they are bearded and have very weak straw. Lodging is one of the main evils to overcome; consequently any barley that has a weak straw can not be counted on the list of eligibles. So far very few of the six-rowed types have proved satisfactory in this respect. The two-rowed types are much less likely to lodge, not entirely because the straw is stiffer, but because the heads are lighter and smaller and so collect less water during a rainstorm, and also offer less resistance to the wind. In either two or six rowed types those having nodding heads are more likely to lodge.

In the effort to maintain absolutely pure strains selections of single plants were made. Pure strains of a number of the most valuable types will be maintained in order to test out thoroughly their behavior under conditions here. A brief description of the different varieties of barley grown in 1914 is given in the table following.

Partial description of barley varieties grown in 1914.

Name of variety.	Station number.	Date seeded, 1914.	Date ripe, 1914.	Days maturing.	Height.	Head characters.	Length of heads.
					<i>Inches.</i>		<i>Cm.</i>
Hybrid.....	14 a-2-3.	May 11	Aug. 17	98	33	Hooded 6-rowed.	9
Abyssinian.....	111 B-1.	do.	do.	98	34	Bearded 6-rowed.	7
Urjala.....	113 B-1.	do.	Aug. 23	103	41	Bearded 2-rowed.	9
Hybrid.....	8 a-2-1.	do.	Aug. 4	85	28	Hooded 6-rowed.	7
Do.....	3 a-6-1-1.	do.	do.	85	35	do.	7
Hansen.....	116 B-5.	do.	do.	85	33	Bearded 6-rowed.	7
Hybrid.....	14 a-4-1.	do.	Aug. 23	103	36	Hooded 6-rowed.	8.5
Do.....	20 b-1.	do.	July 29	79	35	do.	7
Do.....	14 c-3-1.	do.	Aug. 23	103	38	Bearded 6-rowed.	9
Do.....	14 d-1-1.	do.	Aug. 6	87	44	Hooded 6-rowed.	9
Do.....	14 b-2-1.	do.	do.	87	44	do.	8.5
Swedish.....	117 B-5.	do.	do.	87	36	Bearded 6-rowed.	7
Hybrid.....	3 a-6-2-1.	do.	do.	87	37	do.	7
Do.....	3 a-6-1-2.	do.	do.	87	38	do.	8
Do.....	14 a-4-2.	do.	Aug. 20	100	36	Hooded 6-rowed.	8.5
Do.....	17 b-1.	do.	Aug. 23	103	37	do.	9
Do.....	14 a-2-2.	do.	Aug. 20	100	42	Hooded 2-rowed.	10.5
Do.....	1 a-4-1.	do.	do.	100	42	Hooded 6-rowed.	9
Do.....	20 a-1.	do.	do.	100	36	do.	8
Do.....	17 a-1.	do.	Aug. 14	95	43	do.	10.5
Champion.....	118 B-2.	do.	Aug. 10	91	40	do.	7.5
Hybrid.....	21 a-1.	do.	Aug. 20	100	38	Hooded 2-rowed.	7
Chittyna.....	119 B-4.	do.	Aug. 10	91	41	Hooded 6-rowed.	7
Hybrid.....	19 b-1.	do.	Aug. 8	89	34	do.	7.5
Urjala.....	120 B-1.	do.	Aug. 19	100	38	Bearded 2-rowed.	10
Finland.....	121 B-1.	do.	Aug. 7	88	35	Bearded 6-rowed.	6
Hybrid.....	14 a-1-1.	do.	do.	88	35	Hooded 2-rowed.	9.5
Yakutsk.....	123 B.	do.	do.	88	35	Bearded 6-rowed.	7
Hybrid.....	19 b-2.	do.	Aug. 22	102	38	Hooded 6-rowed.	8.5
Do.....	14 e-1-1.	do.	do.	102	33	Hooded 2-rowed.	7.5
Do.....	20 b-2.	do.	Aug. 15	96	34	Hooded 6-rowed.	8
Do.....	14 a-1-3.	do.	Aug. 20	101	34	do.	8
Do.....	22 a-1.	do.	Aug. 19	100	32	do.	8
Do.....	14 b-2-2.	do.	do.	100	37	Bearded 6-rowed.	10
Do.....	14 a-2-1.	do.	Aug. 20	101	41	Hooded 6-rowed.	9
Do.....	14 a-1.	do.	Aug. 18	99	32	Bearded 2-rowed.	8
Do.....	17 e-2.	do.	do.	99	35	Hooded 6-rowed.	8
Do.....	23 a-1.	do.	do.	99	33	do.	8
Do.....	21 a-1.	do.	do.	99	36	Hooded 2-rowed.	8.5
Painir.....	134 B-6.	do.	July 29	79	23	Bearded 6-rowed.	5
Hybrid.....	14 c-2-1.	do.	Aug. 18	99	39	do.	8
Do.....	14 a-4-1.	do.	do.	99	34	Bearded 2-rowed.	8
Hull-less.....	120 B-6.	May 12	Aug. 23	103	30	Hooded 6-rowed.	6
Hanna.....	121 B.	do.	do.	103	33	Bearded 2-rowed.	8
Eagle.....	122 B-6.	do.	Aug. 22	102	43	do.	7
Ideal White.....	123 B.	do.	Aug. 19	99	33	Hooded 6-rowed.	6
Primus.....	124 B.	do.	Aug. 23	103	46	Bearded 2-rowed.	7
Suecess.....	126 B.	do.	Aug. 14	94	33	Hooded 6-rowed.	7
Koyukuk.....	129 B-1.	do.	Aug. 19	99	34	do.	7
Boehmer.....	130 B-4.	do.	Aug. 21	101	33	do.	6
Lapland.....	131 B-8.	do.	do.	101	38	Bearded 6-rowed.	7
Abyssinian.....	132 B-6.	do.	Aug. 22	102	36	Bearded 2-rowed.	7
Do.....	133 B-6.	do.	do.	102	38	Bearded 6-rowed.	7
Wyoming.....	135 B-3.	do.	Aug. 19	99	36	Hooded 6-rowed.	6.5
Manshury.....	136 B-8.	do.	Aug. 22	102	38	Bearded 6-rowed.	7
Abyssinian.....	137 B-7.	do.	Aug. 19	99	38	do.	7

OATS.

Oats made the best grain crop of the season, although the season was unfavorable for most crops; every plat of oats fully ripened. One field of 3 acres was seeded with Finnish Black oats May 25, and while the growth of straw was not heavy, it bore well-filled heads and stood up until cut with the binder. After standing shocked until thoroughly dry, the oats were stacked in the barn, where they will remain until thrashed in the spring. In another field one-fifth acre plats of Norwegian and Finnish Black oats (Pl. X, fig. 2) were seeded, a one-tenth acre plat of Yakutsk and 1 acre of South Dakota. Most

of this ground had been in potatoes the previous year, consequently the growth was strong and the heads large and well filled. All were cut with the binder except the plat of Yakutsk, which lodged so badly that it had to be cut by hand. The table below gives the time of harvesting of each variety. A one-half acre field was seeded with Copperfield oats, which made a good growth and ripened early, but unfortunately it also lodged in places and it was cut with a cradle. This oats is a gray mutant of Finnish Black, but is inferior to that variety because of its propensity to lodge. All grains, both oats and barley, have been stored in the barn. Those from small plats will be hand thrashed this winter. From the larger plats the grain will be run through a small machine consisting of a cylinder and a fan, run by the gasoline engine that does service in the launch during the summer. A fanning mill is then used to separate the grain from the chaff. Among the needs of the station in the near future is a good thrashing machine, small, yet complete, and a suitable engine to run it.

A number of crosses of oats were made, using 25 A-1 and 25 A-2 as mother plants, and pollen from Yakutsk and South Dakota. (Pl. IX, fig. 2.)

Careful single plant selections were made of all the best varieties of oats grown. The following varieties of oats were grown at the station in 1914:

Partial description of oat varieties grown by the station.

Name of variety.	Station number.	Date sowed, 1914.	Date ripe, 1914.	Days maturing.	Height.	Color of berry.	Character of heads.
Hybrid.....	25 a-1	May 11	Aug. 11	92	<i>Inches.</i> 36	Black...	Panicle.
Do.....	25 a-2	do.....	do.....	92	32	Gray....	Do.
Do.....	25 a-3	do.....	do.....	92	33	do.....	Do.
Do.....	25 a-4	do.....	do.....	92	38	Black....	Do.
Irkutsk.....	112	do.....	Sept. 2	113	26	White....	Do.
Orloff.....	114	do.....	do.....	113	36	Black....	Do.
Black Tartarian.....	115	do.....	Aug. 30	111	37	do.....	Side.
Banner.....	117-3	do.....	do.....	111	36	White....	Panicle.
Ontario.....	116	do.....	Sept. 1	113	38	do.....	Do.
Ruakura.....	138	do.....	do.....	113	26	Yellow...	Do.
Beliak.....	79	May 26	Sept. 4	100	39	do.....	Do.
South Dakota.....	115-2	May 8	Aug. 10	94	40	Black....	Do.
Norwegian.....	117-6	do.....	Aug. 16	100	42	do.....	Do.
Finnish Black.....	118-6	do.....	Aug. 11	94	38	do.....	Do.
Yakutsk.....	119-6	do.....	Aug. 10	94	38	White....	Do.
Copperfield.....	139-4	May 12	Aug. 18	98	38	Gray....	Do.

POTATOES.

One acre of ground was planted with potatoes May 17 and 18. They were hand dropped in furrows and covered by a specially constructed drag in the same manner as last year. As usual, the ground was in excellent condition and a good stand resulted. The potatoes began coming up June 3 and were in bloom a month later. July 20

new potatoes were large enough to use. August 18 the tops were completely frozen to the ground. Digging was begun September 15 and finished September 17.

The crop was considerably below average, due to a combination of poor soil, dry June, and early August frost. This year's result again emphasizes the fact that the hillside land on the farm is too poor, if unfertilized, to grow successful crops. However, the object in growing potatoes on the experiment farm is not altogether for the immediate crop, but largely to prepare the land for succeeding crops of grain. Experiments, both here and at the Fairbanks Station, show that crops following potatoes do better than on summer fallow. However, selection of the most promising varieties was continued.

Fifty-three varieties were grown, including Irish Cobbler, Burpee Superior, and Extra Early Pioneer, which constituted the main crop. In determining the percentage of yield Irish Cobbler was taken as standard. Next year lowest yielding varieties will be discontinued. The best yielders will be given another trial and at the close of the season will be tested for quality. The following table gives a partial description of the varieties of potatoes grown at the station in 1914:

Partial description of varieties of potatoes grown at the station.

Name of variety.	Date planted, 1914.	Date harvested, 1914.	Color of blossom.	Color of stalk.	Color of tuber.	Shape of tuber.	Character of eyes.	Relative yield.
Pioneer.....	May 17	Sept. 15	White..	Green..	White.....	Round.....	Shallow...	60
Commercial.....	60
Snowball.....	White..	.....	Pink.....	.....	Shallow...	60
Knowles Big Cropper.	White.....	Long and flat.	Very shallow.	75
Cambridge Russet.	Moderate..	40
Irish Cobbler.	Purple	.....	Round and irregular.	.....	100
Early Six Weeks.	Green..	.....	Long and flat..	.....	110
Carman No. 1..	Oval and flat	.....	95
Late Puritan..	Flat.....	Shallow...	110
Early Harvest.	Moderate..	100
Burbank.....	Purple	Purple	.....	Flat.....	.....	100
Empire State..	White..	Green..	.....	Oval and flat..	.....	100
Clark Seedling.	100
Early Fortune.	90
Market Prize..	Pink.....	Oval and round.	.....	75
Bliss Triumph	White.....	Long and pointed.	.....	110
Dakota Red.....	Red.....	Round.....	Deep.....	100
Columbus.....	White and pink.	.....	.....	40
Noroton Beauty	Sept. 16	.....	.....	Red.....	.....	Moderate..	95
Burpee Superior.	White.....	Long and flat..	Shallow...	100
Piqua Chief....	Purple	.....	White, pink eyes.	Round.....	Deep.....	75
Extra Early Vermont.	White..	.....	Red.....	Round and flat.	Moderate .	60
Early Rose.....	Pink.....	Long and flat..	.....	90
Late Rose.....	White.....	Oval and flat..	.....	60
Million Dollar.	May 18	.....	.....	.....	.....	Long, pointed ends.	Shallow...	80
California Golden Russet.	Long and flat..	.....	20
Lightning.....	Round and flat.	Moderate..	75

Partial description of varieties of potatoes grown at the station—Continued.

Name of variety.	Date planted, 1914.	Date harvested, 1914.	Color of blossom.	Color of stalk.	Color of tuber.	Shape of tuber.	Character of eyes.	Relative yield.
Red Pioneer...	May 18	Sept. 16	White	Green..	Red.....	Round.....	Moderate	40
White Harvest.	do.....	do.....	do.....	do.....	White.....	do.....	Deep.....	75
M a m o t h Pearl.	do.....	do.....	do.....	do.....	Pink.....	Long and flat..	Shallow...	80
Yukon Beauty No. 1.	do.....	do.....	do.....	do.....	do.....	do.....	do.....	40
R u r a l New Yorker.	do.....	do.....	do.....	do.....	do.....	Oblong and round.	Moderate..	80
F i l l b a s k e t Early.	do.....	do.....	do.....	Purple.	Red.....	Round.....	Deep.....	80
Extra Early Eureka.	do.....	do.....	do.....	Green..	White.....	Round and flat.	Moderate.	90
Thorburn LaFollette.	May 19	Sept. 17	Purple.	Purple.	Red.....	Round.....	do.....	80
Yukon Beauty No. 2.	do.....	do.....	White..	Green..	White.....	Flat, with broad ends.	Shallow...	75
Roosevelt.....	do.....	do.....	Purple.	Purple.	do.....	Long and flat..	do.....	35
Netted Gem.....	do.....	do.....	White..	do.....	do.....	Round and irregular.	Moderate..	85
Gold Coin.....	do.....	do.....	do.....	Green..	do.....	Oblong and flat.	Shallow...	40
White Ohio.	do.....	do.....	do.....	Green..	do.....	Round and flat.	Moderate..	90
White Ohio.	do.....	do.....	Purple.	Purple.	do.....	Round.....	do.....	80
Epiure.....	do.....	do.....	White..	do.....	do.....	do.....	do.....	85
White Plume.	do.....	do.....	do.....	Green..	do.....	Round and flat.	do.....	70
Uncle Sam.....	do.....	do.....	Purple.	do.....	do.....	Round and flat.	Shallow...	90
Keeper.....	do.....	do.....	White..	Purple.	Red.....	Round.....	Deep.....	75
Woods Earliest	do.....	do.....	Purple.	do.....	White and pink eyes.	do.....	Shallow...	75
Green Mountain.	do.....	do.....	White..	Green..	White.....	Round and flat.	do.....	90
State of Maine.	do.....	do.....	do.....	do.....	Red.....	Round and flattened.	Moderate..	90
McCormick.....	do.....	do.....	do.....	do.....	Pink.....	Round.....	do.....	40

VEGETABLES.

The garden planted was as usual this year except that considerable more space was given to peas. As heretofore, the peas were sprouted in sawdust about a week before planting. This requires more work, but the extra time and labor are well rewarded by a perfect stand, extra early pods for the table, and ripe seeds for the next season's planting. About 200 hills of Irish Cobbler and Burpee Superior potatoes were also sprouted in sawdust-filled flats. When planted, each seed piece was a mass of roots and had stocky sprouts from 2 to 4 inches long. They were planted May 22 and began blooming 12 days later. In spite of the fact that the tops were frozen to the ground August 18, several days earlier than normal, a most excellent crop was dug, several potatoes weighing a little over a pound each. However, it was quality rather than quantity that was sought; and in that respect the result was all that could be asked. The potatoes cooked drier and were of better flavor than the field grown.

It must be remembered that the seed potatoes for the field were also sprouted before planting, only not to the extent of growing roots on the seed pieces. Of course, such a method can be carried out in a small way only. But for the garden it will be found well



FIG. 1.—FIELD OF RIPE WINTER RYE, RAMPART STATION, 1914.



FIG. 2.—HYBRIDIZING OATS, RAMPART STATION, 1914.

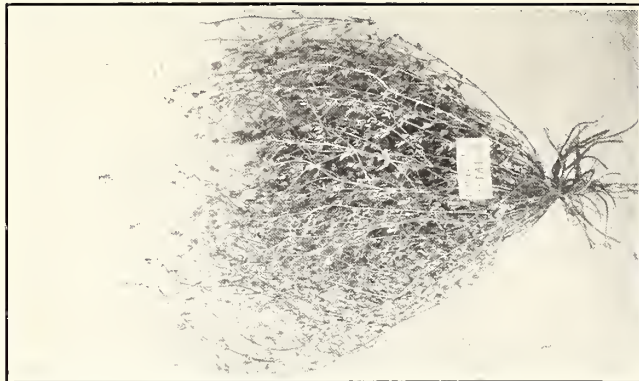


FIG. 3.—GRIMM ALFALFA, RAMPART STATION. THREE-YEAR-OLD PLANT.

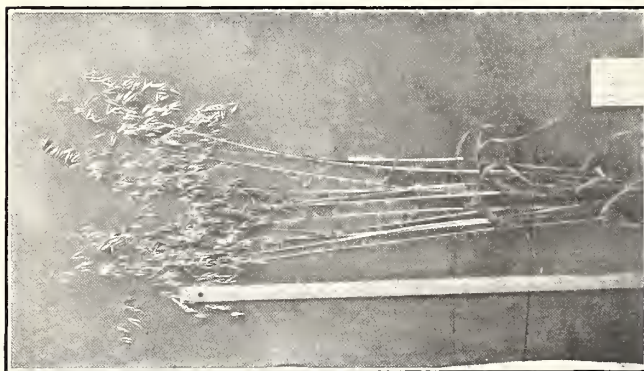


FIG. 2.—FINNISH BLACK OATS, RAMPART STATION.



FIG. 1.—HYBRID SIX-ROWED BARLEY, THIRD GENERATION, RAMPART STATION.

worth while. Simply take a shallow box, a milk case ripped in two edgewise answers admirably for two, sprinkle a layer of sawdust, sand, or pulverized soil in the bottom, lay in the seed, then cover, filling the box level full. Put in a moderately warm place and keep moist. This should be done at least six weeks before planting time. If kept too warm and dark, the sprouts will grow long and spindling, a result which should be avoided.

A number of varieties of broad beans were tried out in the hope that some might mature, but they were caught by the early frost, which injured some to the extent of killing all the pods. On a few plants, only the young pods suffered. The leaves of all were but slightly injured.

The varieties were Sutton Giant Windsor, which grew to a height of 16 inches; flowers, white with purple and black centers; no pods formed. Brown Hangehow, purple flowers, no pods. Beck Dwarf Green Gem, white flowered, no pods. Green Hangehow, flowers purple striped with black centers, bore an abundance of pods, some of which were 4 inches long. This variety was less injured by frost than others. Pamsea, flowers same as Giant Windsor, not prolific but bearing large pods. Mureiana, flowers same as Giant Windsor, grew large pods, some being 7 inches long. Sutton Green Giant, flowers same as Giant Windsor, fairly prolific, largest pods 5 inches. The beans of several varieties were cooked and found to be very savory.

Tripl plats of several types of turnips were grown and gave promising results. The type shape is similar to a rutabaga, but the roots are smooth without laterals. Color, bright yellow. One variety had a purple top. They are of most excellent flavor when cooked. The best roots will be planted next year for the production of seed. The varieties grown are Ostersundom, Bortfelder, Yellow Swedish, Bangholm, and Yellow Tankard.

Several pounds of turnip seeds were produced. The seed, as usual, is plump and heavy with a high percentage viable. More space will be devoted to the production of turnip seed, especially the variety known as Petrowski. This is a yellow imported sort and wherever grown in Alaska has evoked words of praise.

Half a dozen roots of white winter radish were put out early in the spring. Three of them produced large plants which podded freely and by fall the pods were filled with large, plump, ripe seed. Like most root crops grown in Alaska, winter radish attains great perfection. They may be eaten as a relish and make a most excellent salad throughout the long winter season.

REPORT OF WORK AT KODIAK LIVE STOCK AND BREEDING STATION.

By M. D. SNODGRASS, *Superintendent.*

Changing conditions at Kodiak since the fall of volcanic ash in June, 1912, have occasioned some changes in work undertaken the past year. The erosion during the past winter was even greater than the first winter after the ash fall. The heavy westerly winds during November, 1913, and March and April of this year, carried vast quantities of ash from the mountain tops and sides to the lower levels, and into the ravines and canyons in the mountains, and thence to the flats below by the subsequent heavy rains of December and June. Some 25 acres of grass, seeded in 1913 on slopes and beach land where the wind has free sweep, was practically blown out or killed during March and April. Eleven acres of grass seeded last year was plowed up and put into crop this season. The remainder of grass seeded was left to stand. Some 30 acres of mixed grasses withstood the winter winds and made promising growth this season. Some 15 acres of the beach lands will be reseeded another year, and given a surface dressing of manure to prevent the blowing out again. All portions of the field that received manure dressing last year came through the winter in good condition.

The erosion around the buildings and in the feed lots was so great that it required considerable work with plow and scraper to make it possible to get over the ground with a wagon. Around the house and silos it was found necessary to sluice the ash away, as there still remained from 3 to 5 feet of ash. Sluice boxes were made to carry water from a small stream near the house, and over 2,000 cubic yards of ash was sluiced off. Forty rods of fencing covered with ash, along the foot of the mountain, was uncovered by sluicing.

Streams are still cutting new channels in some places, caused by the shifting and building up of the ash in the old channels. More road and bridge work was necessary as a result of this.

The season was unfavorable for seeding and growing spring crops in the ash, due to the heavy rains of May and June, which packed the ash so hard that much of the grain and grass seed was unable to push through the hard-crusted ash. This resulted in a poor stand, in addition to the unfavorable circumstances.

The grain seeded on the ash was nearly a total failure, and necessitated a great deal of work in getting sufficient feed for maintaining the live stock through the winter. It was necessary to go back through the timberlands to the small natural parks, in which the native bluetop grass had come up through the ash and had grown luxuriantly. A number of small parks from 1 to 10 acres in area furnished

abundant hay and silage, but necessitated hauling from 2 to 3 miles. This long hauling made the work more expensive than was anticipated.

The moving of the herd of cattle from Chehalis, Wash., to Kodiak made it necessary to repair or rebuild nearly all of the fencing at Kodiak and to build more fence at Kalsin Bay, to keep the cattle off the grain and grasses seeded this year. So much of the fencing at Kodiak had been cut by the native people during the past two years that it was found necessary to take all the wires down and reset all the posts near the village. In resetting the posts, the fence lines were straightened and two extra wires were added, making a five-wire fence around the pasture of some 50 acres; and an extra wire around a 200-acre pasture, making a four-wire fence around it. Some 300 new posts were set in these fences, including new corner and brace posts throughout. All were put in first-class condition and made calf-tight.

The dairy barn was completed by putting in cement floors with gutters, and fitted with iron stalls and stanchions, and feed mangers of wood. The haymow floor was extended to cover the whole of the barn, 30 by 60 feet. A grain room was added and stalls built for four horses. Floor space of 10 by 20 feet was reserved for storing machinery.

At Kalsin Bay 160 rods of three-wire fence was built, and all of the feed lots were rebuilt. Here it was necessary to put in new corner posts. The posts were cut from cottonwood growing on the reservation.

A sheep shed 20 by 80 feet was built as a lean-to along the side and one end of the horse barn. Feed racks were placed in half of this shed for the feeding of the sheep this coming winter and the other half is used for machinery.

The water pipes, put in five years ago to carry water from a small stream to the house and stock tank in the feed yard, were choked by the ash carried by the water after each rain, so it was necessary to put in larger pipes to insure water for the stock during the winter. Two hundred feet of the $\frac{3}{4}$ -inch pipe were replaced by 2 and 3 inch pipe and necessary drains were put in to insure against the choking of the pipes with ash.

The work of caring for the live stock during the past winter occupied the time of Assistant C. W. Heideman at Kodiak, where sheep and horses were kept. Assistant Laurence Kelly and the writer were occupied caring for the cattle at Chehalis, Wash.

A public sale was held at Chehalis on December 22, 1913, at which 48 head of pure Galloways were sold for breeders. Three head were sold for beef prior to that date and 16 head have been sold for breeders at private sale since that date. The remainder of the herd was wintered there and kept on pasture until July 14. Fifty head of the

selected Galloways were returned to Kodiak July 25, consisting of 3 bulls, 30 cows and heifers over 1 year old, and 16 calves. The herd was moved without mishap, and the cattle came through in good condition. One calf was born at sea.

The writer returned to Kodiak on May 5 for the season's crop work, bringing the team and wagon from Chehalis, cement, stanchions, and stalls for the dairy barn, 7 tons oats for seed and feed, 1 ton seed barley, one-half ton seed wheat, 1,200 pounds grass seed, a new land roller, and a specially constructed deep-plowing gang plow.

On July 25 this station received the following list of machinery and lumber:

A 12-horsepower portable gas engine, a silage cutter, mounted (Pl. XI, figs. 1 and 2), a 10-foot side rake, an 8-foot hay loader (Pl. XII, fig. 1), and 3,600 feet of lumber for completing the dairy barn and the cottage at Kalsin Bay.

Two tons of barbed wire was purchased here at Kodiak for fencing, also 1,000 feet of heavy planking for flooring half of the horse barn at Kalsin Bay.

CROP WORK.

Field work was begun on April 4. The frost was out of the ground and the hillside land was in condition to plow. Light freezing at night caused some inconvenience, but seldom delayed the field work for more than a day at a time. The light rainfall for the month was favorable for the work. The hillside plow was used to good advantage and did good work in turning under the ash and throwing up the sod beneath the ash on all the steeper hillsides. The plow was followed with the harrow several times over the same ground until it was smooth enough to disk. It was then double disked and given another harrowing. The heavy sod was fairly torn to pieces with the harrow disk. A fairly good seed bed was obtained, and then the grain was put in with a press drill. The drill was followed by the land roller, which left the ground smooth and well pulverized on the surface. By May 11 some 16 acres of hillside land had been plowed and put in condition for seeding. Seeding was begun May 12. Rain delayed seeding from May 18 to May 22. Seeding was finished at Kodiak on May 23. All tools and teams were moved to Kalsin Bay on May 26 and 28.

The work of restoring vegetation on land covered with volcanic ash, too deep to turn under with a plow, was resumed. The surface of the ash was packed very solid and required double disking. The disk was followed with the smoothing harrow, and seeding of oats was begun June 6, with both the disk and press drills. Seeding of grain was finished June 19. The heavy rains from June 14 to 18 packed the ash surface very hard. The work of applying fertilizer at

the time of seeding was given up on account of the dampness of the air, which caused the drill to clog with the nitrate of lime. Fifty-nine acres of grain was seeded on the ash and given a dressing of 240 pounds of nitrate of lime per acre as a top-dressing, immediately following seeding, by using the fertilizer drill for the greater part of the field. Some of the fertilizer that had absorbed moisture during the past year sufficient to cause it to harden, was dissolved in water and spread by means of a homemade sprinkler, consisting of a 10-foot cross pipe, containing small holes for sprinkling the solution, and a larger lead pipe extending from a barrel hauled on a wagon. In this manner it was possible to use all the hard lumps of fertilizer that could not have been used otherwise without waste.

A mixture of grasses was seeded by means of a hand seeder following the grain drill on 12 acres of beach land. Further seeding of grass on the ash was abandoned, because of the packing of the ash by the heavy rains.

Between June 22 and July 15, 8 acres of hillside land at Kodiak was cleared of alder and willow and put in condition for seeding grass by means of a heavy harrow, which tore to pieces the tops of the hummocks showing through the ash, and mixed the soil with the ash. The land was left smooth and made an excellent seed bed for grass. A mixture of clovers and grasses was sown July 15, resulting in a good stand throughout.

The specially constructed gang plow, purchased last spring, is here briefly described: The purpose for which the plow was constructed is to turn under 6 to 8 inches of volcanic ash, which could not be done with the ordinary plow. A common riding gang plow was altered by lengthening the beam of the forward plow and setting it to plow 5 inches deeper than the after plow. The frame was altered so as to allow free lever action for the forward plow, which cuts its furrow from the bottom of the furrow made by the after plow in the previous round and turns up the subsoil, while the after plow cuts a furrow from 4 to 6 inches deep and throws the surface of the ground into the bottom of the deep furrow to be covered with the subsoil. In this condition, the soil is easily mixed with the ash by means of disk and harrow.

Owing to the rush of work in the early spring in getting the crops seeded, little work was done with this plow, excepting a trial test. It was found to be very heavy work for four horses when working in sod beneath the ash. The draft of the plow was so heavy that it was impossible to plow more than a half acre a day with four horses. It will be necessary to use six horses to operate this plow successfully. During the fall 6 acres of beach land was plowed, but the ash was too deep to turn under as desired, although considerable old soil was turned up and mixed with the ash. Where the ash was not more

than 6 inches deep, the plow did good work and turned up 3 to 4 inches of old soil from beneath the ash.

Bluestem wheat was seeded with and without oats for hay on the hillside land at Kodiak. That seeded with the oats made a better growth than when seeded alone. At Kalsin Bay wheat was seeded with oats on ash.

Vermont hull-less barley was seeded with oats in the same manner as the wheat, both on hillside land and on the ash. The result was that barley seeded with oats made a better growth than when seeded alone.

On the hillside land fertilizer tests were made on wheat, oats, and barley plats with the following fertilizers: Fish guano, muriate of potash, fish and bone, bone meal, double manure salts, sulphate of potash, nitrate of lime, and nitrate of soda. The first six fertilizers named were used separately on small plats and in combination with nitrate of lime on the same sized plats, on the three kinds of grains. The test was made on land broken up for the first time this spring, in which from 4 to 6 inches of volcanic ash was incorporated. The results were far from satisfactory, with the exception of plats given nitrate of lime or soda. Little response, even to the nitrates, was noticeable in the barley, while the wheat responded fairly well, and with the oats there was marked difference between the plats receiving nitrates and those receiving none.

Bluestem wheat made a good stand, but grew slowly and unevenly until late in July, when the growth was more vigorous. It began heading out August 15, but was not fully headed until September 15. The height was very uneven, ranging from 20 to 36 inches where sown alone. With oats, it stood from 30 to 40 inches high. It was cut for hay September 24, and stored in the haymow September 26. The yield was about one-third ton per acre of the most excellent hay.

Hull-less barley seeded May 22 made a fair stand, but grew very slowly throughout the season. It began heading August 1, at about 8 to 12 inches high. The most of it filled short heads and was nearly mature when cut for hay on September 24. The hay was short, cured easily, and the yield was about three-fourths ton per acre.

Oats and wheat sown together May 15 on plowed hillside land receiving 240 pounds nitrate of lime per acre made a good stand and grew well and evenly throughout the season. It began heading out early in August and filled fairly well. It was cut for silage and hay on September 26, and the yield was about 10 tons of silage and about $2\frac{1}{2}$ tons of hay per acre, respectively.

Oats seeded alone May 12 on hillside land cropped last year received 240 pounds of nitrate of lime per acre. There was about three-fourths stand which made fair growth and began heading out a little later than plats sown a few days later on land not cropped before.

The growth was even, but the straw was smaller and heads lighter, yielding only about 6 tons of silage per acre, while a plat not given any nitrate of lime gave a yield of about 5 tons per acre.

Cow kale was seeded May 22 on steep hillside land plowed the previous fall and harrowed well just prior to seeding. One acre was seeded in rows. It was later thinned and reset where the stand was poor. The growth was very slow until the first of August, when some of the plants began to make fair growth. A light dressing of stable manure was given a portion of the field. The manure was spread around the plant and later covered with soil with a hoe. There was noticeable response to the manure, and the plants made fair growth during August and September where manure was used. Without manure kale made but little growth and few plants grew more than a foot high. In October some unknown person cut the fence and let the town herd of cows into the kale patch and it was completely harvested.

This first attempt to grow kale for cattle feed shows that two things are necessary to grow it successfully on a large scale. The first is that the plants must be started in hotbeds to insure early growth; and second, that manure is necessary. It may be applied just around the plants in small amounts, or by a heavy dressing over all the ground. Successful growing of cow kale on a large scale will be a great boon to dairying in this country, where succulent winter feed is at a premium. Further experiments will be carried on next year.

Rutabagas were seeded May 21 on fall plowed hillside land without manure, and on ash with manure at the rate of 15 tons per acre. The growth was very slow on both plats and but few rutabagas grew to 3 inches in diameter. Those grown on the ash were the larger and contained less woody fiber. Turnips and rutabagas are usually a sure crop in this region and make a good yield. Further work with them will be carried on another season.

POTATOES.

A variety test of potatoes was made this season. Small duplicate plats of seven varieties were planted May 21 on ash that had received a light dressing of manure in 1913 and again this spring, and on new hillside land plowed the previous fall incorporating the ash, without manure. A fertilizer test was made on each plat. Every other hill was given a light surface dressing of potato fertilizer, without noticeable results. The potatoes were slow in coming up and made slow growth throughout the season. Those grown on the ash gave the larger yield, with larger and more mature potatoes. While the potato crop on Kodiak Island was practically a failure this season, owing to a very unfavorable growing season, sufficient results were

obtained to show that a few varieties were not adapted to soil and climatic conditions of this region. Those tested were Hamilton Early Rose, Gold Coin, Clark Alaska Seedling, Freeman, Burpee Superior, Extra Early Ohio, and Irish Cobbler. The Extra Early Ohio, Clark Alaska Seedling, and Irish Cobbler were the better producers. Burpee Superior was a fair producer, but the potatoes were small. The other three varieties did not return as much seed as was planted.

VEGETABLES.

While the season was unfavorable for general field crops, it was quite favorable for a number of vegetables. Radishes, lettuce, carrots, cauliflower, and cabbage did remarkably well this season. Radishes and lettuce came on fairly early and lasted well through the fall months. By planting every three weeks, sweet, crisp radishes may be had until frosts come. Head lettuce does especially well in this region. Early varieties of cauliflower and cabbage produced good marketable heads by August 1.

MAKING HAY AND SILAGE.

At Kalsin Bay the haying season began August 6, at which time the native bluetop was ready to cut for hay. During the month of August, in which there were 14 cloudy days and rain fell on 17 days, some 18 tons of good hay were cured and hauled to the barns and 22 tons were stacked in the field. On only two parts of days, the afternoons of August 19 and 20, were conditions right to make headway by using the hay loader, during which time 36 loads of hay were loaded and stacked or hauled to the barn. Then followed a week of wet weather. Some 20 tons of hay were down and cured ready for stacking when the rainy spell began. This was lost, as it was too dry to put in the silo, and all efforts to tedder the hay availed nothing in face of the continued showers for the week.

Whenever the weather was fit the mowers were kept running, beginning August 31. Two light showers fell September 2 and 3, followed by a heavy northwest wind for three days. By 9 a. m. on September 5 the hay was in condition to stack. Here the hay loader came in for heavy work. (Pl. XII, fig. 1.) Thirty-one loads of hay were taken from the swath and put in stack and barn on that date. The following day all hay that was cured, some 16 loads, was put into stack and barn. A total of 118 loads of good native bluetop hay were secured during the season, estimated at 80 tons of hay. (Pl. XII, fig. 2.) Two tons mixed grain hay was secured later from grain seeded on volcanic ash.

The silage cutter was started August 31. Native bluetop grass was cut in the field when too wet to make hay and hauled to the silo and cut for silage. Fifty-four loads were put through the cutter,

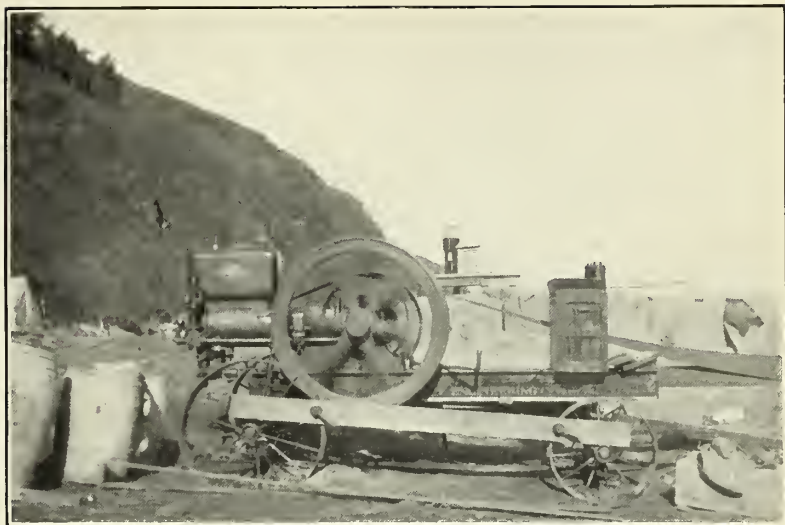


FIG. 1.—PORTABLE ENGINE AT WORK, KODIAK STATION, 1914.



FIG. 2.—FILLING SILO, KODIAK STATION, 1914.



FIG. 1.—HAY LOADER AT WORK, KODIAK STATION, 1914.



FIG. 2.—HEAVY GROWTH OF NATIVE BLUETOP GRASS, KODIAK STATION, 1914.

practically filling a 100-ton silo, by September 18. Later two loads of uncut bluetop grass were put on top of that cut and the silo closed for winter feeding.

The silo, containing oat silage put up last year, was opened and all the spoiled silage removed. Two loads of uncut native bluetop were put on top of the old silage and then 11 loads of uncut beach grass and oats on top of this.

The silage cutter and gas engine were removed from Kalsin Bay to Kodiak on September 22. Oats at Kodiak were cut for silage September 24 to 26. About 35 tons of green oats were run through the silage cutter. Dry windy weather came on September 25 and 26, followed by a light shower on September 27 and two days more of heavy northwest winds. The oats were raked immediately following the mower and put into cocks. Those not hauled to the silo within two days after cutting dried out quickly and cured in the cock sufficiently for hay. Four and one-half tons of excellent oat hay was secured in this manner.

RESTORATION OF VEGETATION ON VOLCANIC ASH-COVERED LANDS.

Natural restoration of vegetation over the ash-covered valleys is progressing rapidly. The heavy production of seed by the native grasses and all kinds of plants surviving the ash fall, together with the leaf fall of trees and weeds and the soil particles carried from the new channels cut by the ash-clogged streams and deposited by the overflow waters of the creeks, are factors favorable to a rapid recovery from the ill effects of the ash. Many plants that showed a vigorous growth last year made still greater growth this season. Native bluetop that showed from one to five stalks through the ash last year sent up several times as many stalks this season. In many patches where there was not grass enough to cut for hay last season a heavy crop of hay was cut this summer. New grass coming from the seed is to be found in sheltered places.

The wild rye grass (*Elymus mollis*) so common on the tide flats and beaches, which seemed almost completely killed out on the tideland and beaches at the station, made a remarkable showing this year. Upon close examination this fall it was observed that nearly every stalk that came through the ash this year was sending out several underground runners or stems, from a foot to several feet in length, a few inches below the surface of the ash, and these were taking root and sending new stalks to the surface. Many of these new stalks showed through the ash an inch or two, due to the mild weather prevailing this fall.

The grasses seeded last year made slow growth and produced a little seed this season. On land protected from the wind and given a dressing of manure during the fall of 1912 and the spring of 1913

the grasses are producing a good sod in the ash and furnished a little late pasture for live stock this year.

Grasses seeded this year did very little on the ash, but that seeded on the hillside where the ash was mixed with the soil produced a good stand and made a good growth.

CLIMATIC CONDITIONS.

The winter weather was very wet. The precipitation for December, 1913, was 10.04 inches, with but 12 inches of snow. January and February, 1914, were unusually wet and but 23 inches of snow fell during the two months. The snow covered the ground about three weeks in January. The frost was out of the ground early in February. March and April were unusually dry and strong westerly winds prevailed. There were 16 clear days in March and 15 in April. The winds carried great quantities of volcanic ash from the mountain tops and the air was full of ash most of the time. Grass began to grow on the mountain sides early in April and furnished some pasture for sheep by the middle of the month. May was about normal in precipitation and sunshine, while June was very wet and cold. There were 17 cloudy days and 1 clear day during the month. The precipitation was 11.5 inches, which is about twice the normal amount for June. The heavy rains packed the ash badly and the cold cloudy weather retarded the growth of all cultivated crops. July was colder than usual and all crops of field and garden made slow growth. Unusually cloudy weather prevailed during both July and August with the precipitation about normal. There were 14 cloudy days each month. September had 5 clear days and 9 cloudy while the precipitation was less than normal, there being only 2.28 inches. The month was cooler than is usual, but the temperature did not go as low as usual. White frost appeared on September 18 and 22 but did no damage. October was several degrees warmer than normal but there was no clear weather. Rainy weather prevailed throughout the month. There were 27 cloudy days with a precipitation of 13.52 inches. The temperature did not go below 33° F. Vegetation grew and ripened better than in many years. November brought more sunshine than is usual for that month and the precipitation was below normal. The first freezing weather came November 9 and 10, followed by light snow and rains, with a hard freeze on November 22. The temperature fell to 12° F., and light snow fell. December weather was ideal during the first half of the month, followed by normal winter weather.

GALLOWAY CATTLE.

The Galloways wintered at Chehalis, Wash., were returned to Kodiak July 25 and again turned on the range from which they were driven two years ago by volcanic ash. They wintered well at

Chehalis and were in the best of condition by June 1. Fifty head selected from the whole herd were shipped from Chehalis July 14 and arrived at Kodiak July 25. All came through in fine condition. They were placed in the pastures, where two years ago there was scarcely enough feed to keep five head of cattle through the summer, and were soon lost in the high grass on the hillsides. They recovered very quickly the flesh they had lost during the trip from the States. On September 21, 16 head were moved to Kalsin Bay by means of a large skiff. Again on October 1, 17 head were transferred, and again on November 28 a bunch of 14 head were moved from Kodiak to winter at Kalsin Bay. Three cows with young calves and the herd bull were left at Kodiak for wintering.

At Kalsin Bay the cattle were herded during the day and corralled at night to protect them from the brown bears that have become so numerous in that locality.

The last selection of cattle was made solely upon their milking qualities. Only the best milkers, along with their offspring, and the 11 head purchased in 1912, together with their offspring, were retained. These cows will be placed in the dairy at Kodiak and a careful record made of their performance, and the more promising of the young cows will be placed in the dairy herd at their first calving and accurate records kept of all. The less promising of the milkers will be offered for sale for beef breeders among the settlers of this country. There will be a goodly number of young bulls for sale each season and a few cows and heifers. As soon as the breeding herd has increased to what can be handled at the station economically, a goodly number of females will be for sale every season. The price of those offered for sale will be somewhat less than the same grade of cattle could be purchased for in the States. This is solely for the purpose of aiding the settlers to stock up with a pure-bred and hardy stock of cattle at reasonable figures, thereby cutting out the excessive freight costs of shipping cattle into this country.

The cattle are maintained on feed natural to the country, along with what can be grown by cultivation. Aside from the cows in the dairy, and their calves, which are fed by hand, no grain feed will be shipped in for feed. Seed grain must necessarily be shipped to the coast regions, as but little can be matured here. Experiments are being made and will be carried on for years to come, with all kinds of promising fodder crops that can be grown in this country for winter feed for live stock.

SUGGESTIONS FOR FUTURE WORK.

The advent of modern machinery at this station places the work well within the zone of certain success. The work of harvesting the crop of hay and silage has been lessened by half. Even under very

unfavorable weather conditions it is now possible to handle the hay crop.

The need of a new and larger launch is in a fair way to be met, but the need of a larger engine for the new launch should not be overlooked at this time. A 40-horsepower gas engine of the best make should be allowed for economy's sake.

The need of a combination stock-wagon scales is very urgent. The problem of weights and measures can not be solved without such a scale.

A windmill and tank should be supplied with the water system for the dairy and dairy barn. All the buildings are badly in need of paint and should receive attention this next season. The damp climate causes frame buildings to weather rapidly when the paint is not renewed every few years.

The need of proper housing of assistants and superintendents is still a problem. With the operation of the dairy there will not be sufficient room for quarters for the dairyman. Rental for office and quarters for the superintendent gradually eats up the cost of such a building. To save this money a suitable building should be erected.

The work confronting the station for the next few years briefly stated is as follows: Experimental dairying with Galloways, production of Galloway beef on native feed, handling sheep for wool and mutton, restoration of vegetation on volcanic ash covered lands, testing of varieties of grains, fruits, and vegetables on a small scale, and the completion of fencing and building improvements.

THE SHEEP.

In the fall of 1913 the station flock consisted of 1 pure-bred Cotswold ram, 1 yearling Grade Lincoln ram, 1 grade Cotswold ram lamb, and 60 ewes of all ages. In driving the ewes from the hills 1 ewe died of heart failure. In November the Cotswold ram was placed with the flock. The two grade rams were left at pasture on an island until December 15, when they swam across the channel to the mainland. One ram was sold to a settler near Kodiak for breeding purposes, and a little later the other was killed by town dogs. The ewes were turned out on pasture each day and rounded up at night and kept in the barn with the ram. The ram was kept in the barn during the day and fed all the grain and hay he would eat during the breeding season, and after December 15 he was left to run with the flock. The pasture began to fail about December 1, and the sheep were given a ration of about 1 pound of hay each at night for a few days, and then given about 2 pounds of oat silage in addition to the hay ration, the silage being fed at night and the hay in the morning. The sheep were kept in the corral a few days during stormy weather, but turned out and allowed to run at will on fair days. After December 15 the

sheep began to scatter badly over the hillsides when not herded constantly. Some were gone several days at a time, but the most of them were rounded up each night. About December 25 the silage ration was increased to about 3 pounds daily and the hay ration cut down a trifle. The sheep were continued on this feed until about February 1, 1914, when they appeared to be getting plenty of feed on pasture. The ground was bare and the south slopes had warmed up nicely. They were allowed to run at will on pasture without feeding until March 15, when they were rounded up. They were holding their own in flesh, but were rounded up to have them under closer observation during the lambing season. It was thought inadvisable to drive ewes heavy with lamb to and from pasture each day, so they were put on full feed and kept in corral. They did not relish silage or hay for a few days and would eat but little of either. The silage was from the bottom of the silo, was firm and apparently good feed, but had a strong sour odor.

SICKNESS IN THE FLOCK.

Several sheep refused feed entirely after the first day, and several more during the next few days. The hay was of poor quality and somewhat moldy. Thinking that the moldy hay was the cause of their loss of appetite, they were put on a straight silage ration. About 20 were sick and refused feed immediately thereafter. Good hay was brought from Kalsin Bay and the flock was put on a straight hay ration. Three sheep died before changing the ration. Soon about 30 head were ailing. A little alfalfa hay was available, and this was fed with the native hay. No more sheep were affected after changing to a hay ration. Their symptoms were as follows: The first stage, refusal of feed, staggering around, and rolling of eyes. They would run into objects as if blind. Loss of flesh was rapid in all cases. The second stage, the sheep became too weak to walk or rise to their feet unaided, had a high fever, and would stand leaning against the water trough and sip a little water for hours at a time. Some died at this stage, but the most of them would become too weak to stand, and would lie breathing fast and with muscles twitching for several days before death came. Post-mortem examination showed that ewes heaviest in lamb were the first to succumb. The larger percentage of ewes that died were carrying twins. Treatment: Those ailing were isolated and several were given physic of castor oil or salts. The bowels were open in all cases and some had slight diarrhea. All passed more or less mucus in feces. In some cases nearly a third was mucus.

A mash of bran and middlings was fed to all that would eat it. Alfalfa and native hay were kept before them all the time. Two ewes that were sick aborted with twin lambs and began to recover

at once. Out of the 30 ewes afflicted, 17 died and 13 recovered. These all began to shed their wool, some losing practically all of it.

The ewes began lambing while some were still sick. The lambs were exceptionally large. All lambs from ewes that recovered died soon after birth. Post-mortem examinations showed the food in the paunch to be mixed with blood, and patches of the mucus membrane sloughed off. The gall bladder was three or four times larger than normal, bowels loose and contained large amounts of mucus. Dr. Joseph Silverman, a local physician, who was called, thought it was a form of typhoid and blamed the water, which contained more or less volcanic ash. It is to be noted that a number recovered and that there was no change of water. The silage was not good. It contained some ash, which adhered to the damp grass when cut, and was in places somewhat moldy, and there was a change for the better when the silage was replaced with hay.

After March 25 all the sheep were given a grain ration of one-half pound each day and the hay ration was half alfalfa and half native hay until April 15, when they were herded on the hillsides, where they got considerable green grass. The grain ration was then stopped and the hay was gradually reduced to 1 pound of hay feed at night for 10 days, until pasture was sufficient. A herder was with the flock and corralled them at night until May 15, when they were allowed to run at will in pasture. The shearing was done May 18 and a fair clip was obtained. From this date they were allowed to run at large until rounded up and taken to Kalsin Bay June 5. There they were turned at large on the mountain side. Here the flock divided into small bands of from 5 to 15 head and scattered over a range of half a mile wide and 4 miles long on a southeast slope of the mountain above the station buildings. Two bands came to the lowlands in August and September, during the fly season, and one remained all fall. The other returned to the higher hillside early in October.

FLOCK ATTACKED BY BEAR.

Late in November 4 bears attacked the flock, with disastrous results. They killed 41 head. At this writing the station owns but 15 ewes, 3 wethers, and 1 ram.

LETTERS FROM SETTLERS AND REPORTS FROM THE SEED DISTRIBUTION.

The letters which follow have been received from nearly all parts of the Territory. In some respects they convey a truer idea of the possibilities of farming and gardening in Alaska than do the reports from the experiment stations, because the results recorded in these letters come from the actual settler who is working under conditions as he finds them. Climates and soils vary greatly in different sec-

tions, yet nearly all the correspondents report that they had good success in their efforts to raise vegetables, and to grow berries and berry bushes.

The report of the Hon. Charles Sulzer (p. 80) is of much value because of the details of yields, areas, and values which he gives.

Fred Patching, Loring, Alaska.—Just a few lines to let you know how our garden did this year.

Radishes and lettuce did fine; in fact, they always do well, especially the Cos lettuce. Turnips did especially well, a great many of them being over 12 inches in diameter, and crisp and sweet. Rutabagas did splendidly, and I never saw them more equal in size, there being very few small ones. Garden peas, as usual, did very well, and the kinds planted (Alaska and Gradus) seem particularly well adapted to this climate.

The kale could not be beaten in any country, and the Brussels sprouts made a crop for the first time in my experience. Cabbage, early and medium late, did fine, some of the latter heads weighing over 20 pounds. String beans did very well and were of excellent quality. Parsley, as usual, did very well. Onions, both sets and seeds, did fine, especially the latter. Rhubarb is one of the easiest things to grow, and makes a large growth and is of a very fine quality.

Red raspberries did the best I have ever seen. We tried some roses and had some very fine blossoms, and sweet brier made a very good growth, and I hope they will live through the winter.

California poppies, pansies, and tiger lilies did fine. A bed of volunteer poppies were exceptionally good.

Thomas Tony, Ketchikan, Alaska.—I would say in reply to your letter of inquiry, that the willows did fine; they made about 3 feet of new wood. The rosebushes are living and have made, I should say, about from 10 to 12 inches of growth.

The early part of the summer was very wet here. It rained every day in July, so considering the weather, I think they did fairly well.

R. H. Campbell, Petersburg, Alaska.—Your favor of December 30 just received, and will say that the six gooseberry, six currant, and four basket willows all lived and made a good growth. I have strawberry and raspberry bushes also, from the Sitka Station, which produced a great amount of berries last season.

John Gauffin, Petersburg, Alaska.—Your communication of December 30 last received. In regard to the plants and stock received from your station, I will state that they all did exceptionally well, considering the weather last season and the ground they were planted in. This ground is wet, but all the plants grew up fine, with the exception of one rosebush, which died.

I also planted some strawberries last summer, which grew up in great numbers, but did not all get ripe on account of too much rain.

Next season I will put some sand and gravel in the soil and dig the ditches deeper.

W. H. Royden, Petersburg, Alaska.—Following is a report of our garden: We have an area of about 30 by 165 feet under cultivation. I planted all the seeds you sent, which did exceptionally well, notwithstanding the very rainy summer we had. The turnips were marvels, some of them weighing 8 pounds 4 ounces, and nearly all firm, smooth roots.

I set out about 400 cabbage plants, and they did exceptionally well, about 65 per cent of them heading, producing large firm heads, as fine in quality as any I have ever eaten. The plants that did not head grew to enormous size and made excellent chicken feed.

Your seed did not cover the area that we have, so planted other seeds, which also did well. I might here make an exception of potatoes, which did not do so well, owing to the very wet summer.

I expect to have more ground under cultivation next year, and hope to have as good luck with the garden as I had this year.

Hon. Charles A. Sulzer, Sulzer, Alaska.—Since 1906 we have each year raised a successful garden here, and the present season has not proved any exception to this rule, although excessive rainfall during almost the entire month of July did some injury. There are certain vegetables that seem to do well here regardless of weather conditions; among these may be especially mentioned carrots, turnips, lettuce, radish, parsnips, and rhubarb.

We obtained from you for the first time last winter some red Finland turnip seed. This seed had been grown at the Rampart Experiment Station in 1913, and we planted it in new ground, and nothing in the garden line has ever given us such profound satisfaction. These turnips developed into beautiful specimens, ranging between 2 and slightly over 4 pounds, and look for all the world like giant apples. They not only are beautiful in appearance, but they are firm and juicy and have a delicious flavor rarely found in a turnip. This latter quality we have found to be true of practically all the vegetables grown here; they are exceptionally sweet and tender and have a flavor all their own, and there is no comparison whatever with vegetables shipped into Alaska. With this Finland turnip seed we planted an area of 450 square feet of ground, from which we secured 539 turnips, giving a weight of 1,342 pounds.

The carrot bed consisted of 495 square feet, from which we raised 880 carrots weighing 559 pounds. These carrots were exceptionally fine, very firm and very tender, and carrots were our second best crop.

We devoted 330 square feet to beets, from which we obtained 540 beets having a weight of 563 pounds. These beets were as good as usual, but on account of the excessive rainfall were more inclined to go to seed, and had this condition not existed they no doubt would have attained a larger growth.

We planted 336 square feet in parsnips and have 428 parsnips, which we are leaving in the ground. The few we have pulled indicate an average weight of one-fourth pound. The parsnips are excellent but somewhat smaller than usual, although they will probably grow for some little time. We have never known any insect or worm attack on parsnips, beets, or carrots.

We planted 400 head of lettuce on 300 square feet of ground, with the usual splendid success secured from lettuce. A small green worm attacked the plants during a dry spell in June, but upon being carefully removed there was no further trouble in this connection. Toward the end of the season there was a slight tendency to go to seed. A second crop of lettuce was planted and is now being used, these latter plants having attained only a small size, but they make a very good substitute.

From 80 square feet devoted to rhubarb we obtained 129 pounds of most excellent rhubarb. We began cutting the 1st of April and enjoyed rhubarb until well into September, the quality remaining uniformly the same.

From 410 square feet of ground we have raised 150 bunches of the finest celery grown anywhere. We have never been so successful with celery as we have been this year.

Radishes, as usual, did exceedingly well, and we produced 1,500 from 90 square feet of ground, sowing two crops on the same ground.

We set out 148 head of cabbage on 972 square feet of ground. The season was too wet for cabbage and 25 per cent failed to head and the balance did not mature to the usual size, having an average weight only about 3 pounds. The quality was good, and we secured 428 pounds from the lot.

Cauliflower may be classified as the only distinct failure for this year. We set out 60 heads and only 20 matured, and these 20 were not very good. Worms attacked the roots and the plants failed to flower. As a general rule, cauliflower is a decided success, but this season proved entirely too wet.

Peas attained a splendid growth during an early and favorable spring and flowered exceptionally well, but while in this stage too much rain rotted many of the blossoms

and we did not obtain the usual yield, although the quality was superb. We secured 48 quarts from a patch covering 400 square feet.

Small beds of domestic spinach, New Zealand spinach, Swiss chard, parsley, blue top turnips, and onions from seed all did very well and gave good yields.

A small bed of kohlrabi grew very slowly and was of very little value. We have not found this vegetable a success unless used when very young; as the plant matures, our experience is that it is tough and fibrous.

A raspberry patch of 675 square feet produced 75 quarts of splendid berries. The yield would have been much larger if the month of July had not been quite so wet.

We replanted our strawberry bed on the 1st of May, and owing to this late date the yield was naturally very small. From 450 plants we obtained 6 quarts of very nice berries. The returns next year should be very large, as strawberries are uniformly a success.

Currants bore very well and very large berries, and this was true of all the native wild berries, due largely to the early warm spring.

A small patch of rutabagas was of very little value, being badly attacked by root worms.

Figuring these products out on a price basis they should bring in almost any market we have:

1,342 pounds Finland turnips, at 3 cents per pound.....	\$40. 26	
555 pounds carrots, at 3 cents per pound.....	16. 65	
563 pounds beets, at 3 cents per pound.....	16. 89	
107 pounds parsnips, at 3 cents per pound.....	3. 21	
400 head lettuce, at 5 cents per head.....	20. 00	
129 pounds rhubarb, at 5 cents per pound.....	6. 45	
150 bunches celery, at 5 cents per bunch.....	7. 50	
1,500 radishes, at $\frac{1}{4}$ cent each.....	3. 75	
20 heads cauliflower, at 5 cents each.....	1. 00	
428 pounds cabbage, at 3 cents per pound.....	12. 84	
48 quarts of peas, at 10 cents per quart.....	4. 80	
75 quarts raspberries, at 10 cents per quart.....	7. 50	
6 quarts of strawberries, at 10 cents per quart.....	. 60	
		\$141. 45
264 hours of labor, at $43\frac{1}{2}$ cents per hour.....	114. 84	
Seeds.....	1. 15	
Profit on operations.....	25. 46	
		141. 45

Locally the products are worth much more than the values used above, and on a larger scale much more could be accomplished for the cost given. The figures lead to the conclusion that gardening on a commercial scale can be successfully conducted if the necessary intelligent care is given and the proper location is secured.

It may be of interest to state that we have raised 89 hogs here during the past 5 years without a single case of sickness. The only problem seems to be that of feed, which must be grown locally to make the business profitable.

D. H. Somerville, Sentinel Island Lighthouse, via Juneau, Alaska.—Regarding the berry bushes and plants, I take pleasure in stating that most of the raspberries and all of the gooseberries took root and appear to be strong and doing well.

The strawberry plants are thriving and bore a few berries last year, so am looking forward to much better results from them next summer.

Rev. A. P. Kashevaroff, Juneau, Alaska.—In answer to your letter of inquiry as to my success with the nursery stock and plants sent me from Sitka Experiment Station last spring, I can not say that I had any marked success with any of the plants. The season was remarkably wet and cold. The gooseberry and the currant bushes did well

and so did the forget-me-nots. The strawberry plants did pretty well. Of course, I did not expect much of anything the first season. All thrived. I shall be pleased to make a full report at the end of next season.

Mrs. P. Madsen, Juneau, Alaska.—I received the stock of plants last spring and had good success with them. They all grew well. There were a few berries, but I did not expect much from them the first year.

J. E. Reynolds, Juneau, Alaska.—I wish to report on the seeds and plants forwarded me last spring. The rhubarb and strawberry plants made a splendid growth. I will have hundreds of fine strawberry plants next spring. The only things that were complete failures were the beans and parsnips.

John C. Hyde, Juneau, Alaska.—Yours of December 30 received and am pleased to report the plants arrived on June 8 in first-class condition and were set out the same day in new sandy loam soil, heavily fertilized with horse manure, in which they thrive exceedingly well. It being so late in the season when the plants arrived, we did not get very many berries, but expect a bumper crop the coming year.

E. J. Liddicoat, Skagway, Alaska.—I received your letter asking me about the three Champion gooseberry bushes I sent for. Two of them did fine and the other died. I have two dozen raspberry bushes planted and some strawberry plants, which I planted last year, and they yielded well. This year I expect them to do a great deal better.

Elsie Dillon, Skagway, Alaska.—Your letter of December 30 to hand and in reply would say I received your nursery stock. There were only 8 of the raspberry bushes that lived and 3 made from 30 to 39 inches of wood. The currant bushes did splendidly. The roses all bloomed and they were pretty while in bloom, but they did not last over 24 hours after they were in bloom. They made about 5 inches of new wood.

Henry Vermeire, Haines, Alaska.—The 12 apple trees you sent me all grew pretty well; 2 of them made a growth of 22 inches. The raspberries all grew and 9 out of 10 of the gooseberry bushes lived. The 4 basket willows grew over 3 feet. The 25 strawberry plants all grew and some of them had runners 4 feet long. The 3 rosebushes did not grow. I think I planted them in too dry ground.

All of the vegetable seeds you sent me did fine except the parsnips. They did not come up at all. I also planted some other parsnip seed and they did not come up either, but the kohlrabi, kale, table beets, and cabbage were very nice.

We planted 4 acres of turnips and rutabagas and we got 1,000 sacks of rutabagas and 300 sacks of yellow turnips. We planted 1 acre of Irish Cobbler potatoes, from which we dug 255 sacks of salable potatoes. Some of our potatoes weighed 2½ pounds.

We sowed 2 acres of oats mixed with Canadian peas, which we cut for hay. We got about 4½ tons, but we had a very hard time to dry it.

We planted lettuce on a patch of ground 9 by 50 feet. Besides what lettuce we used ourselves, we sold \$30 worth to other families. (Lettuce brought 45 cents per head in Juneau.) This lettuce was planted on ground where manure had lain all winter.

The hogs and cattle and horses are doing fine. We put up some silage from the tide flats. On this we wintered five head of live stock. It would make excellent feed if it were not so muddy.

We have sold all our turnips at an average of \$1.25 a sack, and the rutabagas at \$1 per sack. Our potatoes we have on hand yet; also about 100 sacks of rutabagas.

E. A. Adams, Haines, Alaska.—In regard to the fruit trees you sent me, they all lived but one apple tree. They made a growth of 2 feet. The season was very dry, but for that the trees would have made 3 feet. They are all looking fine and I am well pleased.

This season I will subirrigate, and I think I can make a better showing. My large trees were loaded with apples, but my raspberries were a failure. I think it was too dry.

L. McGuire, Haines, Alaska.—I thought I would let you know how your seeds did this year, the first year on my homestead. The yellow Swedish turnips grew fine on

new land without any fertilizer. I raised about 4 tons of turnips and rutabagas, but I think for an early market the small yellow turnip is the best, as it matures in about six weeks, but where you have to put them in the root house the Swedish yellow turnip is the best. I had them as large as 8 to 10 pounds perfectly solid. I also raised about 5 tons of potatoes, the finest I ever saw, even much better than the Yakima potatoes. My potatoes were called the Alaska Beauty.

I raised 1,000 head of cabbage, much better than what I have raised in Washington. Carrots, parsnips, peas, and beans all did fine. I also raised two crops of lettuce. I had lettuce for the table up to November 1. Radishes did very well. In fact, all vegetables do as well here as in the States, with the exception of corn. The corn I planted this year did not ripen, but I shall try it again next year.

My ranch is $2\frac{1}{2}$ miles west of Haines. I have 150 acres of the finest kind of land. Every foot of it could be cut with a mower. We have barn room for about 60 head of stock and a very fine range for cattle and sheep.

Ben Waiczunas, Haines, Alaska.—I have 32 apple trees growing in my orchard, 3 from seed, and the rest of them were what you sent me from Sitka. The Virginia crab made a short growth, but is rich in stem and leaf; the Iowa Beauty grew tall and slim; *Pyrus baccata*, two of them are good and one is very poor; Sylvan Sweet and Hibernial each made a growth of 1 foot; Tetowsky, one made a short growth with few leaves and the other made no growth; Whitney, one dead and one grew tall and slim; Yellow Transparent, all did very well. Basket willows made a growth of 2 feet and one rose did well and bloomed, one grew slowly, and the third died.

I have a mink ranch with 8 pens with 6 minks, and a fox ranch with 9 pens and 18 foxes.

The potatoes grown here are of better quality than the potatoes grown in the States.

Mr. E. R. Rudolph, Seward, Alaska.—As it is coming toward seedtime again, I want to thank you for the seeds and plants sent me last year, which did remarkably well. The strawberry plants grew to immense size but did not even bloom. They are well covered and I think ought to do well. Others here have tried to raise strawberries but have failed to get them to fruit. We are anxious to prove that they can be made a success here.

The Gold Coin potatoes that you sent me did splendidly in virgin soil; also the Early Ohios were fine. The small yellow turnips produced a large crop of most excellent flavor. We grew some of the finest cauliflower I ever saw—some 14 inches in diameter. Some cabbage heads weighed from 4 to 10 pounds and were white and quite solid.

We have plenty of potatoes, rutabagas, cabbage, carrots, and beets to last until spring; nearly all grown from your seeds. The roses you sent did not grow. We have four apple trees which look fine, but I do not think they will ever bear fruit. We have about 100 red raspberries set out in June which bore quite a quantity of berries.

Martin Larsen, Afognak, Alaska.—We had a very late and cold spring. I did not plant my garden until after the middle of June, but it is the first time I ever had such fine vegetables. Everything did well. I had the soil and ashes well mixed and put on plenty of manure. The flowers were something beautiful to look at.

J. T. Gavigan, Valdez, Alaska.—The nursery stock you sent me arrived in fine shape. They all grew nicely last summer. The gooseberry bushes, 13 in number, all grew fine and so did the rosebushes. I failed to ever get apple trees to grow here; they seem to winterkill as do the Siberian crabs. The currant bushes do well; some years they grow a good crop of currants, and it is the same with the raspberries. The above all came from the Sitka Station.

I always get a package of seed from your station in the spring. Beets, lettuce, carrots, peas, and potatoes do well. The maggots get the radish and turnips. The yellow Swedish turnip is the best, for the maggots do not trouble them so much.

Mrs. C. C. Reynolds, Valdez, Alaska.—In reply to yours of December 30, which is just received, will say the plants and roses you sent me last June grew very thrifty and looked fine when I covered them in the fall. One of the roses did not grow, but three did very well. Of course, the berries did not bear, but they ought to this coming year if we have a good season. Last year was very wet, so those I had did not ripen until September and were not good berries. These were from plants I set out two years ago and came from the outside.

Mrs. W. W. Conley, Valdez, Alaska.—In reply to your inquiry regarding the nursery stock you so kindly sent to me last spring, I would say I had not room on my own place for so many trees, so gave five Yellow Transparent, two Whitney, one Siberian, one Iowa Beauty, and two basket willows to friends of mine in this town, who report them as all growing about a foot and looking well when the snow covered them.

I kept one Siberian, one Iowa Beauty, one Yellow Transparent, and two basket willows. They grew 14 to 16 inches and looked very healthy. I fixed straw around them and then stakes to keep the heavy snow from breaking them down. I received three rosebushes. The largest one had two handsome single dark rose blooms on it; the other two grew well, but did not bloom and all looked strong and healthy when I covered them with straw. Last summer was exceptionally cold and rainy, so I hope they will do better this year.

Tim Marcum, Valdez, Alaska.—Yours of December 30 at hand. I received the nursery stock and planted them in boxes and kept them for about six weeks before I took them to the island. They were growing fine the last time I saw them on August 30. They should do well, as we never have any snow to break them down.

The crop of vegetables, such as parsnips, potatoes, carrots, cauliflower, cabbage, turruips, beets, peas, celery, and radish, did well. I have a team of horses on the island, and they are doing well and will winter without feeding.

M. D. Snodgrass, Kodiak, Alaska.—Replying to yours of December 30 relative to the nursery stock received last spring, can say that the potatoes did very poorly this season, due to the very backward and cold season. Small duplicate plats were planted on new hillside land plowed the previous fall and upon ash land that had received a light dressing of manure last year and again this season before planting. The potatoes did best on the ash with manure. Of those tested, the Extra Early Ohio, Clark Alaska Seedling, and Irish Cobbler were the better producers; while Burpee Superior set the most potatoes, they were small and did not mature. The Gold Coin, Hamilton Early Rose, and Freeman did very poorly. There were very little more than the seed returned for the last three varieties.

The nursery stock did very well. Gooseberries, currants, raspberries, and strawberries were set out May 15. About half of the strawberries grew well this season. A few of them were in bad condition when they reached Kodiak. The gooseberries all grew excepting one plant. Three currants out of the 12 grew, while about 30 raspberry plants grew. The wood ripened well and they appear in healthy condition at this date. A few berries set late in the summer, but did not ripen properly. The outlook for small fruit of this kind is very good.

J. G. Carson, Katalla, Alaska.—Most of the vegetables did fine this year, especially turnips, lettuce, cabbage, kale, radishes, carrots, peas, rutabagas, and potatoes. Beets did moderately well. The potatoes did fine until about the time they were in blossom; then there was something attacked the stems at the top of the ground and killed most of them. I was not sure whether it was a bug or a worm, as I found both in the vines—a white worm about one-half inch long and a little black jumping bug about one-eighth of an inch long.

I sprouted the potatoes in the house. Part of the seed came from Skagway. I think they were Gold Coin. The other seed that I got at the store came from the outside and seemed to have scales or scabs on them, or sort of rusty places. The Skagway seed did a great deal the better.

The Petrowski turnips did fine; not a blemish on them. The white turnips also did fine, but the worms got in them quite badly. The rutabagas and peas did fine, but the mice or moles practically destroyed them in spite of all we could do. They also injured some of the cabbage and carrots.

I raised 9 sacks of potatoes, 15 sacks of turnips, 2 sacks of carrots, 75 heads of cabbage, and 2 sacks of rutabagas. Everything is keeping fine in the root cellar, except the cabbage, which is rotting badly. Lettuce and radishes we had in abundance.

A. Wanberg, Uyak, Kodiak Island, Alaska.—The Michigan potatoes you sent me two years ago have proved to be a good yielder and keep well. The first year they were soft, the next year they were better, and this year they are of a better quality than potatoes grown in Washington. Carrots, parsnips, rutabagas, and turnips grow very well and are of excellent flavor. Timothy grass grew over 6 feet high and clover about 2 feet. I sowed some alfalfa last spring and in August it was in fine shape. My chickens had a fine time of it. Even at this writing it is green.

I would like to sow some winter rye for a trial if I had the right kind. The Petrowski turnip is doing very well, even on ground turned over the same week as the seed is planted.

Let me hear from you again in the spring and send me some seed as usual.

A. A. Burglin, Crooked Creek, via Iditarod, Alaska.—I have a homestead here on the Kuskokwim. I had three crops in, but have never had any success with turnips. They are always injured by the maggots. Last September I got some that Mr. Kilbuck raised, about 200 miles below me near Bethel where the climate is not as favorable as here. They were beauties and not one had a blemish or a maggot. Mr. Kilbuck told me he had gotten the seed from the Sitka Station. Kindly send me a few of those seeds, also a few other kinds of seed. I have always bought my seed, but it seems that I can not get the right kind.

Some of my potatoes weighed 2 pounds and some of the cabbage heads weighed 14 pounds. I also raised about one-half acre of oats. It grew 5 feet high but did not get quite ripe. It made good hay. A small patch of barley, seeds for which I picked out of the oats, got ripe the latter part of August. Also a small patch of wheat grew 6 feet high but did not get further than blossom. I would like to try some alfalfa. Timothy that comes up from the hay seems to do well and grows 3 feet high. I sent to Washington for seeds last year, but did not get any. I am 60 miles from the nearest post office, Iditarod.

If you could send me some seeds, I am willing to pay expense charges by first-class mail.

Lilyegren & Wagner, Ellamar, Alaska.—We wish to report on the seeds you sent us. We have four patches of ground under cultivation, as follows: 10 by 60 feet, 10 by 90 feet, 10 by 40 feet, and 14 by 24 feet. The last-named patch I made last spring, using black loam—some of this tundra muck which I cut with a lance and plenty of fish. We did not expect anything, so planted very small potatoes. They did well considering the season and by the 1st of October were still in flower. I sprouted the potatoes as you suggested in your report and found quite a difference in those I planted which were not sprouted. From a row 160 feet long, planted May 15, we dug on October 8, 350 pounds of potatoes. I began using some of them August 11. In planting I used large potatoes split lengthwise, using half of a potato to the hill and they averaged seven medium-sized potatoes to the hill.

Lettuce and radishes, as usual, did well; green onions were poor; peas at the time of this writing are still in flower. Some of the pea vines are 5 feet high and have plenty of pods, but I do not expect any great results from them. Rutabagas, planted June 1, were dug on October 21 and proved to be very poor. They had nearly all grown to stalks. Rhubarb did very well. Turnips (Purple Top and White Globe), planted May 2 were ready for use July 26. Kale planted May 2 was ready for use on August 1. We will have greens all winter.

Those turnip seeds you sent under special cover did very well, planted May 10. We used some on August 1. Some were 8 inches long and 2 inches in diameter. What kind were they? The carrots were very poor. They were planted May 10 and on October 21 we dug but 40 pounds from a 70-foot row. Endive planted June 2 was fit for use August 25. It did very well. The few Brussels sprouts that I planted did very well. The cabbage was a failure; out of 30 plants only 4 headed. Could you tell me the cause? My partner, Mr. Lilyegren, tells me that he has never had any success with cabbage here. Cauliflower did very well. I transplanted seedlings May 15 to the open ground. Every one headed, averaging 7-inch heads.

Our potato crop amounted to 750 pounds, turnips about 100 pounds, and carrots 50 pounds. The last season was the wettest of my experience in Alaska. The clear days during the 4 months were 10 days in June, 9 days in July, 6 days in August, and 13 days in September. Considering the season, I think my crops did very well.

While the soil is rich, I believe there is something lacking. Could you advise us? Also could you spare us some more seed? We have a good cellar where we winter everything frost free.

George Nylan, Matanuska Valley, Knik, Alaska.—This year I had about 1½ acres in potatoes: Early Ohio, Gold Coin, Early Rose, Matanuska, and a California potato. The Early Ohio, Gold Coin, and Matanuska did the best, but all made fine potatoes. Rutabagas, turnips (Petrowski and Purple Top), did fine, some weighing as much as 10 pounds. Lettuce and radishes did fine. Also beets, carrots, parsnips, did very well. Cabbage (Mills Early June) was planted in the open ground June 4 and made nice, firm cabbage. Rhubarb grows well.

Black oats planted on June 2 was 4 feet high the latter part of August and had heavy well-filled heads but was blown down and did not get ripe. I am sure it would grow fine here if planted earlier. The beardless barley was about 3 feet by August 20. The heads were well filled and matured well.

Canadian field peas, sown about June 8, were about 8 feet high. Some ripened and the vines were loaded with pods. The vetch sown June 10 did fine.

Alsike clover sown June 18 came up fine and some got to be 2 feet high and part of it bloomed. The ground was cleared and plowed this spring, the cause of getting things in so late.

I would like to try a few strawberry plants, as they have not been tried in the valley here. I would like you to send me a few Petrowski turnip seed.

M. M. Kinsinger, Knik, Alaska.—I located a homestead in the Matanuska Valley on May 9, cleared off a piece of ground about 30 by 50 feet, and planted 375 pounds of California potatoes. In September we dug 23 crates of fine potatoes. On another small place we planted 10 pounds and dug about 250 pounds. We planted turnips, carrots, rhubarb, beets, cabbage, Brussels sprouts, beans, peas, parsley, and lettuce, and everything did fine but the Brussels sprouts and the beans. Peas were planted the last of June and were just about ready to use when the first frost came in September. We had a nice summer, though a great deal of rain fell in July. The fall has been great; so far, only cold nights. I would like to get some Petrowski turnip seed, if you have them.

W. D. Wentworth, Deering, Alaska.—I have not been able to try all the different kinds of seed which you have sent me, but the ones I have tried have grown very successfully.

Lettuce, radishes, kohlrabi, kale, cabbage, parsley, turnips, parsnips, carrots, beets, and onions, and also potatoes I have grown with success, and it seems to me that they are more tender and better flavored than any I have eaten in the States.

Charles Replogle, Deering, Alaska.—We received the package of Petrowski turnip seed to-day. I wish to thank you for it, also in the name of this entire community, express to you the gratitude for past favors to these pioneers who could get no seeds but for the Government distribution.

We have already planted some seeds from your station, and they are proving very satisfactory. The ice left us on about June 27 and we have warmer weather and our garden is showing the effects in growth and color. Seeds are slow in coming up but when rooted grow rapidly. We found that by covering the ground with gunny sacks until the seed came up, it greatly hastened their germination. Will report later again.

B. S. Lass, Iliamna, Alaska.—The seeds and reports have been a great help to us. The last three years we have raised potatoes, turnips, and rutabagas enough for our own use.

I have been thinking of getting two cows and a bull. On what terms can the Gallo-way cattle be secured?

Thomas W. Hanmore, Iliamna, Alaska.—The season opened here about normal. After sprouting the potatoes well in the house first, they were planted on May 12. From ground that was well drained and fertilized with fish, 8 rows 60 feet long gave a yield of 500 pounds, while on ground that was not well drained and a small part only of which was fertilized with fish, 18 rows 60 feet long yielded only 450 pounds. The best yield was from the Yakima or Burbank, which is commonly shipped to this country under the name of Yakima. The other varieties were mostly Early Rose. It is by far the best eating potato, but is a poor yielder. I harvested part of the Early Rose on September 22, in order to send 50 pounds to the exposition, and the remainder of them by October 1. Vegetables could have been left out until November 6, as the temperature was about normal, with cloudy weather prevailing. The rainfall was not excessive but frequent. A part of my garden was drowned out by springs breaking out. Insects were very destructive; cutworms destroyed the cabbage, a white boring worm damaged most and destroyed entirely the rutabagas and turnips. Wherever they ringed the roots the tops turned yellow, and the roots did not grow any larger and all went to seed. The beets, too, were almost ruined; none of them attained any size. Both mice and insects attacked the carrots by cutting and eating the plants, mostly above or about level with the ground. Radishes and lettuce escaped injury from the insects.

The native gardens were almost all of them a failure, owing to insects. They planted nothing but rutabagas and turnips and all went to seed, due to the ravages of the insects.

John D. Kinney & Son are located on the north shore of the lake and about 16 miles northwest of here. Although the distance is not great, the amount of sunshine at that place is considerably more than at Iliamna village. The village is too close to Iliamna Pass which is a storm center. The Kinneys had a fine garden. About one-half of their cabbage headed and they were troubled very little with insects.

Messrs. Walker, Dutton, Kackley, and Anderson had very fine gardens on Lake Clark. Everything is reported to have yielded well. They have from two to three times as much sunshine as Iliamna village.

The Duryea brothers, both on the coast and at their mines about 9 miles distant, raised good gardens. They have more rain and less sunshine than does Iliamna village, but they have less wind, and when the sun does shine the humidity lasts longer, sometimes throughout the night. On their coast garden they have an abundance of fish which can be gotten conveniently. On some of their ground that has been fertilized for several consecutive years, the elder Duryea brother reports a yield of 1,000 bushels of potatoes to the acre.

The wild hay crop, both here and on the coast, is by far the heaviest seen in the six years past. The wild berry crop was almost a failure, while on the coast and west of here it was large.

A. Stecker, Quinhagak, Alaska.—According to your instructions of February 24, I have distributed the seeds received here. The miners, about 20 miles from here on the Aralik River, raised good turnips, radishes, and such vegetables as do not need

much care. We had a garden here at the station, but the river in changing its course washed it away. I made one on new ground but must confess that it is a failure this year.

We have had very few warm summer days. It rained and rained all the time. No doubt it has been the same all along this part, and we have to wait for a better summer next year. Nevertheless, we had fine potatoes, small cauliflower, and turnips. The beets would have been good but all shot up. Turnips had some worms, except the yellow (Petrowski) ones which were not injured by insects.

We had very nice sweet peas, pansies, and mignonette. I hope to be able to give a better report next year.

A. S. Jones, Chena River, Fairbanks, Alaska.—I thought I would write you a short account of our farming operations here, as you have probably not heard from the district before.

I am running a road house and ranch with my partner on the Chena Hot Springs trail, 34 miles from Fairbanks. We have 3 acres under cultivation and 2 acres more cleared. This ground is very hard to clear, as it is covered with a growth of heavy timber and the stumps have to be blown out with giant powder, but it is thawed ground and very fertile when cleared.

We raised $3\frac{1}{2}$ tons of fine dry potatoes last summer. We have not seen better in any country. We also raised one-half ton of very good turnips and 1 ton of Canadian field peas, which was 4 feet high when we cut them for the hogs. Our Dwarf Alaska peas grew 7 feet high with very large pods. We also grew six crates of winter celery, which we find is the best kind for keeping and remains good all winter. We grew all kinds of vegetables in great sufficiency for the road house and each variety did well. We also grew a quantity of cabbage. In the greenhouse we raised a quantity of cucumbers, tomatoes, and peppers which did well.

We would be glad if you would send us a selection of seeds (garden and flower) and would like to get a few packets of Petrowski turnip seed. We would like to try some fruit trees and berry bushes, as our ground is sheltered by tall trees and has a southern exposure. We think they would do well.

Mrs. M. F. Roberts, McCarthy, Alaska.—Your kind favor of the 30th ultimo at hand. The nursery stock and plants were delayed in shipment until all the gooseberry bushes had died except one. It is doing fine. Of the currants, three are alive and doing fine. The raspberries I am very proud of, as all but 3 of the 25 are putting forth the most vigorous vines and were very large when the snow covered them. I planted the four basket willows to the southeast of my cabin, and they were fully 13 inches in height when the snow covered them. My roses were dead when received as they were so long in transit.

I have one Winesap strawberry, sent me by a friend in Los Angeles as a gentle reminder of the nice things they have, and I planted it. It wintered fine and fruited the next summer. On my homestead I have soil almost 4 feet deep, very dark, and will grow anything I plant. I am going to try celery on it this year, also tomatoes and cucumbers.

I have transplanted some wild currants, blueberries, and cranberries just as an experiment.

Mr. and Mrs. Henry Dull, teachers at United States public school, Shageluk, Alaska.—We arrived here too late last fall to create an interest among the Indians in garden work, but carefully prepared the 225 square feet—all the ground that was in cultivation—and again spaded and pulverized it this spring and planted it carefully in rows.

We planted the eyes of potatoes we brought in with us, or, as the Alaska term applies "Che Chaw Ker potatoes." From 6 rows 20 feet long we dug 165 pounds, many of them averaging 3 potatoes to the pound, but on account of the short season many were small and immature.

Out of the 80 cabbage plants put out, we will have about 60 that will average 2 pounds and over and still growing at this date, though we have had several heavy frosts.

We will have about 175 pounds of turnips and 50 pounds of rutabagas, also about 100 pounds of beets, all of which are still growing and free from insects. The turnips did remarkably well.

We have had radishes and lettuce continually and in abundance ever since early spring up until the present time. It is so much more tender and crisp than [that] grown in the States on account of the rapid growth.

We had several messes of peas, but the beans did not mature. Brussels sprouts made excellent greens in the early spring, but mustard should be added to our list of seeds for early greens. We planted some onion seeds but they were very small, but believe sets would mature into large onions.

There are so many reports that ground in Alaska is of too sour a nature, but if properly drained I find it becomes well pulverized and mellow. Also deep tilling makes it loamy.

On the whole our garden was fine, far exceeding any of our expectations. The natives had no gardens when we came here a year ago, but this spring we induced five to make a plat and since they have seen our nice garden this summer there are at least 25 new plats laid out by that many natives.

The only means we have here for breaking the sod is with spades, as there are no teams near. We have now about 12,000 square feet in nice shape for spring turning and planting and will enrich it this winter with ashes and refuse vegetation. Our Petrowski turnip seed arrived too late to use this year.

CONDENSED METEOROLOGICAL REPORTS.

On the following pages are given condensed meteorological data from 25 stations scattered over Alaska. A careful study of these figures will enable one to get an idea of the weather conditions at the places named, but in order to understand the figures it is necessary to explain the process through which they have been evolved and the points they cover.

There is kept a daily record of the weather at each station. This record includes the maximum and minimum temperatures in degrees Fahrenheit and the precipitation of rain and snow water in inches. There are thus 30 or 31 records, as the case may be, for each month. These records to save space have all been condensed into a single line for the month.

The columns headed temperature contain, first, the maximum or highest temperature in the month; next the minimum or lowest temperature which occurred during the month; the third column contains the mean maximum, that is to say, an average of all the maximum temperatures for the month; the fourth column gives the mean minimum, or the average of all the low temperatures recorded for the month, and finally in the fifth column is given the daily mean temperature, which is an average of the mean maximum and the mean minimum.

Take, for instance, Allakaket, the first station given. In January the highest temperature reached was 4° , that is to say, 28° below freezing. The lowest temperature, on the other hand, was 51° below

zero. Now, in order to make these two extremes somewhat clearer, the mean maximum and mean minimum give the average of these two sets of temperatures.

The total precipitation includes not only the rainfall but the snowfall, which has been melted and measured as water.

The remaining four columns are self-explanatory and easily understood. In January at Allakaket there were 14 clear days, 4 partly cloudy days, 13 cloudy days, and 8 days on which snow fell.

Those who desire to form an idea of the Alaska climate are advised to study these figures carefully.

Condensed meteorological reports.

ALLAKAKET. Latitude 66° 45', longitude 151° 10'. Deaconess B. B. Mills, observer.

Month	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1914.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	4	-51	-11.4	-31.3	-21.4	0.27	14	4	13	8
February.....	27	-56	- .8	-20.1	-10.4	.15	11	7	10	3
March.....	36	-57	12.5	-21.4	- 4.4	.90	18	2	11	10
April.....	41	-33	29.3	2.6	16.0	.74	12	3	14	5
May ¹	64	-17	49.6	28.0	38.8	.87	5	6	18	11
June.....	84	33	71.3	44.0	57.6	.62	7	13	10	8
July.....	77	27	69.5	41.8	55.6	.61	8	7	16	4
August.....	80	22	66.3	39.3	52.8	1.65	9	8	14	14
September.....	58	6	45.6	24.0	34.8	.53	14	1	15	5
October.....	40	0	32.8	14.5	23.6	.69	10	4	17	8
November.....	23	-48	.9	-18.4	- 8.8	1.06	15	1	14	10
December.....	33	-33	18.3	- 2.0	8.2	1.42	8	0	23	16

¹ For 29 days only.

CALDER. Latitude 53° 8', longitude 132° 27'. John McCallum, observer.

1914.										
January.....	44	4	33.1	24.4	28.8	5.84	12	8	11	18
February.....	46	18	40.4	30.2	35.3	8.50	2	10	16	19
March.....	54	19	43.4	30.1	36.8	9.23	3	20	8	15
April.....	65	26	49.9	34.2	42.0	9.36	9	7	14	19
May.....	71	29	54.3	35.8	45.0	5.25	10	10	11	17
June.....	70	31	58.8	38.7	48.8	1.25	15	8	7	7
July.....	66	35	57.1	43.5	50.3	13.17	0	14	17	25
August.....	65	38	58.3	43.7	51.0	5.40	0	14	17	22
September.....	64	33	54.5	39.1	46.8	11.67	3	14	13	23
October.....	60	30	52.7	37.1	44.9	12.65	0	14	17	28
November.....	51	19	40.9	29.8	35.4	18.10	5	7	18	25
December.....	42	15	34.7	26.8	30.8	5.10	12	2	17	12

CANDLE. Latitude 66°, longitude 161° 50'. R. S. Dimmick, observer.

1913.										
December ¹	18	-36	2.5	-12.7	- 5.1	(⁶)	10	0	19	.....
1914.										
January ²	26	-42	5.0	-11.0	- 3.0	(⁶)	10	0	16	.....
February.....	28	-44	2.5	-11.0	- 4.2	(⁶)	12	0	16	.....
March.....	38	-48	4.1	-12.9	- 4.4	(⁶)	16	2	13	.....
April ³	36	-22	25.5	9.1	17.3	(⁶)	6	2	18	.....
May ⁴	58	- 8	46.6	30.9	38.8	0.59	4	6	20	7
June ⁵	82	26	67.5	40.9	54.2	.15	8	1	13	1
July ¹	81	27	66.9	44.2	55.6	2.44	6	1	22	15
August ²	76	26	64.0	41.5	52.8	1.04	2	5	19	15
September ¹	55	6	47.1	23.4	35.2	.86	10	2	17	9
October ⁴	43	6	34.9	21.8	28.4	.19	5	3	22	3
November ⁷	26	-22	11.0	- 3.2	3.9	.....	10	2	16	.....
December ⁸	37	-12	28.7	12.8	20.8	.....	3	3	19	.....

¹ For 29 days.
² For 26 days.

³ For 27 days.
⁴ For 30 days.

⁵ For 22 days.
⁶ No rain gauge.

⁷ For 28 days.
⁸ For 25 days.

Condensed meteorological reports—Continued.

COPPER CENTER. Latitude 62°, longitude 145°. L. A. Jones, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1914.	° F.	° F.	° F.	° F.	° F.	Inches.				
February.....	25	-33	16.7	-2.9	6.9	0.68	4	11	13	4
March.....	45	-37	26.6	-4.1	11.2	.44	11	20	0	2
April.....	51	-23	36.8	10.0	23.4	.45	14	13	3	2
May.....	65	27	56.9	44.7	50.8	.19	2	25	4	2

CORDOVA. Latitude 60° 35', longitude 146°. Genevieve Whalen, observer.

1914.										
January.....	52	13	38.6	24.4	31.5	2.72	16	3	12	12
February.....	44	15	38.3	31.0	34.6	7.76	6	2	20	21
March.....	52	11	42.7	28.8	35.8	8.56	14	7	10	15
April.....	71	17	51.8	30.7	41.2	7.63	15	3	12	12
May.....	70	30	54.1	36.7	45.4	6.86	8	14	8	15
June.....	76	35	59.2	44.0	51.6	11.24	4	13	13	13
July ¹	87	40	62.2	45.8	54.0	6.82	6	5	17	18
August.....	75	42	58.5	48.4	53.4	13.63	2	5	25	21

¹ July 28, 29, and 30 omitted.

DUTCH HARBOR. Latitude 53° 54', longitude 166° 33'. Emil Ittner, observer.

1914.										
January.....	42	14	35.2	25.5	30.4	5.12	10	4	17	14
February.....	50	20	40.4	32.5	36.4	7.69	3	1	24	21
March.....	52	16	38.9	29.8	34.4	1.88	7	5	19	9
April.....	54	22	44.1	31.9	38.0	1.70	9	6	15	6
May.....	56	32	48.3	37.2	42.8	4.28	2	6	23	12
June.....	58	34	51.6	40.9	46.2	7.05	1	7	22	16
July.....	78	40	60.6	47.2	53.9	.82	10	12	9	7
August.....	76	40	59.3	46.8	53.0	3.60	2	4	25	12
September.....	78	32	58.1	44.5	51.3	4.12	3	7	20	17
October.....	52	28	47.2	36.5	41.8	6.76	0	5	26	20
November.....	48	24	41.5	32.4	37.0	8.10	3	2	25	20
December.....	50	26	41.6	31.4	36.5	7.10	7	5	19	17

EAGLE. Latitude 64° 40', longitude 141° 5'. N. R. Meyers, observer.

1914.										
January.....	24	-49	-5.3	-21.6	-13.4	0.29	10	12	9	8
February.....	30	-42	7.6	-12.4	-2.4	.32	6	8	14	7
March.....	46	-40	20.5	-3.2	8.6	.57	5	11	15	13
April.....	58	-15	40.5	11.8	26.2	.32	9	7	14	4
May.....	75	21	61.3	29.7	45.5	1.63	4	13	14	6
June.....	88	28	73.2	37.6	55.4	.81	6	13	11	9
July.....	79	-25	69.1	39.7	54.4	1.75	4	11	16	15
August.....	80	26	66.6	39.1	52.8	2.38	4	9	18	20
September.....	73	11	50.7	26.8	38.8	1.05	4	8	18	15
October.....	57	4	41.1	22.4	31.8	.07	2	15	14	1
November.....	39	-17	16.7	3.6	10.2	.24	4	8	18	8
December.....	23	-12	12.6	3.0	7.8	.22	6	9	16	5

AGRICULTURAL EXPERIMENT STATION, FAIRBANKS. Latitude 64° 50', longitude 148° 9'. J. W. Neal, observer.

1914.										
January.....	16	-34	-1.7	-17.2	-9.4	0.32	19	0	12	3
February.....	34	-34	15.3	-2.6	6.4	.38	9	3	16	3
March.....	48	-31	20.1	-2.2	9.0	1.06	13	5	13	7
April.....	52	-13	38.3	13.0	25.6	.66	8	13	9	5
May.....	70	5	58.6	31.8	45.2	.59	5	15	11	5
June.....	89	35	75.5	45.3	60.4	1.51	5	20	5	9
July.....	79	37	70.1	47.1	58.6	4.63	1	24	6	15
August.....	76	30	64.7	43.5	54.1	2.06	3	16	12	15
September.....	66	17	48.1	31.2	39.6	1.36	5	11	14	10
October.....	57	10	42.8	22.6	32.7	T.	8	12	11	0
November.....	34	-14	15.0	-1.3	6.8	.31	10	3	17	5
December.....	32	-17	17.7	1.3	9.5	1.52	7	4	20	12

Condensed meteorological reports—Continued.

FORT LISCOM. Latitude 60° 37', longitude 140° 27'. Lieuts. Mitchell, von Schroder, and Meister, observers.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1914.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	37	- 8	25.3	6.8	16.0	1.44	23	8	0	8
February.....	37	0	30.4	17.4	23.9	5.15	14	9	5	19
March.....	45	- 3	32.8	17.3	25.0	5.64	20	6	5	15
April.....	50	22	46.6	33.6	40.1	3.57	21	3	6	8
May.....	60	34	50.0	41.2	45.6	2.37	20	9	2	13
June.....	69	40	58.2	47.8	53.0	4.13	13	9	8	13
July.....	76	35	61.4	49.5	55.4	2.76	11	4	16	20
August.....	66	38	57.9	47.1	52.5	10.65	3	5	23	20
September.....	63	26	54.8	39.5	47.2	4.59	10	7	13	10
October ¹.....	.....	13	.....	32.1	.....	7.06	3	7	21	17
November ¹.....	.....	14	.....	24.5	.....	5.66	10	4	16	10
December ¹.....	.....	9	.....	21.1	.....	5.44	7	6	18	16

¹ No maximum thermometer.

FORTMAN SALMON HATCHERY. Latitude 55° 20', longitude 131° 40'. Fred Patching, observer.

1914.										
January.....	44	- 1	34.1	21.8	28.0	11.81	11	1	19	18
February.....	48	6	39.8	27.3	33.6	15.54	4	2	22	20
March.....	61	16	46.3	28.5	37.4	14.21	6	3	22	15
April.....	70	24	54.1	34.3	44.2	12.25	6	5	19	21
May.....	80	31	60.7	38.8	49.8	7.49	9	5	17	19
June.....	80	34	69.1	44.3	56.7	1.91	13	6	11	14
July.....	69	41	60.3	48.5	54.4	19.03	0	2	29	28
August.....	75	40	64.4	48.5	56.4	5.94	1	9	21	18
September.....	70	33	58.2	43.9	51.0	16.03	2	5	23	24
October.....	64	32	55.3	44.4	49.8	25.21	4	2	25	28
November.....	49	18	41.7	32.4	37.0	20.57	4	3	23	23
December.....	40	11	32.2	20.8	26.5	5.73	13	5	13	11

GULKANA. Latitude 62°, longitude 144°. John Low, observer.

1914.										
June.....	79	.....	65.8	.....	.....	(¹)	15	5	10	.....
July.....	79	48	70.2	53.6	61.9	.....	15	2	14	.....
August.....	73	35	63.1	42.6	52.8	.....	6	7	18	.....
September.....	63	10	51.7	26.9	39.3	.....	9	5	16	.....
October.....	52	8	40.6	20.7	30.6	.....	6	4	21	.....
November ²	36	-19	12.4	- 5.3	3.6	.....	8	2	19	.....
December.....	28	-30	9.4	- 2.4	3.5	.....	10	1	20	.....

¹ No rain gauge..² Minimum for 29 days, maximum for 21 days.

HAINES. Latitude 59° 14', longitude 135° 26'. E. L. Winterburger, observer.

1914.										
June ¹	77	41	70.0	50.0	60.0	0.10	5	0	6	1
July.....	77	45	63.3	50.3	56.8	3.58	6	8	17	18
August.....	68	41	60.8	49.1	54.8	3.87	6	10	15	11
September.....	63	33	54.0	41.9	48.0	5.80	7	5	18	12
October ²	58	31	50.3	39.8	45.0	8.15	4	7	14	16
November.....	48	4	36.3	26.3	31.3	4.67	9	3	18	10
December.....	41	4	30.2	14.6	22.4	1.67	22	1	8	6

¹ For 11 days only.² For 25 days.

Condensed meteorological reports—Continued.

JUNEAU. Latitude 58° 18', longitude 134° 24'. C. R. Reid, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maxi-mum.	Mini-mum.	Mean maxi-mum.	Mean mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1914.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	40	- 2	29.1	22.1	25.6	3.39	17	1	13	13
February.....	50	11	38.2	28.1	33.2	7.83	6	3	19	19
March.....	49	23	41.0	31.4	36.2	6.39	11	2	18	18
April.....	67	26	50.5	34.9	42.7	5.47	12	2	16	17
May.....	68	31	56.0	38.6	47.3	6.54	12	4	15	18
June.....	82	33	68.6	50.5	59.6	1.18	11	11	8	11
July.....	70	42	58.4	47.0	52.7	9.30	4	4	23	23
August.....	61	43	56.2	47.2	51.7	9.54	1	3	27	29
September.....	62	36	52.7	41.9	47.3	10.93	4	8	18	22
October.....	57	30	50.7	39.8	45.2	6.26	4	12	15	23
November.....	46	18	37.9	30.2	34.0	4.12	11	3	16	18
December.....	38	12	30.5	22.2	26.3	4.26	21	4	6	8

KETCHIKAN. Latitude 55° 25', longitude 131° 35'. A. P. Craig, observer.

1914.										
January.....	46	4	34.4	21.7	28.0	12.39	11	0	20	18
February.....	50	15	43.0	27.3	34.6	18.64	8	0	20	18
March.....	61	16	47.4	28.2	37.8	13.56	15	0	16	13
April.....	72	23	53.1	32.2	42.6	12.37	10	5	15	20
May.....	81	29	60.4	36.1	48.2	7.42	14	10	7	11
June.....	83	32	66.4	42.0	54.2	3.19	20	4	6	9
July.....	68	36	58.5	44.9	51.7	28.06	4	0	27	26
August.....	79	41	65.8	47.6	56.7	12.59	16	7	8	15
September.....	74	32	58.4	43.1	50.8	19.72	9	1	20	22
October.....	62	32	54.4	42.6	48.5	19.70	3	2	26	26
November.....	51	19	42.8	32.7	37.8	17.36	6	0	24	23
December.....	43	14	32.7	23.0	27.8	8.28	14	0	17	12

KLUKWAN. Latitude 59° 25', longitude 136°. Rev. F. R. Falconer, observer.

1914.										
January.....	36	-26	18.9	0.9	9.9	1.31	17	5	9	10
February.....	43	-11	32.0	15.2	23.6	1.36	11	5	12	12
March.....	50	9	39.9	25.4	32.6	1.74	10	7	14	12
April ¹	65	13	51.9	28.9	40.4	.97	7	10	10	9
May.....	76	24	61.3	35.0	48.2	.77	11	10	10	7
June.....	84	28	69.2	42.1	55.6	.06	20	4	6	1
July.....	82	40	64.4	46.9	55.6	2.02	9	4	18	21
August.....	70	41	62.7	48.3	55.5	1.11	3	9	19	10
September.....	66	30	54.9	39.0	47.0	3.78	5	7	18	22
October.....	55	23	48.2	36.2	42.2	3.19	7	2	22	22
November.....	46	- 1	32.2	20.6	26.4	2.69	12	2	16	14
December.....	33	-10	18.3	4.4	11.4	.35	22	1	8	6

¹ For 27 days only.

KODIAK. Latitude 57° 45', longitude 152° 30'. Charles Heideman, jr., observer.

1914.										
January.....	44	16	33.7	24.1	28.9	3.18	4	14	13	10
February ¹		24		32.9		7.80	3	5	20	12
March ¹		16		27.9		3.89	17	4	10	6
April ²	54	24	44.4	31.0	37.7	2.10	15	7	8	6
May ³	61	27	50.5	38.1	44.3	5.12	4	18	9	10
June ¹		35		41.4		11.21	1	12	17	17
July.....	73	44	61.9	47.4	54.6	5.50	4	13	14	13
August.....	68	42	59.4	48.1	53.8	5.18	1	16	14	17
September.....	61	32	53.1	40.1	46.6	2.28	5	16	9	11
October.....	50	33	46.9	39.5	43.2	13.52	0	4	27	25
November.....	47	12	40.3	30.8	35.6	6.04	4	17	9	16
December.....	45	25	40.3	31.9	36.1	8.70	9	6	16	19

¹ No maximum thermometer.² Maximum for 20 days.³ Maximum for 21 days.

Condensed meteorological reports—Continued.

NOME. Latitude 64° 30', longitude 165° 24'. Mrs. N. S. Jolls, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1914.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	26	-38	11.3	- 3.2	4.0	0.39	8	3	20	6
February.....	35	-37	18.6	3.2	10.9	.61	11	3	14	6
March.....	34	-29	16.5	.4	8.4	1.44	16	2	13	9
April.....	37	-17	27.9	13.6	20.8	1.11	10	3	17	9
May.....	54	- 6	40.2	30.2	35.2	1.53	6	0	25	18
June.....	70	28	56.1	39.7	47.9	1.09	12	1	17	11
July.....	68	30	59.0	45.0	52.0	1.64	10	3	18	15
August.....	74	25	58.4	45.3	51.8	2.88	8	4	19	16
September.....	53	22	44.7	30.7	37.7	1.22	13	3	14	6
October.....	45	16	38.5	29.9	34.2	1.28	5	3	23	9
November.....	35	- 7	21.5	10.5	16.0	.71	12	4	14	10
December.....	36	3	30.5	21.1	25.8	3.44	8	5	18	19

RAMPART. Latitude 65° 30', longitude 150° 15'. G. W. Gasser, observer.

1914.										
January.....	10	-45	- 8.8	-25.0	-16.9	0.04	14	16	1	1
February.....	23	-48	0.7	-11.5	- 5.4	.27	10	2	16	5
March.....	49	-34	17.7	- 7.1	5.3	.21	14	10	7	3
April.....	54	-20	37.7	11.0	24.4	.48	12	9	9	7
May.....	75	0	62.6	29.5	46.0	.51	4	19	8	2
June.....	92	33	79.6	44.4	62.0	.57	13	14	3	4
July.....	89	32	75.0	46.2	60.6	1.04	4	13	14	7
August.....	87	27	70.4	41.5	56.0	1.83	6	12	13	7
September.....	74	9	51.6	26.3	39.0	.50	9	11	10	6
October.....	55	8	34.0	20.9	27.4	.03	5	9	17	2
November.....	24	-29	7.7	- 4.7	1.5	.08	9	6	15	5
December.....	31	-17	12.8	- 0.8	6.0	.26	5	10	16	5

SEWARD. Latitude 60° 6', longitude 149° 26'. W. A. McNeiley, observer.

1913.										
November.....	45	11	34.8	24.1	29.4	4.13	15	4	11	12
December.....	47	2	34.0	22.5	28.2	5.83	9	3	19	16
1914.										
January.....	42	8	30.7	19.5	25.1	4.03	16	6	9	10
February.....	45	11	38.1	28.3	33.2	6.69	6	5	17	20
March.....	49	6	39.8	26.0	32.9	2.36	16	3	12	13
April.....	63	14	49.3	28.0	38.6	1.59	20	3	7	6
May.....	68	30	53.7	37.9	45.8	2.64	11	1	19	14
June.....	69	35	58.0	42.5	50.2	6.81	1	2	27	15
July.....	85	43	66.7	47.5	57.1	1.67	7	5	19	13
August.....	78	41	64.3	46.3	55.3	7.93	0	5	26	21
September.....	75	29	60.3	39.9	50.1	3.79	9	6	15	13
October ¹	57	31	51.9	38.6	45.2	11.09	2	3	20	17
November ²	58	13	41.2	23.5	32.4	4.55	4	3	9	9
December.....	53	12	42.8	23.5	33.2	7.80	4	6	21	20

¹ October 17, 18, 19, and 20 omitted.² November 23 and 24 omitted.

SHRIMP BAY. Latitude 55° 51', longitude 131° 30'. John Orchard, observer.

1914.										
August ¹	69	54	64.2	56.5	60.4	0.63	4	0	8	6
September.....	65	39	56.1	46.4	51.2	11.70	6	3	21	23
October.....	57	35	51.7	44.7	48.2	17.35	4	10	17	27
November.....	47	22	40.0	33.3	36.6	12.57	9	5	16	21
December.....	39	17	31.3	23.9	27.6	4.20	16	5	10	8

¹ Only the last 12 days of this month given.

Condensed meteorological reports—Continued.

SITKA. Latitude 57° 3', longitude 135° 20'. C. C. Georgeson, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1914.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	51	3	39.0	27.4	33.2	2.67	11	7	13	12
February.....	54	22	45.0	34.1	39.6	7.14	4	3	21	19
March.....	56	22	45.7	33.5	39.6	8.39	4	3	24	20
April.....	64	30	52.6	36.7	44.6	5.51	8	5	17	19
May.....	71	32	55.2	40.2	47.7	4.17	8	5	18	18
June.....	68	36	59.3	45.5	52.4	1.63	6	15	9	10
July.....	74	42	59.0	48.0	53.5	6.93	1	4	26	26
August.....	64	45	59.3	49.9	54.6	4.33	1	3	27	29
September.....	69	38	57.1	44.6	50.8	8.66	3	8	19	25
October.....	66	36	56.3	45.2	50.8	7.03	1	9	21	26
November.....	53	22	45.6	35.3	40.4	8.83	8	5	17	23
December.....	49	18	41.2	28.0	34.6	6.79	12	7	12	12

SUNRISE. Latitude 60° 54', longitude 149° 35'. A. Lawson, observer.

1914.										
January.....	39	-10	20.3	5.0	12.6	2.29	17	3	11	12
February.....	47	-2	36.9	21.6	29.2	2.11	6	4	18	16
March.....	49	-10	34.6	14.8	24.7	1.24	15	4	12	11
April.....	59	6	44.6	20.9	32.7	.54	16	6	8	7
May.....	62	20	53.7	32.5	43.1	2.08	6	11	14	14
June.....	72	31	60.9	39.3	50.1	2.48	9	5	16	11
July.....	73	34	61.6	42.2	51.9	1.81	6	9	16	17
August.....	69	34	60.7	43.2	52.0	4.93	7	11	13	20
September.....	60	20	46.9	31.6	39.2	2.47	11	6	13	15

TANANA. Latitude 65° 13', longitude 152° 2'. Violette J. Page, observer.

1914.										
January.....	8	-43	-4.3	-18.7	-11.5	0.54	18	6	7	7
February.....	24	-48	4.1	-4.5	-0.2	.29	11	7	10	6
March.....	38	-46	13.6	-7.0	3.2	.58	12	2	17	10
April.....	42	-16	31.4	9.8	20.6	.81	11	6	13	10
May.....	68	-4	54.3	31.5	42.9	.68	4	10	17	5
June.....	86	35	73.1	45.1	59.1	.52	10	12	8	6
July.....	79	31	69.2	44.9	57.0	2.35	12	7	12	14
August.....	79	30	65.6	43.8	54.7	.74	7	6	18	12
September.....	58	10	46.9	27.0	37.0	.60	10	1	19	7
October.....	44	13	34.0	23.0	28.5	.22	9	6	16	4
November.....	27	-27	8.9	-3.1	2.9	.62	16	2	12	13
December.....	31	-20	20.1	9.6	14.8	2.68	4	3	24	16

TONSINA. Latitude 61° 50', longitude 145°. H. H. Lines, observer.

1914.										
March 1.....	43	-37	21.4	-4.4	8.5	.....	9	0	22	.....
April 1.....	48	-17	36.2	9.2	22.7	.....	23	0	7	.....
May 1.....	60	22	51.1	29.1	40.1	.....	0	0	31	.....
June 1.....	67	27	59.2	33.3	46.2	.....	0	0	30	.....
July.....	70	28	62.4	35.4	48.9	1.60	2	0	29	2
August.....	69	28	65.4	38.5	52.0	2.01	0	4	27	4
September 1.....	66	4	49.4	25.2	37.3	.....	12	10	8	.....
October 1.....	42	10	32.5	20.1	26.3	.....	1	9	21	.....
November 1.....	25	-20	12.2	-3.7	4.2	.....	9	0	21	.....
December 1.....	40	-30	9.3	-6.5	1.4	.....	3	0	28	.....

1 No precipitation recorded; rain gauge broken.

Condensed meteorological reports—Continued.

VALDEZ. Latitude 61° 7', longitude 146° 20'. Mrs. Laura Jones, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1914.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	37	- 5	25.6	8.1	16.8	0.41	11	9	11	8
February.....	37	- 0	33.9	17.5	25.7	3.54	5	5	18	20
March.....	45	- 3	32.6	16.8	24.7	2.85	13	5	13	14
April.....	49	9	41.7	23.3	32.5	3.93	12	8	10	13
May.....	62	21	52.5	33.4	43.0	1.88	7	8	16	15
June.....	69	33	58.5	43.1	50.8	4.08	0	14	16	17
July.....	74	39	61.2	44.8	53.0	2.79	2	13	16	22
August.....	68	39	56.3	44.7	50.5	8.96	0	5	26	27
September.....	61	23	52.1	36.8	44.4	4.31	7	8	15	16
October.....	57	25	46.7	33.7	40.2	5.05	4	10	17	18
November.....	47	2	33.3	18.2	25.8	3.11	14	3	13	11
December.....	39	- 9	29.8	13.2	21.5	3.82	12	5	14	20

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