

DEPARTMENT OF AGRICULTURE
—
CENTRAL EXPERIMENTAL FARM
OTTAWA, CANADA

APPLE CULTURE

AND DISTRICT LISTS OF APPLES SUITABLE FOR ONTARIO AND QUEBEC

WITH

DESCRIPTIONS OF VARIETIES

BY

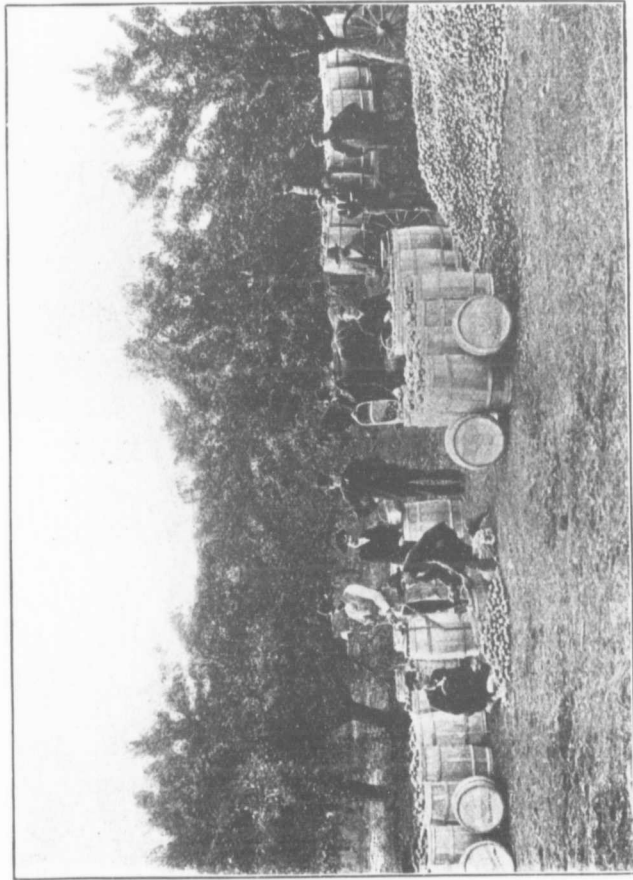
W. T. MACOUN

Horticulturist, Central Experimental Farm

—
BULLETIN No. 37
—

APRIL, 1901

—
PUBLISHED BY DIRECTION OF THE HON. SYDNEY A. FISHER, MINISTER OF AGRICULTURE



Packing Apples for Export in Niagara District, Ontario.

Ap
Ap

The
The

Variet
A dist
Descri
Russia
Pollina
Prunin
Mainte
Cultiva
Cover C
Renova
Picking
Storing
Markets
Spraying
Diseases
Apple in

TABLE OF CONTENTS.

	PAGE
Apple culture in the provinces of Ontario and Quebec	8
Apple culture at the Central Experimental Farm	8
Introduction of varieties	9
Origin of varieties	9
Seedling varieties	10
Cross-bred and hybrid varieties	11
Bud-varieties	16
Propagation by grafting and budding	17
Tools and appliances used in pruning and grafting	24
The nursery	25
The orchard	26
Site and soil	26
Preparation of the land	27
Time of planting	27
Laying out the orchard	28
Windbreaks	28
Kind of trees to plant	29
Planting	30
Varieties	32
A district apple list for the provinces of Ontario and Quebec	33
Description of varieties	37
Russian apples	47
Pollination of apples	48
Pruning	49
Maintenance of fertility	51
Cultivation	55
Cover Crops	57
Renovating orchards	60
Picking and packing	61
Storing	63
Markets	64
Spraying	65
Diseases and other injuries to apples and apple trees	67
Apple insects	70

To t

ment
T. M

has b
with
this t
prepa
subse
and o
of var
are su
descrij
Some
a brief
the Ex
injuri

It
ested in
further
the gro

OTT

To the Honourable
The Minister of Agriculture.

SIR,—I beg to submit for your approval Bulletin No. 37 of the Experimental Farm series, which has been prepared under my direction by Mr. W. T. Macoun, Horticulturist of the Central Experimental Farm.

The subject treated of is Apple Culture and the information presented has been derived mainly from the experimental work carried on in connection with apple growing at the Central Farm during the past twelve years. In this bulletin there will be found full information as to the best methods of preparing the soil for an orchard, with particulars also as to the planting and subsequent care of the trees. Instructions are also given as to pruning, grafting and on many other topics relating to this branch of the fruit industry. Lists of varieties of apples are submitted which ripen at different seasons and which are suitable for planting in different parts of Ontario and Quebec and full descriptions as to the character and quality of these varieties are also given. Some of the diseases to which apple trees are subject are also referred to, and a brief account is given by Dr. James Fletcher, Entomologist and Botanist to the Experimental Farms, of some of the more important insects which are injurious to the apple.

It is hoped that the information submitted will be useful to those interested in the cultivation of this fruit in Canada, that it will prove a stimulus to further planting both for home use and export, and that it may aid in making the growing of apples in this country more successful and more profitable.

I have the honour to be,

Your obedient servant,

WM. SAUNDERS,

Director Experimental Farms.

OTTAWA, April 1, 1901.

the n
fruits
our r
were

T
howev
but th
fruit r
to-day
Roma
with s
tioned
that t
now ca

W
tively
old and
many o
parts o
there i
apples
taste, n
best sui
red and
and pro

Ne
ous sele
round, a
the best
spring,

The

is the k
The
dependi
and his
crops wl
heavily

APPLE CULTURE

BY

W. T. MACOUN,

Horticulturist, Central Experimental Farm, Ottawa.

The apple is the most important and useful fruit in all civilized parts of the north temperate zone where it can be grown successfully. While other fruits are, in a greater or less degree, regarded as luxuries, the apple is part of our regular diet and much would this wholesome and delicious fruit be missed were we unable to procure it.

The origin of the cultivated apple is wrapped in mystery. It is supposed, however, that it had its beginning in the wild apple of Europe (*Pyrus Malus*), but there is no evidence to show when the improvement began, nor when the fruit reached the size, colour and quality of what is regarded as a good apple to-day. It is known, however, that at the beginning of the Christian era, the Romans cultivated a few varieties of apples which might compare favourably with some that are grown at the present time. Although the apple is mentioned in Holy Scripture many years prior to that period, it is now thought that the word referred to another fruit, or other fruits, and not to what is now called an apple.

While the range of successful culture of many other fruits is comparatively limited, the apple has a very wide one in the temperate climates of the old and new worlds and is able to accommodate itself to conditions under which many other cultivated fruits would not thrive. It is, however, in the temperate parts of America where it reaches the highest state of perfection, and where there is an ever increasing area devoted to this fruit. Named varieties of apples are very numerous, being, probably, over 2,500 in number, so that every taste, no matter how eccentric, may be satisfied, and a selection made of those best suited to a particular person or place. It is a very attractive fruit, the red and yellow, which are the predominant colours, varying much in shade and prominence.

No other fruit, probably, has as long a season as the apple. By a judicious selection of varieties, apples may be had in good condition the whole year round, and now that the system of cold storage has been so perfected, some of the best varieties, which, under ordinary circumstances, would not keep until spring, may be had in good order late in the following summer.

The uses of the apple are too well known to need mention. Truly, this is the king of fruits.

The profits from apple growing may be large or may be small; much depending on the varieties planted, the markets, and most of all on the man and his methods of growing this fruit. Some varieties begin to bear paying crops when five years planted. Most of the best sorts, however, do not bear heavily for ten years or more. The profitable life of an apple tree will depend

greatly on the climate it is grown in, the culture given, and the variety. There are, however, other factors which influence it. In the best apple districts of America, profitable crops are gathered from trees sixty to one hundred years of age.

APPLE CULTURE IN THE PROVINCES OF ONTARIO AND QUEBEC.

It was not until forty or fifty years ago that the apple industry began to assume much importance in the province of Ontario, although apples had been grown there since the early years of the 19th century, and probably before. Apple culture has increased very rapidly during recent years and continues to make steady growth. From the statistics for 1900, we learn that the yield of apples for that year was estimated at 36,993,017 bushels; that there were 6,518,048 trees of bearing age, and 3,430,670 young trees in the province. The export of apples from this province is also very large.

In the province of Quebec, apples have been grown for a much longer period than in Ontario. There are records which show that as long ago as 1663 this fruit was being produced there. While the industry has not grown as rapidly as in Ontario, there are now many large orchards in the province, and the area devoted to this fruit is increasing every year and more apples are being exported. On the Island of Montreal, alone, there are now about 2,400 acres of orchard of which most of the trees are apples, and the product is estimated at from 250,000 to 275,000 barrels annually. The future of the apple industry in Canada seems very bright. The best flavoured, most highly coloured and longest keeping fruit is produced in Canada. Apples can be grown successfully on a large scale in the provinces of Ontario and Quebec from latitude 42° to latitude 45°, and from below the city of Quebec west to the great lakes; an immense tract of country which, although not all suitable for apple growing, will furnish enough good land to produce all of this fruit that will be required to supply the world for many years to come.

While it is doubtful whether apples can be grown economically for export in the provinces of Ontario and Quebec on a large scale much north of latitude 45°, they have been grown as far north as latitude 48° 26', at Chicoutimi, in the province of Quebec, and there is every reason to believe that they can be grown even further north than this in both provinces, if only the hardiest varieties are planted and better care taken of the trees than in the more favoured districts. These northern orchards will probably be able to supply all the local demand, and perhaps more.

The market for good apples in Great Britain and Europe is at the present time practically unlimited and will probably be so for a long time.

With the favourable conditions for growing apples which prevail in this country, Canadian apples should take first place on the markets of the world, if the proper kinds of fruit are grown, and if it is placed on the markets in prime condition.

APPLE CULTURE AT THE CENTRAL EXPERIMENTAL FARM.

Most of the information contained in this Bulletin is the result of the experience gained in growing apple trees and apples at the Central Experimental Farm. The notes on apple insects and the remedies therefor, which will be found in the closing pages of this Bulletin, have been kindly prepared by Dr. James Fletcher, Entomologist and Botanist of the Dominion Experimental Farms, to whom I beg to acknowledge my indebtedness.

The lines of work at the Central Experimental Farm have included the testing of the hardiness, productiveness, quality and freedom from disease of the different varieties of apples. The different methods of propagating and grafting have also been tested, using various stocks for this purpose. The top-grafting of tender varieties on hardy stocks has received much attention of late years and good results are already apparent. Different methods of culture have been tried in the orchard and various cover crops have been tested to ascertain which were the best.

Spraying has been a prominent feature of the work since 1890, and many experiments have been tried with different mixtures and solutions for preventing and destroying insect pests and fungous diseases.

The apple orchards at the Central Experimental Farm were begun in the autumn of 1887, but it was not until the spring of 1888 that much progress was made. Since that time the number of varieties tested and the area devoted to this fruit have both increased very much. Up to the present time 645 varieties have been tested, most of which are now growing, though many of the kinds have been replaced several times. The Russian apples have received especial attention, as it was thought that these would prove of particular value for the northern parts of this country. There are now about 160 Russian varieties growing, though some of them may be synonyms. There are 1,271 apple trees in the orchard at present, occupying about 18½ acres of land.

In addition to this there is a Russian seedling plantation, occupying about an acre, and a small orchard of Wealthy apple trees alone.

Much work has also been done in cross-breeding and hybridizing apples for the purpose of obtaining hardier trees or better varieties.

INTRODUCTION OF VARIETIES.

Many varieties of apples have been tested in Canada and the United States since these countries were first settled, and during the last century, especially, the number has increased very rapidly. These have either been introduced from Great Britain and Europe or have been originated in America. It has been found that a much larger proportion of the varieties which have originated in America, are more profitable sorts to grow than of those from other countries, and in Canada the facts are much the same, except in the very coldest parts of the country, where apples can be grown, and there the Russian varieties take a predominant place, but this is probably because the colder parts of the country have not been settled so long, and hardy seedlings of value are, on this account, not so often met with.

During the past thirteen years, 645 varieties of apples have been tested at the Central Experimental Farm, at Ottawa. These have been obtained from many sources, but the largest proportion of them were of Russian and American origin.

Of the apples which are succeeding best at Ottawa, nearly all the most profitable summer varieties are of Russian origin, but most of the best autumn and winter sorts were originated in America.

ORIGIN OF VARIETIES.

Varieties are originated in three different ways. First, from seed; second, by cross-fertilization and hybridization; and third, by sporting or bud variation.

SEEDLING VARIETIES.

Most of the named varieties of apples growing in America to-day were originated as seedlings. Our forefathers brought apple seeds with them from the old land and sowed them in this country. The young trees raised from these grew up and bore fruit, and occasionally a variety of merit would thus be produced, and then propagated. In later times chance seedlings grew up in the fence corners and other waste places, and these also bore fruit and added their quota of good sorts. From trees like these have originated such fine varieties as Northern Spy, Baldwin, Fameuse, McIntosh Red, and many others.

Of late years more systematic efforts have been made to originate new varieties from seed. But the varieties of really useful apples which have originated in this way have been very few indeed. The late Peter Gideon, of Excelsior, Minn., U.S., devoted probably more time to this work than any other man in America. He published the results of his experience in the Thirteenth Annual Report of the Minnesota State Horticultural Society. The following are extracts from that report:—

‘Our efforts and trials in Minnesota began thirty years ago last spring by planting one bushel of apple seed, a peck of peach seed, and five hundred apple, pear, plum and cherry trees, and for eleven years thereafter planted each year enough apple seed to bring 1,000 trees, and in the time named frequent additions to the orchard of old named varieties—all southern or eastern grown trees and seeds, and all kept as long as they could be made to live in Minnesota, and to-day only two trees remain. One of these, the Wealthy, grown from a cherry-crab seed, obtained of Albert Emerson, of Bangor, Maine, of whom I obtained scions at the same time, from which I grew the Duchess, Blue Pearmain, and the Cherry-crab, all of which, combined, were the foundation of Minnesota horticulture, that to-day is the pride and hope of the North-west. But since these varieties came into bearing we have planted only of our own growing of seed, with forty first-class varieties the result.’

‘Thus far it has taken from three to five hundred seedlings to give us one first-class apple, and that from seed taken from the best apples we had.’

Although the Wealthy apple is probably the most valuable variety of its season in the colder parts of Canada and the United States, Gideon’s attempts to produce a hardy late keeping apple of very good quality were of no avail, and at the present time it is not known that any very good late keeping dessert apple exists which is adapted to the climate of Minnesota, or for the colder districts in Canada.

At the Central Experimental Farm at Ottawa, considerable work has been done in raising seedling apples, especially from seed of Russian varieties, but no kinds of great merit have yet been produced.

In the year 1890 an orchard was planted comprising about 3,000 trees grown from seed imported from E. Goegginger, Riga, Russia. The seed from which these were grown was said to have been taken from apples grown north of Riga, Russia. Of these there are now 898 remaining, the rest having been killed by blight or winter or removed on account of weak growth or inferior quality. These began to fruit in 1897, when about 50 trees bore. In 1898 there were 40 trees which fruited; in 1899 there were 43, and in 1900 there were 26, making a total of 159 trees which have borne fruit. None of these apples are sufficiently promising to be worthy of special mention,

but
Ne

hav
orig

tha
it w
fror
*Ap
cha
poss
of a
to o
the
alth

Sow
poss

long

ness,
fruit

the c
sorts
and tl
shoul
to be

A
is not
mixed
until s
much;
soil ca
germir
be sow
if the c
about (
the fol
season.
to 3 fee
they sh

The
hybridiz
cross bet
or a vari
3

but a few of them are as good as the majority of the named Russian varieties. Nearly all of them are summer apples.

Many seedlings are now being grown of the best varieties of apples which have fruited at Ottawa, and it is hoped that some good varieties will be originated in this way.

From our own experience and the experience of others, it would appear that if a good late keeping apple is desired, the chances are very slight that it will be produced from seeds of an early apple. On the other hand, seeds from a late keeping apple will not, necessarily, produce late keeping varieties. Apples have been so inter-crossed, in nature, for hundreds of years, that the characteristics of many varieties are apparent in the seedlings of one. It is possible that there never was a case where a seedling of a cultivated variety of apple was identical in every respect with its parent. If it is desired, then, to originate a new variety, the following methods are recommended as being the most likely to produce the variety with the characteristics sought for, although thousands of seedlings may have to be grown to attain this purpose:—

1. To produce a hardy apple where no apples have yet been found hardy : Sow seeds of apples which have ripened in a climate as nearly similar as possible.

2. To produce a hardy long keeping apple of good quality : Sow seeds of long keeping apples of good quality which have ripened in a similar climate.

3. To produce an apple having certain characteristics, as regards hardiness, vigour and productiveness of tree, and quality, size and appearance of fruit : Sow seeds of varieties having most of the characteristics desired.

4. If seedlings are to be grown on a large scale, more varieties having the characteristics desired will probably be obtained if trees of several named sorts blossoming at the same time be planted in close proximity in the orchard, and the seeds used from fruit borne on these trees. The trees thus planted should combine all the good points in the standard aimed at, for the variety to be originated.

Apple seeds germinate best when sown in the autumn. If, however, it is not convenient to sow them at that time they may be stratified ; that is, mixed with sand, slightly moist, but not wet, and kept in a cool but dry place until spring. Seeds should not be sown in the autumn in soil which heaves much ; better hold them over and sow them as early in the spring as the soil can be worked. If apple seeds become very dry they may not always germinate satisfactorily, and this should be guarded against. The seed should be sown thinly, about two inches deep, in rows from $2\frac{1}{2}$ to 3 feet apart. Or, if the quantity is small, beds may be prepared and the seed sown in row about 6 inches apart. If sown in the autumn, most of them should germinate the following spring and make a growth of from one to two feet that season. They should be transplanted the following spring into rows from $2\frac{1}{2}$ to 3 feet apart, placing them 12 inches apart in the rows. The next spring they should be in good condition for planting in the seedling orchard.

CROSS-BRED AND HYBRID VARIETIES.

Those varieties which are originated by artificial cross-fertilization and hybridization are called cross-bred and hybrid, respectively. A hybrid is a cross between two species : as, for instance, between *Pyrus Malus*, the apple, or a variety of it, and *Pyrus baccata*, the Siberian crab. A cross-bred is a

cross between two varieties of the same species, as, for instance, between the Northern Spy and McIntosh Red apples.

Although nearly all our best apples have been originated as seedlings, the reason is, not that good varieties cannot be produced by artificial cross-fertilization and hybridization, but that comparatively little systematic work has been done in this direction in America until recent years. When one considers that a very large number of chance seedlings have been the result of the natural cross-fertilization of the flowers of different varieties (for it is now an established fact that many varieties of apples are self-sterile) it is reasonable to suppose that a much larger percentage of good apples will be obtained if the flowers are pollinated artificially, as then only the varieties which have the characteristics desired in the seedlings will be used as the parents, and although it has been already said that apples have been so intercrossed in nature for hundreds of years that there is no certainty what the seedlings of any variety will be like, yet the characteristics of the parents will be more likely to predominate than those of varieties whose blood has intermingled at a more remote period. Before beginning any work of this kind, it is important, then, to decide what kind of an apple is most desired, and to select as parents those varieties which have as many of the qualities sought for as possible. The seedlings raised will probably have more of the characteristics of the female parent than of the male, and this should be taken into consideration when selecting the variety for that purpose. There is, however, no certainty in the matter, and in originating cross-bred apples it is wise to do some crossing with one variety as the female parent, and some with the same variety as the male parent. A hybrid, however, is almost certain to partake more of the female parent if the species differ widely.

The season when one may pollinate apple blossoms is very limited, as there is only from a week to ten days during which the work may be done.

In the blossom of the apple the organs of reproduction represent both sexes. When the pollen, which is the fine dust constituting the male part of the flower, comes in contact with the stigma, which is the upper part of the female organ, fertilization is liable to take place, and this must be prevented if artificial pollination is to be performed. The pollen which is contained in the anthers is shed almost as soon as the blossoms open, and work must begin, therefore, when the flower is in bud.

There are usually five or six buds in a cluster on apple trees, but generally only the strongest of these set fruit. The more the flower bud is developed, the greater chances there will be that artificial pollination will be successful. The operator, however, must be certain that no pollen has already been shed. Two or three of the weakest and least developed buds are pinched off and the remainder are left to be operated upon, or if some of the flowers are open they are removed and the others left. A pair of small tweezers are very good for this purpose. They should be perfectly smooth at the tips, both outside and inside, so that no pollen will lodge there. The petals of the buds are now removed by means of the tweezers; the anthers which contain the pollen are then removed, by breaking the filaments off, and thrown away. In removing the petals and anthers, great care should be taken that the stigmas are not injured, as, if they are, failure is certain. Only the female part of the flower now remains. The stigmas are in condition to receive the pollen when they become moist. They will remain in this condition for a day or two. Pollen may, however, be applied to the stigmas before they are ready, as pollen will stay in good condition longer than the stigmas. If the pollen is not applied

immediately, the flowers which have been operated upon should be covered with a stout paper bag and the mouth tied tightly about the twig, so that



Flower of apple prepared for cross-fertilizing—1, flower just before opening; 2, the petals removed; 3, the anthers removed; 4, one of the anthers; 5 and 6, views of pollen highly magnified.

no insect can get in. Flower clusters of the variety of apple which is to supply the pollen and be the male parent of the future seedlings, should be gathered just before the buds open, and the twigs put in water until the blossoms open and the pollen is shed, which can be easily detected as the anthers burst open, when the pollen becomes quite visible to the naked

eye. If the flowers are taken in the orchard after they open there is every probability that insects may have deposited pollen from other varieties there, and thus the parentage of the cross-bred variety would not be certain. When the pollen and stigmas are ready, the bag is removed and the stigmas then well covered with the pollen. This may either be effected by holding the flower in the fingers and rubbing the anthers against the stigmas, by putting some of the pollen on the finger nail and thus rubbing it on, or by applying it on the end of a knife or some other flat surface. The camel's hair brush which is often recommended is not a safe thing to use, as pollen may stick in the hairs, and if several kinds are worked with there will be no certainty as to the parentage. After this operation has been performed the bag should be put on again and tied tightly as before. A label should then be attached to the twig, on which should be written a number, the names of the male and female parents, the number of flowers operated on, and the date on which the work was done. This record should also be kept in a notebook. When the blossoming period is over and the fruit is well set the paper bag should be removed, a record taken of the number of apples which have set, and then a gauze or muslin bag tied over the fruit instead of the paper one. The apples should then be left to grow and ripen in the orchard. Late apples which are not thoroughly matured when harvested should be left as long as possible before the seeds are taken out. The seeds should be removed, however, in time to sow them before winter sets in. They should be counted and the number recorded with the other data, and then treated the same as has already been recommended in the paragraph on Seedling Varieties.

Much systematic work has been done in Canada in originating varieties of apples by cross-fertilization and hybridization. To the late Chas. Arnold, of Paris, Ont., and to the late P. C. Dempsey, of Trenton, Ont., is due great

credit for work done at a time when few were interested in the scientific aspects of fruit growing. The Ontario apple, which was originated by Chas. Arnold by crossing the Northern Spy with the Wagener, is a worthy memorial to that gentleman, it being one of our best and most profitable commercial apples. The Trenton and Walter apples are two of Mr. Dempsey's crosses, and are among the best apples of their season. The late horticulturist of the Central Experimental Farm, Mr. John Craig, also did some work in this direction, and it is expected that his crosses will begin to fruit next year. During the past two years we have done a limited amount of work also, the object being to obtain, if possible, hardy, late-keeping, productive apples of fine colour and good quality, which are much needed in northern and eastern Ontario and the Province of Quebec. Both seasons the McIntosh Red and Lawver apples have been used for this work. They are good sized red apples, and are perfectly hardy at Ottawa, being also annual, though not heavy, bearers. The McIntosh Red apple is probably unsurpassed in quality by any apple of its season. The Lawver apple is the best keeping apple yet fruited at the Central Experimental Farm, it having been kept in good condition in an ordinary cellar for over a year. Both of these apples have been used as the male and female parents, and it is hoped that an apple will be originated from them which will supply a long felt want in the colder parts of the country. The most comprehensive and extensive work of this kind, however, has been done by Dr. Wm. Saunders, Director of the Dominion Experimental Farms, and by his son, Dr. C. E. Saunders. While it is too soon yet to judge of the full value of this work, the results have been so satisfactory and encouraging thus far that there is good reason to believe that some of the varieties which have already fruited will prove hardy in places where the ordinary apple or crab apple will not survive the winters.

The following extract from the Director's Annual Report for 1899 will give some idea of the scope and results of this work :—

‘During the spring of 1887, shortly after the work of the Experimental Farms was begun, a number of varieties of seeds was kindly forwarded to the director by the late Dr. Regel, who at that time had charge of the Royal Botanic Gardens at St. Petersburg, Russia. Among these was a package of the seed of *Pyrus baccata*, a wild form of crab apple known as the berried crab, a native of the northern parts of Siberia. Young trees were grown from this seed, and in 1890 and 1891 specimens were sent to the Experimental Farms at Brandon, Manitoba, and at Indian Head, North-west Territories, to test their hardiness in those localities. These trees have been found quite hardy at both of these western Experimental Farms, and have started from the terminal buds on the branches every year since they were planted.

‘As this was the only form of the apple which had proven hardy in the Canadian North-west, after several years experience had established its hardiness, a series of experiments were instituted to improve the size and quality of the fruit, which in its native form is not much larger than a cherry, and is often quite astringent. The trees, however, bear fruit abundantly.

‘In the spring of 1894 this small wild crab was crossed with several varieties of hardy apples such as Tetofsky and Wealthy, also with some of the larger crabs, including Transcendent, Orange and Hyslop. The seeds obtained from these crosses were sown in the autumn of that year and germinated the following spring, producing in all about 160 thrifty young trees. These were planted the next year in a small orchard, in rows 5 feet apart each way. Some of them have grown very rapidly and have made shapely young

trees. During the past season (1899) 36 of these trees have fruited and some of them have borne heavy crops. The fact that so many of these cross-bred trees have fruited on the fourth year from the sowing of the seed is very encouraging and indicates a very early bearing habit. Of the 36 trees which have fruited this year, five have borne fruit of such size and quality as to justify their being named and propagated. Several others among those which have fruited are promising and will be further tested. Most of those of less promise have been dug up and destroyed, so as to give the remaining specimens more room. Following are the names and descriptions of the five varieties referred to, given in what is believed to be the order of their merit.

'*Charles*.—A cross of Tetofsky male on *Pyrus baccata* female. Tree a very upright and vigorous grower with large leathery leaves. The blossoms are deep pink in bud, pinkish white when open, large with wide petals. The fruit set well and the tree was fairly well laden, the fruit being distributed very evenly over the tree. It was ripe September 3, size $1\frac{1}{8}$ inches across, $1\frac{1}{8}$ inches deep, very distinctly ribbed. Colour a uniform yellow, very attractive. Flesh yellow, solid, crisp, juicy, mildly acid with a pleasant flavour, and slightly astringent. The skin is thin and the fruit bakes well. When compared with the Transcendent crab, the size was practically the same, and the acidity and astringency a little less; stem long, calyx persistent.

'*Novelty*.—A cross of Wealthy male on *Pyrus baccata* female. Tree fairly upright and a vigorous grower with good foliage. On this tree there were only a few bunches of blossoms, which were deep pink in bud, white when open, flowers large, petals broad. Fruit ripe September 19. Size, $1\frac{1}{2}$ inches across and $1\frac{1}{4}$ inches deep, smooth, colour deep red. Flesh a pale yellowish pink, firm, crisp and juicy, sub-acid and of fair quality. Stem long, calyx usually persistent; bakes well. The largest and best of the Wealthy crosses which have yet fruited.

'*Aurora*.—A cross of Tetofsky male on *Pyrus baccata* female. Tree a vigorous grower, upright in habit, leaves large, thick and leathery, blossomed freely. Flowers deep pink in bud, large when open and pure white, petals broad. The fruit set freely and was ripe September 11. Size $1\frac{1}{8}$ inches across, $1\frac{3}{8}$ inches deep. Colour bright red almost all over; very pretty; flesh crisp, juicy, acid and of fair flavour; astringency very slight. When baked this fruit is acid, but of good flavour. Stems long, calyx persistent.

'*Progress*.—A cross of Wealthy male on *Pyrus baccata* female. The tree is a vigorous grower and fairly upright in habit. It blossomed freely; the blossoms were deep pink in bud, pinkish white when open, flowers large, petals wide. Fruit ripe September 14. Size $1\frac{3}{8}$ inches across and $1\frac{3}{8}$ inches deep. Colour red, with some yellow and with a dark red cheek. Flesh very firm, crisp, sub-acid, juicy, astringency scarcely perceptible; of fair flavour. Stem long, calyx persistent.

'*Prairie Gem*.—A cross of Tetofsky male on *Pyrus baccata* female. This tree is a moderately vigorous grower, and rather spreading in habit. It was covered with blossoms, which were pink in bud, white when open, of medium size, with petals of medium width, and was covered with fruit from top to bottom. The fruit was ripe August 30. Size 1 inch across and 1 inch deep. Colour brilliant yellow and crimson. Flesh crisp, juicy, acid; flavour good, almost free from astringency; excellent for jelly. Deficient in size but promising for its earliness, quality and profuse bearing habit.

'All these varieties are remarkable for the persistent manner in which the fruit is attached to the tree. The stems are so firmly fastened that they re-

quire a considerable effort to detach them. The trees are all very strongly built with the branches bound to the trees with bands of woody fibre which are difficult to break. Root grafts were made of some of these varieties in the spring of 1898, chosen on account of their promising growth. A number of these were sent at that time to Brandon and Indian Head, and thirty-one specimens of twenty-two varieties survived the winter at Indian Head and had made fair growth by the close of the season in 1899. At Brandon seventy-four specimens of twenty-five varieties passed safely through the winter of 1898 and made fair growth in 1899. In both these collections the variety named Charles is represented, three trees of this apple survived at Brandon and two at Indian Head. A further supply of root grafts of promising sorts was sent last spring, and now that the fruit of the five varieties referred to has proven of value these will be propagated more freely and arrangements are in progress for testing them in many different parts of the North-west country. There is every reason to expect that they will prove generally hardy and that they will be highly appreciated. It is not expected that these new fruits will be much esteemed where larger fruits can be grown, but if they can be grown without special care or protection by farmers generally throughout the North-west country and the colder sections of Ontario and Quebec where the larger sized apples do not succeed, they will prove a great boon to the settlers in those districts, and furnish a wholesome and healthful addition to the food of the people.

'Since five good sorts have been found among the first thirty-six of these crosses which have fruited, it is probable that many other equally good or possibly superior sorts will occur among the many cross-bred trees,—about 270 now growing at Ottawa—which have not yet fruited.

'Another series of crosses have been made on a species of *Pyrus* known as *Pyrus prunifolia* and its hardiness has been established by a test of several years on both of the North-west experimental farms. The natural fruit of this species is nearly double the size of of *P. baccata*. The first crosses in this line were made in 1896, and some of the trees from this source are now two years old and are strong and vigorous in growth. The varieties of the different crosses with *Pyrus prunifolia* number about 200 in all, among which there will no doubt be many interesting sorts.

'The results reported are but the first steps in a series of experiments which are full of promise. As the more useful of these hybrids bear fruit the seeds of the finest specimens are being sown from which we may expect many interesting sports. Now that the continuity of nature has been broken by the work of cross-fertilizing, the method of selection will be brought to bear on the best of the seedlings, from some of which increase in size and improvement in quality of fruit may be looked for, and within a few years we shall doubtless have from these sources a considerable number of useful sorts of apples ripening at different periods in the season which will endure the climate of all the settled parts of the North-west country.'

BUD-VARIETIES, SPORTS.

These are chance variations from the ordinary types which are sufficiently distinct to be regarded as different varieties. For instance, if the fruit on one branch of a tree which has not been grafted or budded is quite different from that on the others, it is a bud-variety. Bud-varieties may be propagated and perpetuated the same as other kinds.

PROPAGATION BY GRAFTING AND BUDDING.

When a good variety has been originated, more trees of it are usually wanted, and the process of increasing the number is called propagation. Plants which come true from seed, are, as a rule, increased by growing them from the seed; but as a variety of apple cannot be reproduced in that way, other methods must be adopted, and recourse is had to grafting and budding. There are other methods of propagation, but these are what are usually adopted in this country. In grafting the apple, the name scion is given to a cutting of wood of the variety that it is desired to propagate. The stock is the tree or portion of the tree, be it young or old, that the scion is to be, or is, united with. As it is only through the stock that the scion can procure the sap which nourishes it, at least for a time, the former must be furnished with roots.

Stocks.—Some kinds of fruits may be grafted successfully on others which are closely related to them botanically, such as the pear on the quince; but there is nothing so satisfactory to graft the apple on as the apple, and, under certain circumstances, the crab apple.

Although the stock and scions are united by the process called grafting, both of them retain, almost entirely, their individual characteristics. The stock does, however, modify the vigour and fruitfulness of the variety grafted on it. If a variety is grafted on a dwarf or slower growing tree than itself the result is that the stock tends to dwarf it, as a sufficient quantity of crude sap does not pass through it to maintain the natural vigour of the top; and as a lessening in vigour tends to the development of fruit buds, this kind of stock is often used for the purpose of inducing fruitfulness in a variety and for dwarfing the tree. The Paradise stock of Europe is an example of this kind of stock. There is, however, often such a difference in the growth of the stock and the variety grafted on it that the result is not satisfactory. It is quite possible that the stock may have the effect of making the tree hardier, as if growth is checked the wood may ripen better. In top-grafted trees, great care should be taken that the stock is a vigorous growing variety, as, if it is not, the union may be bad, or the top outgrow it and the tree will become top heavy and finally break down. While good results have been obtained by top-grafting on crab apple stock, it is not very satisfactory and should not be used unless in exceptional cases, as the union is often bad or the grafted part outgrows the scion.

Dwarf or slow-growing stocks are not recommended for use in any but the coldest parts of the country. The stocks used in root grafting and budding in the districts where the best apples can be raised successfully are usually obtained from apple seeds which are procured at cider mills or anywhere else where they can be got easily and in large quantities, and no pains are taken to learn what varieties produced the seeds. Stocks grown from this kind of seed, while quite satisfactory, as a rule, are not desirable in the coldest parts of the country where root-killing is liable to occur, as individual trees vary much in hardiness, and one might graft a hardy variety on a tender stock without knowing it. At Ottawa, what stocks are required for root-grafting are usually grown from seeds of the Martha crab, which is a very hardy, vigorous sort. Seeds from the hardiest varieties of both apples and crab apples are more likely to produce hardy stocks than if the seeds were obtained promiscuously.

For the very coldest parts of Canada where the apple can be grown at all, the berried crab, *Pyrus baccata*, will probably make the most satisfactory stock for root-grafting or budding. It is perfectly hardy at Indian Head, N.W.T., where the winters are very severe, having endured the climate there. The seeds from which the stocks are to be grown for root-grafting or budding should be treated in the manner already described under the heading 'Seedling Varieties.' It is important to cultivate the young trees thoroughly the first season if it is desired to use them for root-grafting during the following winter. Only the strongest should be used for this purpose, and the others left to grow for another season, when they may be used for budding, if propagation is done that way, or for root-grafting as before. They will not be large enough for budding the first season. If it is known that a hardy variety is growing on its own roots, hardy stocks may be obtained if pieces of the roots are cut off and scions grafted on them.

There are many of the best apples which will not succeed in certain parts of Ontario and Quebec when grown in the ordinary way, as they are either root-killed, or sunscalded so badly that they die from the effect of it. Experiments conducted at the Central Experimental Farm go to prove that by top-grafting these varieties on hardy stocks some will grow well and produce fruit of fine appearance and quality. To obtain these stocks it is necessary, first of all, to have hardy roots. This may be effected to a large extent by raising seedlings from the very hardiest apples or crab apples. A variety is then grafted or budded on them, which forms a straight, clean trunk which does not sunscald, and on this variety is top grafted the kind that does not succeed when grown in the ordinary way. The surest way, however, of obtaining hardy stocks is to grow the hardy varieties on their own roots as explained in the paragraph on Root-grafting.

SCIONS.

As much of the success in grafting depends on the condition and quality of the scions, too much stress cannot be laid on the importance of having them of the best quality and in the best condition at the time of grafting.

Scions may be cut any time after the wood is well ripened in the autumn and before the buds begins to swell in the spring. The best time, however, is in the autumn, as they may then be kept in the condition desired. If they are cut in cold weather, in winter, the trees from which they are taken may be injured if large numbers are removed from them, as the bark is liable to split, there is less sap also in the scions at that time and thus the chance of their drying up is greater than if they were cut in the autumn. One cannot tell very well, either, in winter whether the young wood has been injured or not. Scions should be cut from healthy, bearing trees. The wood of old trees is liable to be diseased, and if diseased wood is used it is likely to produce a diseased tree when grafted. Scions should also be cut from the most productive trees. Occasionally, one or more trees of a variety will produce more and heavier crops than the others. If scions are taken from these trees, the probability is that a larger proportion of the grafted trees will produce crops like the trees from which the scions were taken than they otherwise would. The scions should be cut from the wood of the current season's growth, as older wood is not satisfactory. The buds should be well developed and the wood thoroughly ripened. It is not wise to use the water sprouts or young shoots which spring from the main branches or trunk for this purpose.

They may not be thoroughly ripened, and it is also possible that sprouting propensities may be thus more developed in the grafted trees. The entire season's growth may be cut off and packed away until required for grafting, when it should be cut into pieces from four to six inches in length having three well developed buds.

Scions may be kept in good condition in moss, saw-dust, sand, or forest leaves. The last named are found very satisfactory at Ottawa. These materials should be slightly moist, but not wet; the object being to keep the scions fresh and plump without there being any danger of them rotting. They should be kept in a cool cellar which is not too dry, and should remain dormant until ready for use.

Root-Grafting. The cheapest and one of the best methods of propagating apples, especially in Canada, is by root-grafting. The strongest of the young stocks which have been grown in the manner already described are heeled in during the autumn in a cool cellar in moist sand. Grafting may be done any time during the winter, but it is usually not started until January or February. Whip or tongue grafting is the method usually employed. As only the root is required, the trunk and branches are cut off and thrown away. As there is but little advantage in using the whole root, it may be divided into several pieces, much depending on its size. Each piece should be at least four inches long. A smooth, sloping cut upwards, about two inches long, is made across the main part of the root most suitable to receive the scion. The scion is prepared by cutting off a piece of the wood procured for this purpose in the autumn from four to six inches long and with about three well developed buds on it; a smooth, sloping cut downwards and across it is now made of about the same length as that already made on the stock. Clefts are now made in the sloping surface of both scion and stock, in the former, upwards; and in the latter, downwards. They are then joined together by forcing the tongue of the scion into the cleft of the stock. The inner bark, or cambium, of both scion and stock should be in contact with one another on at least one side of the graft, as it is at this point of contact where the union begins to take place. In order to ensure a speedy and successful union, waxed cotton thread is wound tightly around to hold the parts together. Amateurs are also advised to rub grafting wax all over where the two parts are joined, as with this treatment success is likely to be more certain.

The operation having been completed, the grafts are packed away in moss or sawdust until spring. They are then planted out in nursery rows about



Example of Root-Grafting.

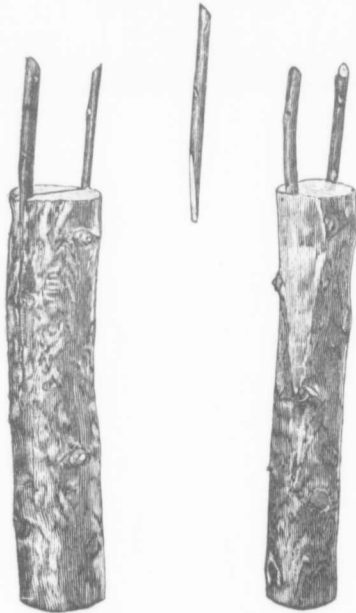
three feet apart and one foot apart in the rows, the point of union being about three inches below the surface of the soil. The ground should then be kept thoroughly cultivated throughout the season. Some varieties of apples throw out roots quite readily from the scion and after a time they thus become practically on their own roots. If it is desired to have a variety on its own roots, a scion from eight to twelve inches long may be used and the graft planted deep in the nursery row, only leaving one bud of the scion above the surface of the ground. Roots will then be thrown out on the scion, and when the tree is dug the stock may be cut away, and the tree will then be on its own roots. Or, on the other hand, a piece of root from a tree of the same variety as the scion may be used as the stock.

Crown-Grafting. Crown-grafting is usually done on young stocks in the nursery row in the spring. The trees are cut at or just beneath the surface of the soil at the crown or collar. A sloping cleft is then made in the side of the crown and a scion, cut wedge-shape at the lower end, is inserted in the cleft. The same precautions should be observed as in root-grafting, of having the inner bark of both stock and scion touching on at least one side. The grafted part should then be well covered with grafting wax, in order to exclude the air. The trees usually make a strong growth when grafted in this way, but as the work has to be done in April before growth begins it is often inconvenient to do it at that busy season of the year.

Top-Grafting. Where there are trees which produce poor or unprofitable fruit they may be made to bear good fruit by top-grafting other varieties upon them. If it is desired to grow a variety which, when grown in the ordinary way, proves a failure, on account of root-killing or sunscalding, it is possible to grow it successfully by top-grafting. Varieties which ordinarily take a long time to come into bearing will fruit much sooner when top-grafted. These are some of the most important results which may be obtained by this method.

Up to the present time in Canada, top-grafting has usually been done on old or bearing trees which produced poor fruit, and as very satisfactory results have been obtained this practice will continue to be popular.

The work is done in the spring before growth begins, but it is possible to graft successfully even when the trees are coming into leaf, provided the scion is quite dormant, but the chances of success are much lessened if it is done late. As the shock to a large tree would be very great if all or nearly



Example of Cleft-Grafting.

all of the branches on which the leaves develop were cut off the first season, from three to four years should be devoted to removing the top of the tree. If, however, a large number of scions are inserted, the top may be changed in less time, but, as a rule, it is not wise to do it in less than three years. Furthermore, a too severe pruning at one time will cause a large number of shoots to grow on the tree, and considerable labour will be involved in removing them

if
tr
inc
th:
pu
a v
be
sav
inc
a w
wh
sho
side
now
outs
of 1
poir
if th
has
end
more
all a
been
the a
the
scion
the o
readil
trunk
the g
if the
scion
graft
is sure
better
is cut
to get
three
results
It
remove
scions.
severely
conside
ence w
order to
describ
will be
In
were pla

if many trees are grafted. Cleft-grafting is usually adopted in top-working trees, it being a simple and satisfactory method.

The branches to be grafted should not exceed an inch and a-half or two inches in diameter. If they are larger it is so long before the stub heals over that disease may set in. It is possible, however, to graft larger branches by putting in more scions. The top-grafting of a large tree should be done with a view to having the new top as symmetrical as possible, and great care should be taken in selecting the branches to be grafted upon. After the branch is sawn off it is cleft by means of a mallet and strong knife to the depth of an inch and a-half to two inches. It is held open to receive the scion by driving a wedge into it. Scions for use in top-grafting are cut from dormant wood which has been kept in good condition in the manner already described. They should have about three strong buds and be cut wedge-shape at the base, one side, however, being a little thicker than the other. Two scions are now inserted in the cleft of the stub, with the wide side of the wedge on the outside, and thrust down until the lowest bud is almost on a line with the edge of the stub. The inner bark of both scion and stub should meet at some point, so that the union will take place readily, and this is more easily effected if the scion is given a slightly outward slope when inserted. When the wedge has been withdrawn from the cleft the advantage of having the wedge-shaped end of the scion thicker on one side will be apparent, as it will be held much more tightly than if both sides were the same. If the scion is not a tight fit all along, there is something wrong in the way it has been cut or the stub has been cleft. The cut parts should now be covered with grafting wax to exclude the air and hold the scion in place. Cotton is also sometimes wrapped around the wax in order to more effectively hold the scion in place. If both of the scions grafted on a stub should grow, the weaker one should be removed after the other is well united and the surface of the stub at least partially healed over.

It is often desirable to top-graft young trees, and this may be done very readily. The main branches are cut back to within a short distance of the trunk, and the scions grafted on, either by cleft or whip grafting. The closer the grafted part is to the trunk, the better, as the tree will be stronger than if the union occurred further out on the limb, since the growth of graft and scion may not be equal. It is possible to cut off the whole top of the tree and graft successfully on the main trunk, when the tree is young, but unless one is sure that the union will be perfect and the top not outgrow the stock, it is better not to run the risk of losing the tree. Furthermore, if the whole top is cut off there will be such a growth the first season that the scions are liable to get broken off. In top-grafting a young tree that has been planted from three to five years, it is better to take two seasons to do the work, as the results will, as a rule, be more satisfactory.

It is necessary to examine the grafted trees during the summer and remove any young shoots from the stocks which are interfering with the scions. It is not wise, however, especially when the tree has been cut back severely for grafting, to remove all the shoots until the grafts have grown considerably and furnish a good leaf surface. In the chapter on stocks, reference was made to the top-grafting of tender varieties on hardy stocks, in order to make the former hardier. The trees should be double worked as described there, planted out in the orchard, and when large enough, which will be in two or three years, top-grafted with the tender sorts.

In 1896, trees of McMahan White, Gideon, Haas, and Hibernial apples were planted in the orchards at the Central Experimental Farm. These are

all very hardy, strong-growing varieties which do not sunscald at Ottawa and which are fine, straight-trunked trees. They were grafted on hardy roots. In 1898 the work of top-grafting these with varieties that are not perfectly

hardy was begun, and up to the present time the following sorts have been grafted:—Baldwin, Belle de Boskoop, Benoni, Domine, Early Harvest, Esopus Spitzenburg, Fallawater, Keswick Codlin, King of Tompkins Co., Mother, Newtown Pippin, Northern Spy, Ontario, Rhode Island Greening, Rome Beauty, Sutton Beauty, Wagener, Winesap, and York Imperial. Few of these varieties can be grown successfully at Ottawa as standard trees. Top-grafted, they have already endured two winters and the terminal growth has not been injured. This work will be continued until all the best varieties of apples which are likely to grow here have been tested. The results of this experiment will be watched with much interest from year to year. To show the possibilities in this direction, it may be said that in 1891 a tree of Duchess and two trees of Wealthy were top-grafted with Northern Spy, which will not live at Ottawa when grown as a standard tree. All of these fruited in 1897. The grafts on Duchess produced fruit in 1897 and 1899, and those on Wealthy in 1897 and



Part of tree top-grafted.



Young tree top-grafted on main stem.

1898. The wood of the Northern Spy appears quite hardy, and if the Duchess and Wealthy had been stronger growing stocks it is probable that good crops would have been produced for many years, but the Northern Spy is outgrowing the stocks and soon the trees will be so top heavy that they will likely break off in a severe storm. It is, then, not wise to top-graft a strong-growing variety on a weak-growing stock.

Budding. Although grafting is a much more common method of propagating apples than budding, the latter has some advantages over the former and can also be done at a time when grafting could not be performed successfully.

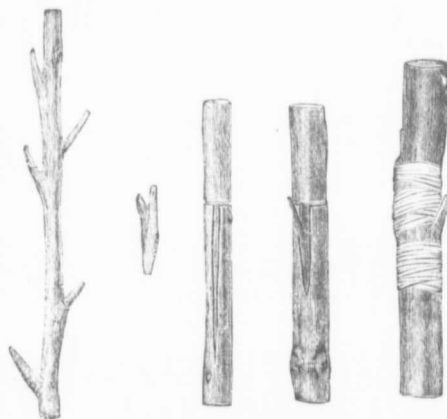
The best season for budding the apple is in late summer, some time during August being the best time for Ontario and Quebec. Young stocks of the second season's growth from seed are generally used. The process of budding adopted for apples consists in inserting a bud with very little or no wood, under the bark of the stock and on the surface of its wood. It is called shield-budding.

Budding is best performed when there is still sufficient sap beneath the bark to permit of the latter being easily raised with a knife. On the other hand, if the work is done when the tree is still growing vigorously the bud is liable to be 'drowned out,' or, in other words, forced out by reason of too much sap and growth of the stock.

The stock which is to receive the bud should be at least three-eighths of an inch in diameter near the ground. The lower leaves are rubbed off to a height of five or six inches to enable the budder to work more freely. A perpendicular cut is now made in the stock as near the ground as possible from an inch to an inch and a half long and preferably on the north side of the tree, as the bud will not be so readily dried out by the sun on that side. The cut should only extend through the bark. Another cut should now be made across the top of the perpendicular one. The two cuts when made will appear thus: J

The buds are cut from well developed and ripened shoots of the current season's growth of the variety it is desired to propagate. Before the buds are removed the leaves should be cut off the shoots; a piece of the petiole or leaf stem is left, however, by which the bud may be handled after it has been removed. A very sharp, thin-bladed knife is necessary in removing the bud. Knives are specially made for this purpose. The bud is cut off the shoot downwards or upwards, whichever is more convenient, the general practice, however, is to cut upwards. The length of the piece removed with the bud should be about one inch long, and the cut surface smooth. It should be

quite thin, as but little of the wood is taken with the bud. The buds or twigs should be kept where they will not dry out while the work of budding is going on. The bud is inserted under the bark by raising the latter with the blade of the knife or the part of the budding knife made for that purpose. The bud is then pushed down and under the bark with the fingers, and finally the piece of leaf stalk which was left when it was removed from the twig is pressed with the blade of the knife to bring the bud into the proper position. The bark on each side of the bud, which should now be under the bark of the stock will hold it in position. In order to bring the bud and stock into close contact



Example of shield-budding.

and prevent the former from drying up before the union takes place, they should be tied tightly together with raffia or some soft string, taking care not to cover the bud with it. The bud should unite with the stock in two or three weeks, and after that time the string should be cut, as otherwise the bud may be injured. If the proper season has been chosen for the work the bud should remain dormant until spring. If it starts in the autumn it may be killed during the winter. In the following spring the stock should be cut off just above the bud, which will cause all the strength of the stock to be directed into the bud and produce rapid growth, three feet not being an exceptional growth for the first season.

Budding is now a very popular method of propagating apples. The first season's growth is greater than from root-grafted trees and there is a larger proportion of straight trunked trees by this method. If it is desired also to prevent trees from becoming on their own roots, budding is preferable, as trees propagated in this way may be planted so that the stock is just at the surface of the soil and all roots are thrown from it.

TOOLS AND APPLIANCES USED IN PRUNING AND GRAFTING.



Tools used by the fruit grower.

While grafting implements and appliances are numerous, the work can be done with a few, and as it is not often convenient for the farmer or fruit grower to get a large outfit, only the really necessary things are mentioned. These are:—A sharp, fine-toothed hand saw, to be used for sawing off large limbs, or for making the stubs on trees to be top-grafted where the limbs are too large to be cut with the pruning knife.

A strong pruning knife for cutting the smaller limbs; for smoothing the wounds made by the saw or pruning shears; for trimming off torn

edges of branches, and for pruning roots of young trees when planting.

A budding knife, with a thin steel blade, for removing buds, having an ivory handle which is made thin at the end and is used for raising the bark.

A grafting knife, which is used in top-grafting trees. Home-made grafting knives can be easily made. A strong, sharp blade is the chief requisite.

Pruning shears, which are intermediate in their uses between the saw and the pruning knife. They are used for cutting off branches which are too large for the latter and too small to need the saw; for rough pruning and for cutting scions.

A wedge and mallet are also necessary in top-grafting large trees.

Raffia, which is one of the best tying materials. It is very strong and very pliable and is particularly useful for bandaging when budding.

Cotton yarn, which is used for tying root grafts and is one of the most satisfactory materials for the purpose. The size known as No. 18 knitting cotton is the best. It is bought in balls, which should be soaked for a few minutes in melted grafting wax before using. The yarn may also be drawn through melted wax, which ensures its all being thoroughly soaked, and is, perhaps, on this account preferable to soaking the ball.

There are many kinds of grafting wax recommended, but it is unnecessary to enumerate them all. One of the cheapest and best is that recommended in *The Horticulturist's Rule Book*, under the name 'Reliable Wax,' the receipt of which is as follows:—

'Reliable Wax.—Resin, 4 parts, by weight; beeswax, 2 parts; tallow, 1 part. Melt together and pour into a pail of cold water. Then grease the hands and pull the wax until it is nearly white. One of the best waxes for either indoor or outdoor use.' This should be heated before using if too hard.

The principal value of grafting wax is to exclude air from the wound, and thus prevent the wood from drying before a union takes place. A good grafting wax should not crack when on the tree, else the air will reach the wound and the wax prove of little value. Many materials may be used instead of grafting wax for this purpose, one of the simplest being a mixture of clay and cow dung, but grafting wax is much to be preferred. Strips of cotton are often used, especially in top-grafting and crown-grafting, for wrapping around the wound after the wax has been applied for the purpose of helping to exclude the air, and also to assist in holding the scion in position until the union takes place. This cotton is unnecessary if good grafting wax is used; but if a very valuable variety is grafted it is safer to use the cotton, as when the growth of the scion is rapid there is a chance of its getting broken off during the first season before it is thoroughly united with the stock. Large wounds on trees should be covered with some material that will protect the cut surface from the weather, prevent disease from setting in, and which will not peel off easily. A good dressing of lead paint is probably the best material to use for this purpose. Grafting wax may be used on smaller branches.

THE NURSERY.

Although, as a rule, it will be the most convenient plan to buy trees from the professional nurseryman, yet he who propagates apple trees by root grafting, crown grafting, or budding, for his own use, should have a nursery in which to grow them until they are ready for the orchard. A good sandy loam soil, which does not bake and is well drained, is best suited for this purpose, and will grow the strong, healthy trees which are desired. The ground should be thoroughly prepared and the young trees planted about 12 inches apart, in rows from 2½ to 3 feet apart. Cultivation should be thorough up to about the middle of July, when it should cease, as in colder climates, especially, it is very desirable that the wood ripen well, and late cultivation would encourage late growth. It will be necessary the first year the grafted or budded trees are growing in the nursery to go over them carefully and cut out any shoots which may be coming from the stocks, and also to reduce the graft to one stem should more develop. If any side branches grow, however, they should be left intact. In small nurseries it is sometimes advisable to tie the young trees to stakes the first season. This will make them straighter and will help to keep them from being broken. These trees may be planted in the orchard

the following spring if one-year old trees are to be used. By the end of the second year or the beginning of the third, after the branches have been pruned to the proper height and the tops shaped, the trees will be in the best condition for planting in the orchard.

THE ORCHARD.

Site and Soil.—The farmer's orchard is, as a rule, near the house, and probably will be in the future, in most cases. There are many advantages in having it there which will offset the reason why it should not be. The man who makes fruit growing his main business, however, should consider well before deciding where he will plant his trees, so that good and profitable returns may be obtained. There has been much debate in recent years as to what slope is best suited for the apple. The trees planted on a southern or south-western slope are more subject to sunscald than if planted on a northern or eastern one. On the other hand it has been proven that in a very severe climate, trees suffer more from root killing on a northern slope, the intensity of the frost being greater. As sunscalding probably causes the death of more trees than root killing where the apple can be grown at all, and as root killing can be prevented to a large extent by growing cover crops, a northern or eastern slope would generally be best. It is not, however, necessary, to have the orchard on any slope, but sloping land is usually freer from early frosts and is better drained than level land, and good drainage is one of the chief essentials to successful apple growing. Good natural drainage is best, but if this cannot be had the soil should be thoroughly drained either with tiles or in some other way. Trees growing in badly drained soil will become stunted, diseased, short-lived and will rarely prove profitable.

The question of spring frosts should also be considered. All practical farmers and fruit-growers know that spring frosts are often very local, occurring on one part of a farm and not on the other. As these frosts sometimes mean much loss if they occur at the blossoming period, it is very important to avoid choosing a site where they are liable to do injury if another good site is available where frosts do not occur so often.

It is important, if possible, to have the orchard protected in some way from prevailing winds, and natural protection is an important factor in successful orcharding. The orchard can, however, be protected by planting windbreaks, reference to which is made elsewhere.

Apple trees grow well in almost any kind of soil if it is thoroughly drained. It is this adaptability of the apple which causes the trees to be planted frequently on poor land; but the better the soil, the better the results will be. A good orchard soil should, in the first place, be abundantly supplied with plant food in a form that may be made easily available. It should be rich in humus and should be easily worked, and if possible it should be of limestone formation. Sandy soil is easily worked, but is, as a rule, not rich in available plant food and is also lacking in humus. Plant food also which is applied in the form of barnyard manure and artificial fertilizers is easily leached away in sandy soil. In the colder parts of the country root-killing is also more prevalent in sandy soils. Clay land, on the other hand, is too stiff and is hard to work, the soil baking easily, and making it difficult to cultivate. Where, however, the ground is not kept cultivated and the fertility maintained by top dressing, trees are grown very successfully and good crops produced on this kind of land. The trees make less growth and on this account develop

more fruit buds than on light soils. Sandy loam and clay loam soils are, as a rule, the most suitable, and probably clay loam soils are the best for apple growing in the best apple-growing districts. Sandy loam soils are better further north, as they are warmer. Land which has been exhausted of much of its plant food by growing cereals or other crops upon it is less suitable for orchard purposes.

Preparation of the Land. It very often happens that the farmer or fruit grower suddenly decides to plant an orchard. No previous thought had been given to the matter, or if there had, nothing was done to get the land into better condition for the young trees. The trees are bought, the land hastily, and not very well, prepared and the trees set out to take their chances. No after cultivation will fully make up for neglect of the thorough preparation of the land. Trees should begin to grow thriftily from the time they are planted if they are to obtain a good size before they begin to bear heavily, and if the land is not thoroughly prepared and in good condition when they are planted, growth is likely to be slow. It is much better, if one has no land in good condition, to delay planting a year, and give the soil the necessary attention. The time will not be lost, as the trees will do much better. Land which has been well manured for root crops, ploughed in the autumn, and again ploughed in the spring and thoroughly levelled and pulverized with the harrow should be in good condition for planting the trees. If the subsoil is near the surface the subsoil plough should be used after the ordinary one, loosening the soil from four to six inches deeper than the former.

Sod land ploughed in the autumn, top dressed in the spring with a good coating of barn-yard manure and then ploughed again and thoroughly pulverized with the harrow, should also bring the soil into good condition. A green crop, such as clover ploughed under in the spring and the land thoroughly harrowed, would also be a very good method.

Time of Planting. Although trees may be planted successfully in the autumn, early spring is undoubtedly the best time. One of the few advantages of fall planting is that there is more time to do it than in the spring. If trees are planted early in the autumn they will throw out some roots and be in a fair condition for standing the winter, but by the time the trees are ordered from the nurseryman and received, it is usually rather late, and if they are planted late the chances are that a large proportion will die, although this is not always the case. One cause of death appears to be that when the roots are not in close contact with the soil and the trees not well charged with sap, the trees dry out during the winter, and so die. It very often happens also that to begin with, the autumn is dry, and this makes the chances of success still less. It also often occurs, especially where the land has not been thoroughly prepared and only small holes dug for the trees, that rain, when it falls, does not escape from the holes. The water thus accumulated saturates the soil in the holes, freezes, and causes the trees to heave badly. If when this occurs it is overlooked and the trees not lowered in the spring, they may never thrive well. On the other hand, if trees are planted in the spring, the best conditions are afforded them for growing. They should, however, be planted in good season before growth begins and as soon after the ground is in condition to work as possible. As it is of the greatest importance to get the trees planted early and as, when ordered from nurserymen in the spring, it is difficult to get them as early as required, the best plan is to order them to be delivered in autumn and heel them in until spring, when they may be had as soon as required. A place should be chosen

for this purpose where the drainage is good, where there will not be danger from mice, and where the trees will be well covered with snow. A trench should be made deep enough to permit of the roots being well covered with soil. After cutting off any broken roots, the trees should be laid in a single layer in such a slanting position that the tops will almost touch the ground, and the roots and about half the trunk then well covered with soil, the latter being well worked in among the roots. If treated in this way they should come through the winter in good condition.


Laying out the Orchard.—The distance apart that apple trees should be planted will vary according to the varieties used, the locality, the land at the planter's disposal, and the other purposes, if any, for which he intends to use the land. In order to thrive best and produce fruit of good size and colour, the trees should have abundance of sun, light and air, and they cannot obtain these if planted too close together. Spraying has become such an integral part of successful fruit growing that sufficient space must be left between the trees to permit of doing this work thoroughly. When planted close, injurious insects and fungous diseases are more prevalent than where there is abundance of light and air. The only important advantage of close planting is the protection the trees afford each other, but it is only in the very coldest parts of the country where this protection is necessary, especially if low-headed trees are planted. The great mistake in the past has been that trees have been planted too close, the result being the production of poorly coloured, ill-shaped, and scabby fruit.

In the best apple growing districts most of the winter varieties should be planted from 33 to 40 feet apart each way. This seems a great distance when the trees are young, but they will continue to bear profitable crops for many years when trees planted much closer will have ceased to bear good fruit. A growing practice now-a-days, and one which is giving good satisfaction, is to plant what are called 'fillers' between the permanent trees. These are early, heavy-bearing varieties, such as Wealthy, Duchess and Wagener, which begin to produce profitable crops of fruit when very young, and which may be removed when they interfere with the permanent trees. Other fruits, such as plums, cherries and peaches, may also be used for this purpose. If, however, the permanent trees are planted less than 40 feet apart each way, the 'fillers' should only be planted between the trees in the permanent rows, as in a few years the trees would be too crowded for best results, and spraying could not be thoroughly done. When the distance apart at which the trees are to be planted has been decided upon, the orchard should be laid out, or, in other words, the places marked where the trees are to be planted. The rows of trees should be perfectly straight, both for the sake of easier cultivation and appearance. This may be easily accomplished if a little trouble is taken. If the field is irregular it is more difficult than if it is square. The places where the trees are to go should all be marked with stakes before the holes are dug, as it will be easier to keep the former in line if this is the case. The trees should be sighted both ways when placed in the holes.

Windbreaks.—If the orchard is not naturally protected from the wind by trees or by rising ground, a windbreak may be planted with good effect along the north and west sides, or any other side from which the greatest injury comes, the object being not to stop the wind altogether, but simply to check its velocity, as if a windbreak is high and very dense it stops the circulation of air in the orchard to a large extent, and this gives very favourable conditions

for
proj
whi
the
not
fact
by a

(Pic
wher
plan
prop
heig
two
or 10
of A
Norw
grow
to be
If the
whic

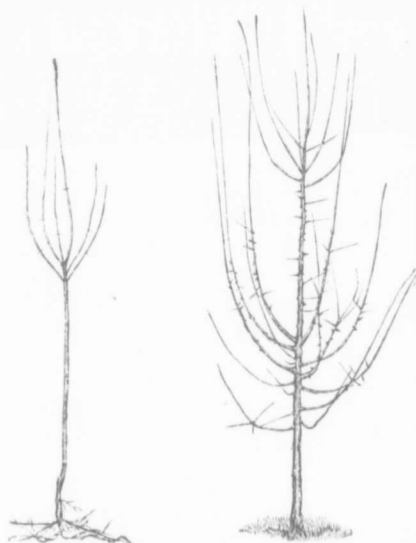


Two year
Tree, m
pruning
easily f
stronger
trees, ar
this heig
place an
In
the top

for the spread of both insect pests and plant diseases. On the other hand, a proper windbreak lessens the force of the wind and thus protects the trees, which will grow straighter and shapelier; it will also very materially lessen the amount of windfalls, and it will permit of growing varieties which will not succeed under ordinary exposure. Wind is one of the most important factors in drying out the land and causing drought. If its force is checked by a windbreak the evaporation of moisture from the soil will not be so great.

One of the best trees to plant for a windbreak is the Norway Spruce (*Picea excelsa*). It is a rapid growing evergreen and is hardy almost everywhere where apples can be grown successfully. A single row of these trees planted from eight to ten feet apart is quite sufficient. They should grow, if properly cared for, at the rate of from 2 to 3 feet a year until they reach a height of 50 to 60 feet. In very exposed places it may be desirable to plant two rows of trees, the trees forming the second row being planted between 8 or 10 feet behind the trees in the first row. The first row may be composed of Arbor-vita, which are rather slow growing, and the row behind made of Norway Spruce, if desirable. White pine and European larch are rapid growing trees which may be used for this purpose. Scotch pine is inclined to be irregular in growth, and is, on this account, sometimes not satisfactory. If the trees already mentioned cannot be obtained there are other native trees which will give good satisfaction.

Kind of Trees to Plant:—In the past, the popular tree was one with a



Two year old Apple Tree, marked for pruning.

Three year old low-headed Apple Tree.

trunk from five to six, and even, at times, seven feet high. The reasons why such trees were desired being that they enabled the planter to grow other crops nearer them than he could have done if the tops had been lower; they also enabled him to drive under the branches when working the land. The result, however, of training trees with such high trunks is that the apples are much more difficult to pick and the expense of picking them greater. When the trees are young the trunks are exposed to the sun, and sunscald is much more prevalent than it would be if there were less bare trunk and the head nearer the ground. These high headed trees are, however, gradually giving place to ones with less trunk, and from three to four feet is now considered the proper length by most of the best fruit growers. If trees of this kind are grown, the fruit can be much more easily picked, there is less trunk exposed to the sun, and the trees are stronger. There is also a less proportion of windfalls than from high headed trees, and it has also been found that proper cultivation can be given them at this height. If other crops are grown in the orchard they should take second place and trees should not be trained high on that account.

In the colder parts of the country the best results will be had by starting the top within one to two feet from the ground, as the trees will be much

better protected than if the branches started higher up. It is possible that orchard culture, even in the best apple growing districts may be so modified in the future that it will be found that the best results will be obtained from trees branching out almost from the ground.

Two or three year old trees are, as a rule, the most satisfactory kind to plant, as when they are older than three years, growth is so checked and the trees so stunted by transplanting that it is not at all desirable to plant them when they are so old. Furthermore, the freight or express will be less on smaller trees. If low headed trees are desired they may be planted when one year old, if the growth is strong, and cut back to the desired height, leaving only the bare stem. The ordinary farmer, however, who may not give his trees much attention, requires a tree two or three years old, so that it may easily be seen if he grows other crops in the orchard. Trees should be procured from reliable nurserymen, as it is important to have them true to name and well shaped. A local nurseryman is best if he carries good stock. It will pay to get the highest grade of trees offered. Stunted, unshapely trees will never give the same results as healthy straight ones.

The two or three year old trees should have the heads well formed when received from the nurseryman. The best head consists of a central leader with three or four side branches rising alternately from the trunk. If the branches are opposite, a crotch is formed and when the tree is heavily laden a branch may be easily broken. It is not always possible to get a central leader, and the next best top is one with from three to five branches rising alternately from the main trunk, forming a symmetrical head.

Planting:—As many of the roots of apple trees are destroyed when they are dug, this should be taken into consideration when planting the tree, and the top headed in. If the top is not headed in there will not be enough sap from the roots which are left to support it, and the moisture transpired by the leaves being greater than the quantity supplied by the roots, the tree is liable to wither up and die. If the trees are grown by the person who plants them, great care should be taken in digging to destroy as few roots as possible. The amount of heading in will depend upon the number of roots and the condition of the tree. The branches should be cut back at least one-half and in the majority of cases it will pay to cut them back to about four buds. The work of heading in can be best done immediately after the trees are planted, as one can see better then what to do.

The "Stringfellow" method of planting trees has of late years been advocated by H. W. Stringfellow, of Texas. The theory of this method is that trees when transplanted in the ordinary way lose their tap root, but if the roots are pruned back to a mere stub a new tap root will be formed and the tree will be more permanent than when treated in the ordinary way. Trees pruned in this way would also be easier and more cheaply shipped, and make less labour in planting. To counterbalance the cutting off of the roots nothing is left of the top of the tree but a mere stub about eighteen inches long. While trees planted by this method may succeed under moist conditions of soil and climate, it is not a practice to be adopted in Canada where the soil and air are dry.

The roots of the trees should not be allowed to become dry from the time they are dug in the nursery or received from the nurseryman until they are planted. Much of the failure in planting comes through carelessness in this regard. When taking the trees to the orchard it is a wise precaution, especi-

ally,
of
from
tree
prec
trees
idea
into
not.
age i
state
neces
sprea
after
In di
or th
in th
groun
may l
plant
has b
done,
more
it is n
the be
the tr
T
spread
by the
contact
the tre
good s
be wel
the sur
face of
moistu
any tre
well co
If
trunks,
In
soil is l
of from
which v
the tree
prevent
rapid.
the seas
is loose
be guar

ally if there are drying winds blowing, to puddle the roots in a thin mixture of loam and water, which will prevent, in a large measure, the small fibres from drying out. In addition to this, the roots should be protected until the trees are planted, by covering them with wet sacking or straw. Too much precaution cannot be taken in this matter. Before exposing the roots of the trees, however, the holes should be made. Many planters seem to have the idea that if they dig a hole barely large enough for the roots to be crowded into they will have good results. Sometimes they do; much oftener they do not. If the whole field has been subsoiled and is in a thorough state of tillage it would not matter so much, as the soil all over would be in the same state of friability, but this is very rarely the case. So that, as a rule, it is necessary to make the hole somewhat larger than will accommodate the roots, spread out to their full extent. It should be made about 18 inches deep, after which the subsoil should be loosened a few inches more, but not removed. In digging the hole, the surface soil should be kept separate from the subsoil or that of poorer quality. Sufficient surface soil should now be thrown back in the hole to make the tree, when planted, about an inch deeper in the ground than it was before. If a tree is not planted deep enough, the roots may become exposed and the tree die. On the other hand, it should not be planted too deep. Before it is planted permanently in the hole, the soil which has been thrown in should be raised and rounded off in the centre. If this is done, the roots of the tree can be spread out much more readily and placed more in their natural position. Roots of apple trees have not many fibres and it is necessary to spread what are left on the tree, carefully, in order to get the best results. Broken or bruised roots should be cut off before planting the tree.

The tree being now placed upright in the hole and the roots carefully spread out, the surface soil is gently thrown in and worked in among them, by the hand, if necessary. It is very important to have the soil come in close contact with the root fibres, in order that the best conditions may be afforded the tree to begin growth promptly. When the roots are well covered, more good soil should be thrown in and when the hole is about half full it should be well tramped with the feet, after which the hole should be filled level with the surface of the soil, tramping being done while it is being filled. The surface of the soil should be left loose, as this will help to prevent evaporation of moisture from the soil which has been thrown in. It is not necessary to water any tree if planting is done at the proper season and the soil fairly moist and well compacted about the roots.

If the orchard is in an exposed position and the trees large and with high trunks, it will pay to tie stakes to them to keep them from getting loose.

In districts where drought is liable to occur, or even in places where the soil is likely to become rather dry, it will be wise to mulch the trees to a depth of from 4 to 6 inches with manure, straw, sawdust, or anything of that nature which will not become a compact mass. If this is placed about the base of the tree and left during the summer it will keep the surface soil loose and prevent evaporation of moisture and the growth of the tree will be much more rapid. A good mulch may be the means of preventing a tree from dying if the season is very unfavourable or the tree in poor condition. If the mulch is loose when winter sets in there may be danger from mice, and this should be guarded against.

VARIETIES.

The selection of varieties for planting is a very important factor in successful apple culture. There are now probably over 2,500 named kinds of apples. In 1892 it was found that 878 varieties were advertised by nurserymen in America alone.

Downing, in his great work, describes 1,856 kinds. At the Central Experimental Farm 645 varieties have been grown since 1887, while at the Experimental Farm at Agassiz, B.C., 1,217 have been tested. It will be seen, therefore, that the number of sorts from which to select is very large indeed. Of these there are a limited number of varieties which excel all the others in merit, and yet a smaller number which can be recommended for growing in the provinces of Ontario and Quebec.

With the experience which has been obtained at the Central Experimental Farm, with the large number of varieties which have been tested there, and with the information which has been obtained from prominent fruit growers in Ontario and Quebec, it has been possible to come to a fairly accurate conclusion as to the kinds which will be most likely to give the best results in the various parts of those provinces.

Before selecting varieties to plant it is necessary, first of all, to decide on what will be done with the fruit when the trees come into bearing. If there are near markets, where the apples can be sold to advantage, more of the earlier and perishable kinds may be planted; but if the markets are already overstocked with such fruit, as they are in most places, varieties which will ship well should occupy the predominant place. After the proportion of summer, autumn and winter varieties has been settled, it is necessary to know which kinds representing these seasons are hardy, and which are productive and of good quality and well coloured. The following list of varieties which has been made after careful study, and the descriptions of most of them which follow, are given in order to afford this information to intending planters.

The provinces of Ontario and Quebec have been divided into thirteen districts (see map) numbered from 1 to 13, representing roughly the various climates of the two provinces, and the varieties which have been thought most suitable for these districts, are given under their respective numbers. The lines dividing the districts are by no means arbitrary. It is impossible to fix a line on one side of which one variety will succeed, and on the other on which another will do well. The boundaries are merely suggestive. It will also frequently happen that there will be particularly unfavourable orchard sites in a milder district on which it would be wiser to plant the varieties recommended for a colder one. The judgment of the planter will have to be exercised in such cases. Many varieties will be found to occur in nearly all the lists. There are in summer and autumn kinds, particularly, quite a number which appear to do equally well in various climates. The object has been to keep the number of varieties recommended as small as possible. One great objection which British buyers make to apples from Canada is that too many kinds are shipped by one individual, and there is no large quantity of any one sort. The shipper suffers in such cases. The reason that so many varieties are grown is that up to comparatively recent years it was not known which kinds would succeed best, but now more accurate information may be obtained, and if a few of the best kinds are planted there will be more profit.

A DISTRICT APPLE LIST FOR THE PROVINCES OF ONTARIO AND QUEBEC.

In the following lists of varieties recommended and suggested for the several districts marked off on the accompanying map, the summer and autumn kinds recommended are, as a rule, arranged in their order of maturing. The early winter and winter varieties are mostly arranged in descending order of merit from a profitable standpoint, but this arrangement is only suggestive. The order might be changed for different localities of the same district. Before planting an orchard, the owner should learn what varieties are proving most profitable in his vicinity.

The varieties which are merely suggested in these lists as worthy of trial are arranged in somewhat the same order.

Information which was obtained from prominent fruit growers regarding the best varieties of apples in their districts has been freely used in the preparations of this list:

District 1.

Varieties recommended:—

Summer—Yellow Transparent, Red Astrachan, Duchess of Oldenburg.

Autumn—Gravenstein, Wealthy, Colvert, Twenty Ounce.

Early winter—Blenheim Pippin, Rhode Island Greening, Hubbardston Nonsuch.

Winter—Ontario, Baldwin, Ben Davis, Cranberry Pippin, Fallawater, Golden Russet.

Additional varieties suggested:—

Early winter—Ribston Pippin, Sutton Beauty.

Winter—Roxbury Russet, Rome Beauty, York Imperial.

Additional varieties suggested for home use:—

Winter—King of Tompkins Co., Northern Spy, Talman Sweet.

District 2.

Varieties recommended:—

Summer—Yellow Transparent, Red Astrachan, Duchess of Oldenburg.

Autumn—Gravenstein, Wealthy.

Early winter—Blenheim Pippin, Ribston Pippin, Rhode Island Greening.

Winter—Ontario, Ben Davis, Cranberry Pippin, Baldwin, Golden Russet.

Additional varieties suggested:—

Autumn—Fanny, Colvert, Fall Pippin, Twenty Ounce.

Early winter—Fameuse (a late autumn variety in this district), Sutton Beauty.

Winter—Rome Beauty, York Imperial, American Pippin, Salome.

Additional varieties suggested for home use:—

Summer—Pimate.

Autumn—Maiden's Blush, St. Lawrence.

Early winter—McIntosh Red (really a late autumn variety in this district), King of Tompkins Co., Princess Louise, Grimes' Golden.

Winter—Esopus Spitzenburg, Talman Sweet.

District 3.

Varieties recommended :—

Summer—Yellow Transparent, Red Astrachan, Primate, Duchess of Oldenburg.

Autumn—Wealthy, Gravenstein (preferably top-grafted), Alexander.

Early winter—Fameuse, McIntosh Red, Blenheim Pippin (preferably top-grafted), Ribston Pippin.

Winter—Ontario, Northern Spy, Westfield Seek-no-Further, Ben Davis, Stark, Golden Russet.

Additional varieties suggested :—

Winter—Gano, Salome, Scott's Winter.

District 4.

Varieties recommended :—

Summer—Yellow Transparent, Red Astrachan, Primate, Duchess of Oldenburg.

Autumn—Gravenstein, Wealthy, Colvert, Twenty Ounce.

Early winter—Blenheim Pippin, King of Tompkins Co., Ribston Pippin, Hubbardston Nonsuch, Rhode Island Greening.

Winter—Ontario, Northern Spy, Baldwin, Ben Davis, Stark, Golden Russet.

Additional varieties suggested :—

Early winter—Fameuse, McIntosh Red, Wolf River, Sutton Beauty.

Winter—Rome Beauty, York Imperial, Cranberry Pippin.

Additional varieties suggested for home use :—

Autumn—St. Lawrence, Keswick Codlin.

Winter—Swayzie Pomme Grise, Esopus Spitzenburg.

District 5.

Varieties recommended :—

Summer—Yellow Transparent, Primate, Duchess of Oldenburg.

Autumn—Trenton, Gravenstein, Wealthy.

Early winter—Fameuse, Blenheim Pippin, Hubbardston Nonsuch.

Winter—Ontario, Northern Spy, Ben Davis, Stark, Cranberry Pippin, Baldwin.

Additional varieties suggested :—

Autumn—Alexander, Colvert.

Early winter—King of Tompkins Co., Sutton Beauty, Rhode Island Greening.

Winter—York Imperial, Rome Beauty, Westfield Seek-no-Further, Roxbury Russet.

District 6.

Varieties recommended :—

Summer—Yellow Transparent, Red Astrachan, Duchess of Oldenburg.

Autumn—St. Lawrence, Wealthy, Alexander.

Early winter—Fameuse, McIntosh Red, Scarlet Pippin, Wolf River.

Winter—Ontario, Stark, Scott's Winter, Gano, Ben Davis, Golden Russet.

Additional varieties suggested :—

Winter—Pewaukee, Red Canada, Milwaukee, Salome.

Additional varieties suggested for home use :—

Early winter—Grimes' Golden.

Winter—Swayzie Pomme Grise, Yellow Bellflower, Northern Spy (top grafted).

District 7.

Varieties recommended :—

Summer—Yellow Transparent, Red Astrachan, Duchess of Oldenburg, Montreal Strawberry.

Autumn—St. Lawrence, Wealthy, Alexander.

Early winter—McIntosh Red, Fameuse, Scarlet Pippin, Shiawassee Beauty, Wolf River.

Winter—Scott's Winter, Gano, Red Canada, Salome, Golden Russet, Pewaukee, Ben Davis, Canada Baldwin.

Additional varieties suggested :—

Summer—Tetofsky, Switzer, Charlamoff, Brockville Beauty.

Autumn—Peach of Montreal, McMahan White, Haas, Flat Aport.

Early winter—Baxter, Winter St. Lawrence.

Winter—Arctic, Milwaukee, La Victoire, Lawver, Stark.

Additional varieties suggested for home use :—

Summer—Lowland Raspberry, Russell.

Winter—Swayzie Pomme Grise, Pomme Grise, Yellow Bellflower, Northern Spy (top grafted), Talman Sweet.

District 8.

Varieties recommended :—

Summer—Yellow Transparent, Duchess of Oldenburg, Red Astrachan, Montreal Strawberry.

Autumn—St. Lawrence, Wealthy, Alexander.

Early winter—Fameuse, McIntosh Red, Wolf River.

Winter—Scott's Winter, Gano, Red Canada, Golden Russet, Canada Baldwin, Ben Davis, Pewaukee, Salome.

Additional varieties suggested :—

Summer—Tetofsky, Switzer, Charlamoff.

Autumn—Peach of Montreal, McMahan White, Haas.

Early winter—Baxter, Winter St. Lawrence.

Winter—Arctic, La Victoire, Stark, Lawver.

Additional varieties suggested for home use :—

Summer—Lowland Raspberry.

Early Winter—Grimes' Golden, King of Tompkins Co. (top grafted), Princess Louise.

Winter—Northern Spy (top grafted), Swayzie Pomme Grise, Pomme Grise, Talman Sweet.

District 9.

Varieties recommended :—

Summer—Yellow Transparent, Red Astrachan, Duchess of Oldenburg, Montreal Strawberry.

Autumn—St. Lawrence, Wealthy, Alexander.

Early winter—Fameuse, McIntosh Red, Wolf River.

Winter—Canada Baldwin, Scott's Winter, Red Canada, Pewaukee, Golden Russet, Salome, Gano, Ben Davis.

Additional varieties suggested :—

Summer—Tetofsky, Early Williams, Charlamoff.

Autumn—Peach of Montreal.

Early winter—Winter St. Lawrence.

Winter—Arctic, Bethel, Arabskoe (Winter Arabka).

Additional varieties suggested for home use :—

Summer—Lowland Raspberry.

Winter—Swayzie Pomme Grise, Pomme Grise.

District 10.

Varieties recommended :—

Summer—Tetofsky, Yellow Transparent, Red Astrachan, Duchess of Oldenburg, Charlamoff. The two latter being really autumn varieties in this district.

Autumn—Peach of Montreal, St. Lawrence, Wealthy, Alexander, Haas.

The last three being early winter varieties in this district.

Early winter—Wealthy, Fameuse, McIntosh Red, Wolf River (a winter variety in this district).

Winter—Scott's Winter, Golden Russet, Canada Baldwin.

Additional varieties suggested :—

Autumn—McMahon White, Hibernial, Longfield, Antonovka. All of these are early winter varieties in this district.

Winter—Milwaukee, Salome.

District 11.

Varieties recommended :—

Summer—Tetofsky, Yellow Transparent, Red Astrachan, Duchess of Oldenburg, Charlamoff. The last two being autumn varieties in this district.

Autumn—St. Lawrence, Alexander, Wealthy, Longfield. The last two being early winter sorts in this district.

Early Winter—Fameuse.

Winter—Scott's Winter, Golden Russet.

Additional varieties suggested :—

Autumn—Hibernial, McMahon White, Patten's Greening, Antonovka. These are all early winter apples in this district. Whitney Crab is also suggested.

Early Winter—McIntosh Red, Wolf River; the latter being a winter apple in this district.

Winter—Malinda, Milwaukee.

District 12.

Varieties recommended :—

Summer—Tetofsky, Yellow Transparent, Red Astrachan, Duchess of Oldenburg, Charlamoff. The two latter being autumn varieties in this district.

Autumn—Peach of Montreal, St. Lawrence, Wealthy, Alexander, Haas, Hibernial. The last four being early winter sorts in this district.

Ad

Vari

from
receiv
all th
They
and t
ence.

(
severa
and A
well s
white,
mediu
open ;
core s
hardy,
variety
a good
north.

L

Fruit i
streak
moder
white,
fruit, l

Early winter—Fameuse, McIntosh Red.

Winter—Scott's Winter, Golden Russet, Malinda.

Additional varieties suggested :—

Autumn—Antonovka, Longfield, Hiberna. Really early winter varieties in this district.

Early winter—Wolf River. A winter sort in this district.

Winter—Milwaukee.

District 13.

The most northerly district.

Varieties suggested :—

Summer—Tetofsky, Yellow Transparent, Duchess of Oldenburg, Charlamoff. The two latter being autumn varieties in this district.

Autumn—Whitney, Martha, and Transcendent crabs; also the hybrids between the Siberian crab and apple originated at the Central Experimental Farm; Wealthy, Hiberna, McMahon White, Longfield and Patten's Greening apples, all of which are early winter sorts in this district.

Early winter—McIntosh Red.

Winter—Scott's Winter, Malinda, Milwaukee, North-western Greening.

DESCRIPTION OF VARIETIES.

The following varieties have been practically all described by the author from typical specimens either grown at the Central Experimental Farm or received from fruit growers in the provinces of Ontario and Quebec. Nearly all the kinds recommended in the district lists will be found among them. They are divided into summer, autumn, early winter, and winter varieties and the names in each division are arranged alphabetically for ease of reference.

SUMMER VARIETIES.

Charlamoff (*Pointed Pipka*, *Arabka*).—A Russian variety, grown under several different names in this country, the most common being Pointed Pipka and Arabka. Fruit above medium to large, oblong, conical; skin pale yellow well splashed and streaked with bright purplish red or carmine; a few small white, fairly distinct dots; cavity deep, and of medium width; stem of medium length, stout; basin shallow and of medium width, wrinkled; calyx open; flesh white, rather coarse, juicy, mildly subacid, with a pleasant flavour; core small; quality good; season, August, just before Duchess; tree very hardy, a spreading, strong grower and heavy bearer. The chief fault of this variety is that it only remains in good condition for a very short time. It is a good dessert apple when at its best. Does very well at Ottawa and further north.

Duchess of Oldenburg (New Brunswicker).—Originated in Russia. Fruit medium to large, roundish to oblate; skin yellow, well splashed and streaked with bright red; cavity of medium depth and width; stem short, moderately stout or rather slender; basin deep, open; calyx partly open; flesh white, crisp, tender, juicy, acid. Quality only above medium as a dessert fruit, but one of the best cookers; season, August, but will keep until

September further north ; tree very hardy, a moderate, spreading grower, and an early and very productive bearer. This variety was called the New Brunswicker in the Maritime Provinces some years ago, and it may still be found under that name there.

Red Astrachan.—According to Downing this was first imported into England from Sweden in 1816, and thence to America. Fruit medium to above medium in size, roundish, slightly conic ; skin pale green, almost covered with bright and deep crimson, very handsome ; dots few, pale, obscure ; cavity deep and of medium width ; stem of medium length, fairly stout ; basin shallow and of medium width, slightly wrinkled ; calyx open ; flesh white, firm, crisp, juicy, almost acid, with an agreeable rich flavour ; core small ; quality good ; season, latter part of July and first half of August ; tree hardy and an upright, strong grower, but inclined to be a shy bearer.

Russell.—Originated in Russell Co., Ontario. Fruit medium to above medium in size, roundish to oblate ; skin pale yellow, almost, or completely, covered with deep red ; dots few, gray, not prominent ; cavity shallow, open ; stem long, slender ; basin shallow, open, slightly wrinkled ; calyx closed ; flesh white, tender, melting, juicy, subacid, with a pleasant flavour, having a suggestion of Fameuse about it, slightly astringent ; core large, quality good ; season, middle of August to middle of September ; tree vigorous. Top grafted on Wealthy at the Central Experimental Farm it has produced good crops every other year. It ripens unevenly, making it more desirable for home use than for commercial purposes.

Yellow Transparent.—Originated in Russia, and was introduced in America in 1870 by the Department of Agriculture, Washington. Fruit medium to above medium in size, roundish, slight conical, slightly angular ; skin pale yellow ; dots fairly numerous, pale and rather obscure ; cavity deep, narrow ; stem of medium length, fairly stout ; basin narrow, shallow, slightly wrinkled ; calyx closed ; flesh white, firm, crisp, juicy, sprightly subacid, not high flavoured but pleasant ; core small ; quality good ; season, latter part of July and first two weeks of August ; tree an upright moderate grower, a good and early bearer and very hardy. The Yellow Transparent is the best apple of its season for the colder parts of Ontario and Quebec.

AUTUMN VARIETIES.

Alexander.—Of Russian origin. Fruit very large, roundish, conical ; skin greenish yellow, well splashed and washed with deep red ; dots few, obscure ; cavity deep, and of medium width, russetted ; stem short, moderately stout ; basin deep, of medium width, almost smooth ; calyx large, open. Flesh yellowish, rather coarse, moderately juicy, subacid, with a pleasant flavour ; core medium size. Quality medium to above medium. Season late autumn. Tree hardy, vigorous, spreading and productive.

Fanny.—Originated near Strasburgh, Lancaster Co., Pa., U.S. Fruit above medium size, roundish to oblate, slightly conical ; skin yellow, heavily splashed and washed with deep red ; dots few, yellow and not prominent ; cavity deep, moderately open ; stem short, slender ; basin of medium depth, narrow, almost smooth ; calyx partly open. Flesh white, crisp, tender, juicy, subacid ; core small ; quality good. Season September. Tree vigorous, spreading, productive.

Gideon.—Originated by Peter M. Gideon, Excelsior, Minn., U. S. Fruit above medium size to large, roundish conical, ribbed; skin yellow with a bright rosy red blush; dots fairly numerous, yellow, distinct; cavity narrow, medium depth; stem short to medium, slender; basin shallow and of medium width, wrinkled, calyx closed; flesh white, crisp, juicy, brisk subacid, liable to water-core; core large; quality above medium; season October and early November; tree very hardy, a strong grower and moderately productive.

Gravenstein.—Originated in Germany. Fruit large to very large, roundish; skin yellow, splashed and streaked with orange and red; stem short, stout; basin wide and rather deep. Flesh tender, crisp, juicy, subacid and very high flavoured; quality very good; season September and October. Tree a strong, spreading grower and very productive.

Haas (Fall Queen).—Originated near St. Louis, Mo. Fruit medium to above medium in size; oblate; skin yellow, well splashed and washed with deep, sometimes brownish red: cavity deep; moderately open; stem short, stout; basin narrow, of medium depth, almost smooth. Flesh white, juicy, subacid, with little characteristic flavour, rather astringent; core small; quality medium to above medium. Season autumn. Tree hardy, a strong, upright grower and a good annual bearer. Not desirable except in the coldest parts of the apple growing districts.

Hibernal (Romna).—Originated in Russia. Fruit above medium to large, oblate conical; skin pale greenish yellow, splashed and streaked on sunny side with bright purplish red; a few white dots; cavity deep, of medium width, russetted; stem short, stout; basin of medium depth and width, slightly wrinkled; calyx open. Flesh yellowish, crisp, tender, juicy, acid; core small; quality above medium; season September to November. Tree very hardy, a strong, spreading grower, and very productive. Although not a good dessert fruit this is a fine cooking apple and on account of its great hardiness and productiveness is one of the best of the Russian apples.

Longfield.—A Russian variety introduced in the year 1870. Fruit sometimes medium, mostly below medium in size, roundish conical, slightly angular; skin pale yellow, almost white, with a bright pink blush; dots few, obscure; cavity very narrow, deep, more or less russetted; stem short, slender; basin narrow, of medium depth, wrinkled; calyx partly open; flesh white, crisp, very juicy, very tender, melting, brisk subacid, almost acid, pleasant; core medium; quality good; season October and November; tree very hardy, a moderate grower, spreading, pendulous, a very heavy bearer. Owing to the great crops, the fruit is liable to be undersized, and because of its tender flesh and pale skin, it shows bruises badly, which lessens its commercial value and is against it. It is a good apple for the north on account of its hardiness and low growth.

McMahon White.—Introduced by A. L. Hatch, Wis., U.S. Fruit large to very large, roundish, slightly conical; skin pale waxy yellow, almost white when in best condition, with a delicate pink blush; cavity deep, open, slightly russetted; stem short, stout; basin of medium depth, narrow, almost smooth; calyx open; flesh white, rather coarse, crisp, juicy, brisk subacid; quality above medium. An excellent cooking apple. Season October and November. Tree a very strong grower and a good cropper. Trees planted in the spring of 1888 are now bearing from 2½ to 3 barrels each. Owing to its vigour and apparent great hardiness it should be one of the best apples to plant near the limits of successful apple culture.

Twenty Ounce (Cayuga Red Streak).—Originated in Connecticut, U.S. Fruit large to very large, roundish; skin yellow, splashed and streaked with bright purplish red; cavity deep and wide; stem short and stout; basin of medium depth, calyx small, open; flesh white, coarse, juicy and briskly subacid; quality above medium, but a first-class cooking apple; season late autumn to early winter. Tree a strong grower and productive.

Wealthy.—Originated by Peter M. Gideon, Excelsior, Minn., U.S. Fruit of medium size, almost large on young trees, roundish; skin yellow, well splashed and washed and sometimes completely covered with crimson; dots yellow, fairly numerous, distinct, but not prominent; cavity deep and of medium width; stem short to medium, slender; basin narrow, rather deep, almost smooth; calyx partly open; flesh yellowish sometimes tinged with red, crisp, tender, juicy, briskly subacid with a pleasant aromatic flavour; core small; quality good to very good; season September to November, and later in some parts of the provinces; tree spreading, a medium grower and an early and heavy bearer. This is another apple which is hard to excel in its season.

EARLY WINTER VARIETIES.

Blenheim Pippin.—Originated at Woodstock, Oxfordshire, England. Fruit large, oblate; skin golden yellow, well washed and splashed with orange red mostly on the sunny side; dots few, pale, distinct but not prominent; cavity moderately deep, narrow, russetted; stem short, moderately stout; basin of medium depth, smooth, open; calyx large, open; flesh yellow, crisp, tender, melting, moderately juicy, mildly subacid, of good flavour; core small; quality good to very good. Season November and December. Tree a strong grower and a good bearer.

Fameuse (Snow).—Origin unknown. Supposed either to have been brought to Canada with the early French settlers or to have been a seedling originated in this country. Fruit of medium size, roundish to oblate; skin pale yellow, either almost or completely covered with deep red or splashed and washed with red when fruit is not well coloured; dots not prominent; cavity of medium depth and width; stem short to medium in length, slender or moderately stout; basin small, somewhat narrow, almost smooth; flesh very white, very tender, juicy, subacid with a fine flavour and a delicate perfume; core small; quality very good to best; season early winter; tree a strong grower, spreading, and a heavy bearer. This is one of the best dessert apples and one of the most profitable where it succeeds well.

Hubbardston Nonsuch.—Originated at Hubbardston, Mass., U.S. Fruit above medium to large, roundish to oblong, conical; skin yellow, splashed and washed with orange red and purplish red; dots fairly numerous, gray, distinct, but not prominent; cavity deep, narrow, russetted; stem short, slender; basin narrow of medium depth, slightly wrinkled; calyx open; flesh yellowish, crisp, very tender, melting, juicy, mildly subacid, with a pleasant flavour; core small; quality very good. Season early winter. Tree a strong, spreading grower and a good bearer.

King of Tompkins Co.—Origin uncertain; said to have originated in New Jersey. Fruit large, roundish, somewhat oblate, obscurely angular; skin yellow, well splashed and washed with bright crimson and orange red; dots fairly numerous, white, distinct, prominent; cavity of medium depth and width; stem short, moderately stout; basin of medium depth and width,

almost smooth; calyx closed; flesh yellow, rather coarse, crisp, tender, melting, moderately juicy with a rich, high, aromatic and very agreeable flavour; core small; quality very good to best; season early winter; tree a strong, spreading grower, but an uncertain cropper, the crops being usually light.

McIntosh Red.—Originated with John McIntosh, Dundela, Ont. Fruit above medium to large, roundish, slightly angular, highly perfumed; skin pale yellow, almost entirely covered with crimson, dark on sunny side and brighter on rest of fruit; dots few, small, yellow, distinct but not prominent; cavity of medium depth and width; stem short, stout; basin narrow, almost smooth, medium depth; calyx partly open; flesh white, crisp, very tender, melting, juicy, subacid, sprightly with a pleasant aromatic flavour; core of medium size; quality very good to best; season November to January; tree hardy, and a strong, moderately upright grower and an annual and medium bearer. For its season the McIntosh Red apple is one of the best varieties grown. It is said to be very subject to scab in some places, but this has not been the experience at the Central Experimental Farm. It has also not been found to be a shy bearer as reported by some.

Rhode Island Greening.—Originated on Rhode Island. Fruit large, oblate to roundish; skin green, often with a light, pink blush; dots numerous, pale or gray, distinct, but not very prominent; cavity narrow and of medium depth; stem short, moderately stout; basin narrow, shallow, slightly wrinkled; flesh yellow, crisp, tender, juicy, subacid, rich, slightly aromatic; core of medium size; quality very good. Season early winter to midwinter. Tree a spreading very strong grower and a heavy bearer. This variety is quite subject to scab and needs thorough spraying. It also lacks high colour, which is against it as an export apple.

Scarlet Pippin (Leeds Beauty).—Originated at Lyn, Leeds Co., Ontario, near Brockville. Mr. Harold Jones, Maitland, Ont., has had most to do in bringing this fine apple before the public. Fruit of medium size, oblate to roundish; skin yellow, waxy, more or less washed and splashed with bright and dark crimson, and covered with a light bloom; cavity deep and of medium width; stem short, slender; basin narrow, shallow, almost smooth; calyx generally closed; flesh white, firm, crisp, tender, melting, juicy, a mild subacid, with a pleasant but not high flavour; core small; quality very good; season early winter. A very attractive looking apple and said to sell better than Fameuse, which it does not, however, equal in quality. Tree a strong, upright grower, and said to be a heavy bearer.

Shiawassee Beauty.—Originated in Shiawassee Co., Mich., U.S. Probably a seedling of Fameuse. Fruit of medium size, oblate, flattened; skin yellow, well washed and splashed with deep crimson; dots few, pale, distinct; cavity deep, open; stem of medium length, slender; basin medium in depth and width, and almost smooth; calyx closed or open. Flesh white, crisp, tender, juicy, mildly subacid with a good flavour; core medium. Quality very good. Season early winter. Tree a hardy, strong, moderately upright grower, and a heavy bearer in alternate years.

Sutton Beauty.—Originated at Sutton, Mass., U.S. Fruit of medium size, roundish conic; skin waxen yellow, washed and splashed with crimson; dots fairly numerous, pale, distinct; cavity of medium depth, narrow; stem of medium length, moderately stout; basin medium in depth and width, slightly wrinkled; calyx of medium size, open or partly open; flesh dull white, crisp, firm, juicy, a sprightly subacid with a pleasant but not high flavour; core

small; quality good. Season midwinter. Tree an upright, strong grower and productive.

Winter St. Lawrence.—Imported in 1833 from Manchester, England, under the name of Mank's Codling, by the late Wm. Lunn, of Montreal. Named Winter St. Lawrence by the Montreal Horticultural Society about 1873. Fruit medium to large, roundish, slightly conical; skin greenish yellow well covered with deep red through which are dark purple splashes and streaks; dots fairly numerous, pale, distinct; cavity rather deep and medium in width; stem short, slender; basin narrow, almost smooth, of medium depth; calyx partly open, sometimes closed. Flesh white, rather soft, melting, moderately juicy, subacid, good flavour; core small; quality good; season, early winter. Tree a moderately spreading, strong grower and apparently very hardy. A shy but annual bearer at Ottawa.

Wolf River.—Originated with W. A. Springer, near Wolf River, Fremont, Wis., U.S., and disposed of to H. Riflen before coming into bearing. It is supposed to be a seedling of Alexander. Fruit large to very large, oblate conic, slightly angular; skin greenish yellow, becoming lighter later in the season, nearly covered with a dark red or crimson, with a few pale, distinct dots; cavity deep and of medium width, russetted; stem short, slender; basin narrow and of medium depth; calyx closed or open; flesh yellowish, moderately juicy, rather tender, subacid with a pleasant flavour; core of medium size; quality above medium; season, early to midwinter; tree hardy and a strong, spreading grower and a good cropper in alternate years.

WINTER VARIETIES.

American Golden Russet.—Origin uncertain. Fruit medium to above medium in size, roundish; skin greenish yellow, more or less russetted sometimes with bronzed blush; dots obscure; flesh greenish yellow, juicy, subacid with a high rich flavour; core medium; quality good to very good; season, late winter; tree a strong, upright grower sometimes but a light cropper. This is a valuable variety in the colder parts of Ontario and Quebec, as it is very hardy.

American Pippin.—Origin uncertain. Fruit medium to large, roundish; greenish yellow with a pink or orange blush or lightly splashed with same; dots fairly numerous, distinct but not prominent; cavity deep, medium in width, sometimes slightly russetted; stem short and stout; basin rather deep, medium in width and slightly wrinkled; calyx large, open; flesh yellow, firm, crisp, juicy, subacid; core small; quality good. Season late winter. Tree a vigorous spreading grower and productive. An exceptionally good keeping apple.

Baldwin.—Originated in Massachusetts, U.S. Fruit above medium to large, roundish; skin yellow, well washed and splashed with crimson and red; dots fairly numerous, gray, distinct; cavity of medium depth and width; stem short and stout; basin deep, open, somewhat wrinkled, calyx closed or open; flesh yellowish, firm, rather coarse, moderately juicy, mildly subacid, with a pleasant flavour; core small; quality good; season, late winter; tree moderately upright, vigorous and productive. Has been a very profitable variety in the past on account of its productiveness, appearance and good shipping qualities.

Ben Davis.—Originated in North Carolina early in the 19th century. Fruit medium to large, roundish conical; skin yellow, well splashed and

stre
sett
caly
no c
tree

skin
gree
stem
whit
qual

on tl
Fisk
roun
with
cavit
in de
white
corky
core
a shy
have

skin
brigh
white
core s
strong

to abo
covere
yellow
basin
open;
of med
a poor
which
home

F
roundi
sunny
cavity
slender
fully o
pleasan
tree a s

Go
Fruit a
overspr
obscure

streaked with red; dots obscure; cavity deep, of medium width, slightly russeted; stem short, slender; basin of medium depth and width, wrinkled; calyx open; flesh dull white, firm, moderately juicy, mildly subacid, but has no characteristic flavour; core medium; quality medium; season late winter; tree hardy, spreading, vigorous and very productive.

Bethel.—Originated in Vermont. Fruit large, roundish, slightly angular; skin greenish yellow, splashed and streaked with carmine; dots numerous, greenish yellow, prominent; cavity deep, of medium width, slightly russeted; stem short, slender; basin shallow, narrow, smooth; calyx partly open; flesh whitish with traces of pink, juicy, mildly subacid; core of medium size; quality good; season, midwinter to late winter; tree a strong grower.

Canada Baldwin.—Said to have originated from seed of Pomme de Fer on the farm of Alexis Dery, St. Hilaire, Que. It was given its name by N. C. Fisk, Abbotsford, Que., who propagated it in 1855. Fruit of medium size, roundish to slightly oblate; skin yellow, well washed, splashed and streaked with bright red and crimson; dots fairly numerous, large, yellow, prominent; cavity deep, open; stem short to medium in length, slender; basin medium in depth and width, slightly wrinkled; calyx closed or partly open; flesh white, tinged with red almost to the core, rather coarse, firm, inclined to be corky, fairly juicy, mildly subacid, with a pleasant flavour, slightly astringent; core small; quality good; season midwinter; tree an upright, strong grower; a shy but annual bearer at Ottawa; said to be subject to sunscald, but trees have not suffered much from it here.

Cranberry Pippin.—Originated near Hudson, N. Y. Fruit large, roundish; skin yellow, splashed, streaked and washed, especially on the sunny side, with bright purplish red; dots fairly numerous, small, gray, not prominent; flesh white, crisp, moderately juicy, rather coarse, subacid, flavour not very marked; core small; quality medium; season, early winter to midwinter; tree a very strong, spreading grower and productive.

Esopus Spitzenburg.—Originated on the Hudson River. Fruit medium to above medium in size, oblong, tapering, angular; skin yellow, nearly covered with bright rich red which is darker on the sunny side; dots numerous, yellow, prominent; cavity deep and narrow; stem short, moderately stout; basin narrow, of medium depth, wrinkled; calyx of medium size, partly open; flesh yellow, crisp, tender, juicy, subacid with a rich high flavour; core of medium size; quality very good to best; season early to midwinter; tree a poor grower of moderately spreading habit and usually a light bearer, which lessens its value for commercial purposes, though one of the best for home use.

Fallwater.—Originated in Pennsylvania. Fruit large to very large, roundish; skin yellowish green washed with pink or dull red, mostly on the sunny side; dots few, pale, large and prominent on the red portion of skin; cavity narrow, of medium depth, slightly russeted; stem short, rather slender; basin narrow, of medium depth, slightly wrinkled; calyx partly or fully open; flesh greenish yellow, crisp, tender, juicy, mildly subacid, with a pleasant flavour; core small; quality good; season, midwinter to late winter; tree a strong grower and a good bearer.

Gano.—Originated in Missouri and is said to be a seedling of Ben Davis. Fruit above medium size, roundish conical; skin yellow, almost completely overspread with crimson, not splashed or streaked as Ben Davis; dots gray, obscure; cavity of medium depth and width; stem short; basin of medium

depth and width, slightly wrinkled; calyx open. Flesh dull white, somewhat tenderer than Ben Davis, moderately juicy, mildly subacid, has no characteristic flavour; core medium; quality medium; but little, if any, better than Ben Davis; season late winter. Tree a hardy, upright, strong grower and an annual and good bearer. This is a very handsome apple, being more highly coloured than Ben Davis, as grown at Ottawa.

La Victoire.—Originated near Grenville, Que. Probably a seedling of Fameuse. Fruit above medium size, oblate, regular; skin greenish yellow, almost covered with crimson; dots fairly numerous, gray, distinct; cavity of medium depth and width, slightly russetted; stem short and stout; basin of medium depth and width, almost smooth; calyx open and medium in size; flesh white, tinged with red, rather coarse, moderately juicy, mildly subacid, with a pleasant flavour; core small; quality good; season midwinter; tree hardy and a strong, moderately spreading grower. This variety has not, so far, proved very productive, but is a handsome apple, and on account of its season and hardiness will probably prove useful in the north.

Lawver (Delaware Red Winter).—Origin uncertain. Fruit above medium size, roundish to oblate, somewhat angular; skin yellow, nearly all, or quite, covered with bright to deep red; dots few, pale, distinct; cavity medium in depth, narrow; stem long and slender; basin very shallow, narrow, wrinkled; calyx small and closed; flesh yellow, faintly tinged with pink, firm, crisp, tender, juicy, sprightly subacid, slightly aromatic; core small; quality above medium; season late winter; tree, hardy, vigorous, moderately upright. An annual bearer but not a heavy cropper. This is an exceptionally good keeper. The fruit may be kept for a year in an ordinary cellar without difficulty.

Mann.—Originated in New York State. Fruit above medium to large, oblate; skin very green in early winter changing to yellow when fully ripe, often with a brownish pink blush; dots numerous, pale, and quite prominent in early winter; cavity deep, medium in width, russetted; stem short, slender; basin of medium depth and width, slightly wrinkled; calyx partly or fully open. Flesh yellow, crisp, juicy, mildly subacid, with a pleasant flavour. Quality good; season late winter. Tree a vigorous, spreading grower and an early and heavy bearer. A good keeping apple but lacks attractive colour.

Milwaukee.—A seedling of Duchess which originated in Wisconsin. Fruit large, oblate, slightly angular; skin pale yellow well splashed and washed with bright red and crimson; dots few, small, white, not prominent; cavity deep and of medium width, slightly russetted; stem short, moderately stout; basin deep, open, slightly wrinkled; calyx open. Flesh yellowish, crisp, very tender, juicy, acid with but little characteristic flavour; core small. Quality above medium; season December to March. Tree spreading, a moderate grower and an early and good cropper. A promising apple for the north, as it appears to be very hardy.

Northern Spy.—Originated near Rochester, N.Y., U.S. Fruit large to very large, roundish conical, slightly angular; skin yellow, usually well washed, splashed and streaked with pinkish red, which in highly coloured specimens becomes bright red; there is also a pale bloom which increases the attractiveness of this variety; dots few, small, yellow; cavity deep, open; stem short, moderately stout; basin of medium depth, narrow, slightly wrinkled; calyx small, closed or open; flesh creamy white, crisp, tender, juicy, subacid, sprightly, aromatic, of a good flavour; core rather large; quality very good to best; season midwinter to late winter. Tree

an upright, strong grower and yields good crops in alternate years, when it comes into bearing, but it is usually from twelve to fifteen years before full crops are produced.

Ontario.—Originated by the late Charles Arnold, by crossing Wagener with Northern Spy. Fruit large to very large, oblate, sometimes roundish, slightly angular; skin yellow, usually well washed and splashed with bright red and carmine, there is also a pale pink bloom which adds to the appearance of this variety; dots few, pale and a little larger and more distinct than on the Northern Spy; cavity deep, open, slightly russeted; stem short, moderately stout; basin medium to rather deep, slightly wrinkled; calyx small, open or closed; flesh creamy white, crisp, tender, juicy, a brisk subacid (more acid than Northern Spy), sprightly, slightly aromatic; core small; quality very good; season midwinter to late winter. Tree moderately vigorous, but an early and heavy bearer. One of the best apples, both for commercial purposes and for home use.

Red Canada.—Origin unknown. Fruit medium to large, oblate, slightly conical; skin yellow, well splashed and washed with deep, rather dull red; dots fairly numerous, large, yellow, prominent; cavity deep, narrow; stem short, slender; basin narrow, shallow, slightly wrinkled; calyx small, partly open; flesh yellowish, tender, moderately juicy, mildly subacid with a pleasant but not high flavour; core of medium size; quality good; season midwinter to late winter. Tree a strong grower and has proved productive in some places, while a shy bearer in others.

Roxbury Russet.—Originated in the State of Massachusetts and is thought by many to be the same as the Nonpareil of Nova Scotia. Fruit above medium to large, oblate, conic, slightly angular; skin greenish yellow, more or less russeted, sometimes with a bronze blush; dots obscure; cavity of medium depth, open; stem short, stout; basin of medium depth and width, smooth, calyx open or closed; flesh yellowish, tender, moderately juicy, subacid, with a good, rich flavour; core small; quality very good; season midwinter to late winter; tree moderately vigorous, spreading and a good cropper.

Salome.—Originated with Elias C. Hathaway, Ottawa, Ill., U.S. Fruit medium to below medium in size, roundish conical, somewhat angular and inclined to be irregular; skin pale yellow, splashed and washed with bright and sometimes rather pale red, overspread with a delicate pink bloom making the fruit very attractive looking; dots numerous, pale yellow, prominent; cavity deep and medium in width; stem short, moderately stout; basin narrow, medium in depth, almost smooth; calyx small, closed or partly open; flesh yellow, crisp, tender, moderately juicy, subacid, slightly aromatic; core large; quality good; season midwinter to late winter; tree a strong, upright grower, hardy and a good cropper. When the crop is large the fruit is liable to run below medium in size. This is a handsome apple and being hardy and a good keeper is valuable in the colder parts of the country.

Scott's Winter.—Introduced by Dr. F. H. Hoskins, Newport, Vt., U.S. Fruit medium to below medium in size, roundish conical, angular; skin yellow, well splashed and washed with deep orange and purplish red; dots obscure; cavity of medium depth and width, slightly russeted at base; stem short, moderately stout; basin deep, rather narrow, slightly wrinkled; calyx partly open; flesh yellowish, crisp, tender, juicy, acid but with a pleasant flavour; core medium; quality above medium, almost good; season late winter. Tree, very hardy and a strong, upright grower. An annual bearer and a good cropper.

Stark.—Origin not known. Fruit large, roundish, slightly angular; skin greenish yellow when in good condition, more or less splashed and washed with brownish pink, mostly on the sunny side; dots not prominent; cavity of medium depth and width; stem short, moderately stout; basin of medium width, rather shallow; calyx large, partly open or open; flesh yellow, moderately juicy, rather coarse, mild subacid, pleasant but not high flavoured; core medium; quality almost good; season late winter. Tree a strong, moderately spreading grower. This has proved a light cropper at the Central Experimental Farm, but is reported to be a good bearer elsewhere. The trees here, however, have only been planted since 1891.

Swayzie Pomme Grise.—Supposed to have originated near Niagara, Ont. Fruit below medium, sometimes almost medium in size, oblate to roundish; skin yellow covered with a thin russet nearly all over; dots fairly numerous, pale, distinct but not prominent; cavity deep, narrow; stem short, slender; basin narrow, of medium depth, almost smooth; calyx partly open; flesh pale greenish yellow, crisp, breaking, tender, juicy, sprightly subacid with a high aromatic flavour; core small; quality very good to best; season midwinter; tree hardy and an upright but only moderate grower and rather light cropper. A fine dessert apple.

Talman Sweet.—Originated on Rhode Island. Fruit medium to above medium in size, roundish; skin yellow when fully matured with often a faint blush on the sunny side; a distinct line usually runs from stem to calyx; dots few, gray, not prominent; cavity open, medium in depth; stem rather long, slender; basin medium in depth and width, wrinkled; calyx open; flesh white, firm, moderately juicy, sweet, with a high flavour; core small; quality very good for a sweet apple; season early winter to late winter. Tree a strong, spreading grower and very productive.

Wagener.—Originated in the State of New York. Fruit medium to above medium in size, oblate; skin yellow, well washed and streaked with crimson; dots pale, distinct; cavity wide, deep; stem medium length, slender; basin medium in depth, wrinkled; flesh yellowish, crisp, very tender, juicy, briskly subacid, pleasant flavour; quality very good to best; season midwinter. Tree an upright and moderate grower and an early and heavy bearer.

Westfield Seek-no-Further.—Origin, Connecticut, U.S. Fruit of medium size, roundish conical; skin yellow, well washed and splashed with deep red; dots numerous, large, yellow, distinct, prominent; cavity deep, narrow, russeted; stem short, moderately stout; basin narrow, shallow, smooth; calyx open; flesh yellow, tender, melting, juicy, mild subacid, with a pleasant flavour; core above medium in size; quality very good; season midwinter. Tree vigorous and productive.

Yellow Bellflower.—Originated in Burlington, N.J., U.S. Fruit large, oblong conical; skin pale yellow, often with a pinkish or orange blush on the sunny side; dots few, gray, prominent; cavity of medium depth and width; stem of medium length, moderately stout; basin narrow, shallow to medium, wrinkled; calyx closed or partly open; flesh yellow, tender, buttery, juicy, subacid, with a pleasant flavour; core large; quality good; season midwinter. Tree a spreading, moderate grower, and productive.

York Imperial.—Supposed to have originated in York Co., Pa., U.S. Fruit of medium size, oblate, flattened and somewhat one sided, angular; skin yellow, splashed and washed with bright red; dots few, yellow, distinct,

but not prominent; flesh yellowish, firm, crisp, tender, moderately juicy, mildly subacid with but a slight characteristic flavour; quality above medium; season late winter. Tree a moderate grower, but productive. A very popular commercial apple in some parts of the United States.

RUSSIAN APPLES.

When the Russian apples were first introduced into Canada it was thought that they would prove a great acquisition, especially in those parts where the climate was severe. Most of the varieties, of which a large number were imported, have proved to be of inferior quality, and as almost all of them are early apples, their usefulness has been necessarily limited. There are, however, a few of them which are very valuable, and, being hardier than most varieties of American origin, are useful to those who live near the extreme limits of successful apple culture. As far north as Ottawa, however, which is about latitude 45° , many apples of American origin succeed well, and these are, in most cases, preferable to the Russian. North of latitude 45° the Russian apples increase in value the further north they are grown. The Yellow Transparent and Duchess of Oldenburg apples are exceptions to almost all the others, these being standard varieties in all parts of Canada where apple trees are grown.

A large number of Russian apples have now been tested for twelve years at the Central Experimental Farm. In the year 1888 there were planted in the orchards 133 supposed varieties. Since that time others have been added at intervals, and, notwithstanding those which have been winter-killed, there are now about 160 varieties, though some of these may be synonyms, as a number of synonyms have already been discovered.

A few of the trees planted in 1888 fruited in 1890. The trees did well and made vigorous growth up to the year 1892, when blight appeared in the orchard and did considerable injury, and in 1893 the disease appeared earlier in the season and committed great ravages among the trees. This left the orchard in a very bad condition. Some trees had died altogether, others were reduced to stumps, and again others which had large diseased limbs sawn off had lost their symmetry. The trees were not so much affected in 1894 and 1895, but owing to the severity of the winter of 1895-6 a large number were root-killed. Further injury from root killing occurred during the winter 1896-7. During the past three seasons the trees have been replaced and have made good growth, and many of those which were affected by blight are regaining symmetrical proportions.

The most promising varieties are recommended in the district lists and described elsewhere in this bulletin.

The following case for and against the Russian apples, which was published by Prof. F. A. Waugh, in Bulletin No. 61, of the Vermont Agricultural Experiment Station, so fully expresses our own opinion of them that it is endorsed, and herewith quoted:—

FOR.

‘They have given us several varieties of recognized value, like Oldenburg and Yellow Transparent.

‘They promise to give us other useful varieties through gradual intercrossing with our common apples.

'They furnish hardy trunks on which more tender varieties may be grafted to advantage.

'The trees are very hardy.

'They are mostly free from disease (except blight)

'They usually bear early and abundantly.

'The fruit is often large and finely coloured.

'Their introduction has encouraged many persons to grow apples in regions where they would not otherwise have attempted it.

AGAINST.

'Very many of the varieties introduced are immensely worthless.

'Most of them ripen too early and will not keep. This is due to their introduction from a zone of shorter season to one of longer seasons.

'The fruit of many varieties drops badly before mature.

'The fruit is usually coarse grained and of poor quality.

'The skin is often very thin and tender, making the fruit liable to injury.

'Their nomenclature is so badly confused that no one can be sure of what he is handling.

'The young growth is extremely subject to "fire blight."

POLLINATION OF APPLES.

It is now known that the cause of the unproductiveness of some varieties of apples when planted in large blocks by themselves is often due to either complete or partial self-sterility of the blossoms. It has also been found that varieties self-sterile in themselves will, if planted near each other, be cross-fertilized, if the two varieties bloom at the same time, and fruit will set on both kinds. As it has been found that a variety which is self-sterile in one locality is not necessarily so in another, it is impossible to give an accurate or complete list of those which are self-sterile and those which fertilize themselves. The relative blossoming periods of the different varieties of apples, however, are fairly regular in the provinces of Ontario and Quebec, and by planting those kinds which bloom about the same time it is not absolutely necessary to know whether a variety is self-sterile or not. For five years, observations on the dates of blossoming of varieties of apples were made by persons in various parts of Canada for the Horticultural Division of the Central Experimental Farm. The data thus accumulated have been compiled and it is now possible to give the following list of apples divided into three groups, according to their average time of blooming. While this division may not hold good in all parts of Canada, it will be found to be fairly correct on the whole.

EARLY GROUP.

Antonovka, Duchess of Oldenburg, Early Harvest, Fameuse, Gravenstein, Gideon, Haas, Hurlbut, Longfield, Patten's Greening, Red Astrachan, Scott's Winter, Shiawassee Beauty, Tetofsky, Wagener, Scarlet Pippin—16 varieties.

MEDIUM GROUP.

Alexander, Baldwin, Baxter, Ben Davis, Blenheim Pippin, Canada Baldwin, Esopus Spitzenburg, Fallawater, Fall Jenetting, Gano, Golden

Russ
of T
Maic
Gris
St. I
St. I
Colv

Spy,
Yello

of we
symm
fruit
trees,
Prun
much
exha
a hea
the n



T
If muc

Russet (American), Hubbardston Nonsuch, Jonathan, Keswick Codlin, King of Tompkins Co., McIntosh Red, McMabon White, Magog Red Streak, Maiden's Blush, Malinda, Mann, Newtown Pippin, Peach, Pewaukee, Pomme Grise, Primate, Princess Louise, Rhode Island Greening, Roxbury Russet, St. Lawrence, Salome, Stark, Swaar, Swayzie Pomme Grise, Wealthy, Winter St. Lawrence, Wolf River, Yellow Transparent, Ontario, Ribston Pippin, Colvert, Brockville Beauty—42 varieties.

LATE GROUP.

Blue Pearmain, Cranberry Pippin, Grimes' Golden, Lawver, Northern Spy, Red Canada, Talman Sweet, Walbridge, Westfield Seek-no-Further, Yellow Bellflower—10 varieties.

PRUNING.

There are several objects in pruning trees, the principal being the production of well coloured fruit of good size, in paying quantities, and the maintaining of a symmetrical top and well balanced tree to bear this fruit. Trees will bear fruit without pruning, but it is small in size and not so attractive. Unpruned trees, also, are likely to bear heavily one year and have no crop the next. Pruning lessens the number of apples produced and the tree not being so much exhausted at one time is likely to bear more regularly. It does not exhaust a tree as much to bear a good crop of fine fruit as it does to produce a heavy crop of small fruit, as the exhaustion of the tree is in proportion to the number of seeds matured, and not to the size of the fruit.



Low headed apple tree unpruned.



Low headed apple tree pruned.

Trees should be pruned regularly, beginning when they are young. If much pruning is done at one time it would be likely to injure the tree.

When the trees begin to grow thriftily many new branches will be formed, and it is the work of the pruner to remove all those which are not necessary and to cut back others. The top of the tree should be kept open, to admit air and sunlight, but pruning should be so carefully done that there will be no bare limbs. All branches which are growing across and through the top should be cut out. If two branches touch one another, one of them should be removed. If a branch on one side of the tree has outgrown the other, it should be headed back so as to make the tree symmetrical, cutting it off just above a bud which is on the side that it is desired to have the new growth. If, when the trees are young, they are treated in this way every year, comparatively little work will have to be done at one time. The best time to prune is between the middle of May and the middle of June when the trees are growing thriftily, as the wounds will heal over quicker if done at that time, but as this is a very busy season of the year the customary practice is to prune during the month of March, when quite satisfactory results are obtained. By pinching off young growth, which is not required, in summer, labour will be saved in pruning. It is much better to prune at any time of the year than to neglect it altogether, as it is not a matter of great consequence what month it is done in. The tools used should be a sharp pruning knife and a fine saw; the branch should be cut off close to the limb or trunk from which it is removed and the cut should be as clean and smooth as possible. A bad practice in pruning, and a very common one, is to leave the stub remaining of the branch cut off. In many cases this never grows over, rot sets in and reaches the heart of the tree, and eventually ruins it. A clean, close cut will heal quickly and needs no paint or wax, unless a large limb has been removed.

Unfortunately, too many of our farmers and fruit growers neglect pruning their trees regularly, the result being that when they do begin, it is necessary to remove many large limbs. In cases of this kind it is not wise to do too much pruning in one season, as a severe pruning of the tree will cause so much young growth that it will be necessary to thin it out. It will also expose the limbs which have been protected, and may cause sunscald. A better practice is to do it regularly. If large limbs are removed, the wounds should be given a coating of lead paint, which will protect them from weather and prevent rot from setting in until they begin to heal over.

It is a well known fact that winter or spring pruning tends to the production of wood; and summer pruning, to the production of fruit buds. The reason of this is that pruning before growth begins, or when it is beginning, destroys the balance between top and root, and there being then more sap supplied by the roots than the remaining top can elaborate, stronger growth is made or new branches formed to re-adjust this balance. If pruning or pinching off part of the new growth is done in the summer after most of the growth has been made, a part of the elaborated sap, which is as necessary to the production of strong roots as it is to the production of top, is removed, and the tree is checked in its growth and weakened, although the pruning should not be so severe as to make the latter apparent. A weakening of this kind tends to the development of fruit buds. Summer pruning to produce fruitfulness is, however, seldom necessary, and it is not recommended. If trees are given even a fair measure of attention they will reward the owner with abundant crops. Some varieties of apples do not come into bearing as quickly as others and often growers think that something is wrong with these trees when they

do not bear early. Root pruning, which also tends to weaken the trees and promote favourable conditions for the development of fruit buds, is sometimes advocated, but this, likewise, is seldom necessary. This is done by digging around the trees, and thus destroying part of their roots.

A branch which is broken or split by the wind or by weight of fruit may often be saved if it is carefully bent back to as near its original position as possible and bolted with an iron bolt. An auger hole is made through the broken branch and the uninjured part and a bolt run through. By doing the work carefully, the branch may be drawn almost into its original position by tightening the nut well. The bolt should be as near the size of the auger hole as possible, as the tighter the fit the better. The nut and end of the bolt are better large, as they will not sink so readily into the wood. After the bolting is done the ends of the auger hole should be closed up with grafting wax or paint, as the bolt will not fit tightly enough to exclude air, and germs of disease may enter. If the split or break is a bad one the branch should be headed back, so as to lessen the leaf surface. Although a branch may often be saved by treating it in this manner, a better practice is to bolt the trees before the branch breaks. A weak branch is often indicated by a splitting at the crotch, and if the bolt is run through then the branch is almost certain to be saved. It is sometimes advisable to brace the tree higher up, and this can be done with a longer bolt.

Patching up trees is not, however, on the whole a very satisfactory practice, and it may be avoided to a large extent by having trees without crotches, and this may in a large measure be accomplished by pruning the trees properly when young.

Trees are often ruined by neglecting to treat wounds or allowing rot to set in at the crotch. In such cases all the decayed part should be removed and the wood scraped back to living tissue, and in the case of rough wounds made by bruises or breaking of limbs, the edge and surface should be trimmed until quite smooth, so that healing may begin rapidly. These should now be painted, or, if not painted, sprayed with Bordeaux mixture to destroy germs of disease, and then covered with paint or grafting wax. Wounds should be kept covered with these substances until they are healing nicely.

MAINTENANCE OF FERTILITY.

When it is at all possible, it is much better not to remove any crops but apples from the orchard land after the trees are planted. When it is considered that the apple trees are to bear crops for fifty years or more on the same land, it may easily be understood that the trees to do their best will need all the plant food that they can get from the soil, and as much more as can be economically applied. If the soil is cropped with grass, cereals and roots, for instance, for eight or ten years, much plant food will be removed, and although these crops may be manured there is but a small percentage of people who will manure the land sufficiently to make up for the plant food removed. Furthermore, the moisture in the soil is lessened if other crops are grown, owing to the evaporation from the leaves of the growing crops, and as droughts now occur so frequently in some parts of the country, as much moisture as possible should be conserved for the use of the young trees. If other crops must be grown, they should be such as may be cultivated or hoed. Corn, although an exhausting crop, is one of the least objectionable crops to grow, as

it shades the trunks of the young trees. If other crops such as hay or grain are grown there should be four or five feet left on each side of the tree without any, and the strip thus left may be cultivated. If no other crops are grown in the orchard, the trees, if cultivated properly, will need very little manure until they come into bearing, as apple trees will grow quite thriftily when young on comparatively poor soil, as the exhaustion of the soil from the production of wood is small compared with that when large crops of fruit are removed.

Barn-yard manure is one of the best complete fertilizers where it can be procured cheaply and conveniently.

The weight of the fertilizing constituents which are removed from the soil in the production of a crop of apples when the trees are in full bearing has been estimated by careful analyses, and if about fifteen tons of fresh barn-yard manure were applied every three years, considerably more plant food would be restored to the soil than would be removed by the crops of apples. But as some of it will leach away and some never be reached by the feeding roots of the trees, it is wise to give a liberal dressing.

As in many places barn-yard manure cannot be profitably used because of its scarcity, the following extract from the report of Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, for 1894, will prove valuable to those who desire to maintain the fertility of their land by other methods than the application of barn-yard manure :—

‘COMPOSITION OF THE FRUIT.’

Analysis of Apples.

‘The general composition, viz., the percentage of water, organic matter and ash (which make up the whole) and the amount of nitrogen, are given for the four varieties examined in the following tabulated form :—

Name of Variety of Apple.	Water.	Organic Matter.	Ash.	Nitrogen.
Duchess of Oldenburg.	88·61	11·14	·25	·0382
Wealthy.	87·00	12·71	·29	·0375
Fameuse.	85·22	14·46	·32	·0512
Northern Spy.	87·08	12·65	·27	·0445
Average.	86·98	12·74	·28	·0428

Although there is a great similarity in composition in the varieties examined, and none differ much from the average deduced from them all, it is of interest to note that the Fameuse is the richest in organic matter, in ash constituents and in nitrogen. The Wealthy and Northern Spy contain almost identical amounts of organic matter and ash, and the Duchess of Oldenburg has the largest percentage of water and lowest percentage of organic matter and ash.

' PERCENTAGES OF IMPORTANT CONSTITUENTS IN ASH.'

Name of Variety of Apple.	Phosphoric Acid.	Potash.	Soda.	Oxide of Iron.	Lime.	Magnesia.	Silica.
Duchess of Oldenburg	8.90	53.67	3.28	1.77	5.80	5.20	.36
Wealthy	8.15	57.00	2.65	1.76	3.33	3.84	.63
Fameuse	7.19	56.25	2.56	1.26	3.55	4.03	.32
Northern Spy	11.68	54.11	1.94	2.13	3.86	3.99	1.11
Average	8.98	55.26	2.61	1.72	4.38	4.27	.60

In this table the composition of the ash in detail is given. Of its components, phosphoric acid and potash are the principal. The latter constitutes over half of the ash (55.26 per cent), while the former is about 9 per cent, the average being 8.98 per cent.

No great differences between the varieties are here to be noticed, though the Northern Spy presents some striking variations from the average. Its ash contains nearly 3 per cent more phosphoric acid, nearly 1 per cent less soda, about .5 per cent more oxide of iron and alumina, and about .5 per cent more silica than the ash of the other apples.

The ratio of the potash to the phosphoric acid in the ash of the fruit is 6 to 1; in the ash of the older leaves it is 2 to 1. Relatively, therefore, the demands of the leaf and the fruit on the soil of these two constituents are very different. It might here be remarked that the greater quantity of the ash ingredients of the fruit is contained in the seeds and walls of the ovary, comparatively little being found in the flesh of the apple.

A comparison of this table with that showing the composition of the ash of the leaf, will reveal further interesting features. The total percentages of ash in similar weights of leaf and fruit, are as 3.46 to .28. Lime is much more abundant in the ash of the leaf, while magnesia, oxide of iron and silica are about the same, taking the older leaves for comparison.

For the purpose of a practical presentation of the subject, the data presented in the following table have been prepared :

' WEIGHT of Important Fertilizing Constituents withdrawn from the soil.'

Name of Variety of Apple.	Average weight per bushel in pounds.	NITROGEN.		PHOSPHORIC ACID.		POTASH.	
		Lbs. per barrel.	Lbs. per acre, or 160 barrels.	Lbs. per barrel.	Lbs. per acre, or 160 barrels.	Lbs. per barrel.	Lbs. per acre, or 160 barrels.
Duchess of Oldenburg	44	.046	7.359	.027	4.307	.162	25.975
Wealthy	50	.057	8.220	.032	5.181	.226	36.232
Fameuse	50	.070	11.223	.031	5.043	.256	39.456
Northern Spy	46	.056	9.006	.039	6.383	.185	29.570
Average	47.5	.057	8.952	.032	5.228	.217	32.808

NOTE.—In the above calculations the following data are used: Forty trees per acre in an orchard twenty-five years old yield, on an average, one hundred and sixty (160) barrels. One barrel contains two bushels and three pecks.

We have here the number of pounds of nitrogen, phosphoric acid and potash estimated as contained in one barrel of the fruit, and the amounts removed per acre by a good crop. None of the quantities are at all excessive, and the cost of returning them would not be great. The largest demand is on the potash in the soil; next comes the nitrogen, and lastly the phosphoric acid. In the case of the leaves, the nitrogen stood first.

For the vigorous development of the tree and an abundant crop of fruit, the soil must contain these constituents in a more or less *immediately available condition*. It is for this reason, as well as to replace the exhausted plant food, that fertilizers are necessary to profitable apple growing.

Nitrogen.—To supply nitrogen, some organic manure is perhaps the most economical. Barnyard manure or the turning under a leguminous crop (the latter being rich in nitrogen) are to be recommended. Besides adding nitrogen, they furnish humus or decaying vegetable matter, which serves a useful function by liberating carbonic acid, and which in turn sets free locked-up forms of mineral food. Humus, moreover, has much to do in bringing about good tilth and in the retention of soil moisture. As the period of growth and fruit development in the apple is comparatively long, organic manures in most instances will probably give better returns than those containing more soluble forms of nitrogen, such as nitrate of soda or sulphate of ammonia.

Potash and Phosphoric Acid.—To furnish potash and phosphoric acid, we would first mention wood ashes. In most parts of Canada they are the cheapest form in which to purchase these constituents. Moreover, they possess them in the relative proportion best suited to tree requirements and in a condition that renders them easily available.

If wood ashes are not obtainable, kainit and muriate of potash may be substituted to supply potash; and bone meal and superphosphate, the phosphoric acid. Bone meal contains 2 per cent to 3 per cent of nitrogen, in addition to the phosphoric acid, but requires a greater length of time in the ground to give up its constituents; its effects naturally last longer. For this very reason it is often advocated for orchard fertilization.

Both wood ashes and bone meal furnish lime, which we have seen to be a necessary and somewhat important element.

Soils differ so much in composition that it is impossible to state definitely the amounts of these fertilizers that should be employed in all cases. The wants of the tree for fruit and leaves have been given and the principles for an economical return of these requirements indicated. In conclusion, it may be said that the best and most profitable crops can be obtained only when the soil contains what might be thought to be a large amount of plant food, the greater part of which is more or less assimilable. A good tilth, among other advantages, tends to a good root development. In such the rootlets are able to procure food from a much larger area than otherwise; but in every orchard, owing to the disposition of the roots, there must of necessity be much unoccupied soil, and hence the importance of supplying liberally and in excess of that which is absolutely needed for a season's growth and fruit, those forms of plant food which we have been considering.

Leaves in proportion to their weight contain a much larger amount of plant food than the fruit. The amount contained in 1,000 pounds of leaves

gathered
phoric
analyse

Of
serious a
to be ge
tion of n
The plan
tillage w
Sha
the ques
and som
under m
results.

Ma
sod. In
cultivate
and are i
few orch
in sod, a
vated!
will be t
will be n
summer
before it
penetrat
it availab

In th
the best
much bet
if the gro
better rip

Cult
cultivation
better pra
it forms a
The air al
readily.
make vig

Fruit
in sod, an
break up
where the
may be fo
are perhap
spring. I
not wise t
too thick,

gathered in September was 8.87 pounds of nitrogen, 1.94 pounds of phosphoric acid, 3.92 pounds of potash, this being the average of five varieties analysed by Mr. Shutt.

CULTIVATION.

Of late years, orchard cultivation and management have received the serious attention of all progressive fruit growers. The droughts, which appear to be getting more prevalent in certain parts of Canada, have led to the adoption of methods which are more conducive to the conservation of moisture. The plant food, also, which is in the soil, is made more easily available by the tillage which many orchards now receive.

Shall we keep our orchards in sod or adopt clean cultivation? This is the question asked time and again at meetings of farmers and fruit growers, and something is to be said in favour of both methods, though, as a rule, and under most conditions, clean cultivation with cover crops will give the best results.

Many good crops of apples have been grown in orchards which are in sod. In fact, until recent years, comparatively few orchards were kept cultivated. If the soil is good and the trees never suffer from lack of moisture, and are in a thriving condition, it will not be necessary to cultivate. But how few orchards there are in which the trees do not suffer from drought when in sod, and where they thrive as well as they would if the land were cultivated! If grass is growing in the orchard a very large amount of moisture will be transpired through its leaves and the soil being thus deprived of it will be much drier, and the apple trees will suffer. Rain, which falls during summer showers, will often not soak through the sod, as it will be evaporated before it does so. When a thick sod is formed in the orchard the air does not penetrate as freely and the plant food, which requires the action of air to make it available for the use of the tree, will not become available so readily.

In the colder parts of the country where the apple will grow, however, the best plan will probably be to keep the orchard in sod, as the roots will be much better protected from frost. There will also not be as much growth as if the ground were kept cultivated and the wood on this account will be better ripened and more prepared to withstand the winter.

Cultivation of the soil in orchards offers such great advantages over non-cultivation that in the best apple growing districts it is unquestionably the better practice to adopt in most cases. When the surface soil is cultivated it forms a mulch and prevents the evaporation of moisture in a large measure. The air also is able to enter the soil very easily and nitrification takes place readily. With sufficient moisture and with plenty of plant food the trees will make vigorous growth and good crops of fruit will be borne.

Fruit growers who have followed the custom of keeping their orchards in sod, and who decide to cultivate them in future, should be careful not to break up the sod in the autumn, especially in those parts of the country where the winters are severe. The roots which have not been disturbed, & may be for years, will be near the surface and are likely to be injured, and are perhaps destroyed altogether by hard frost. It is better to plough in the spring. The first ploughing, to break up the sod, should be shallow, as it is not wise to destroy too many roots at one time. Sometimes, if the sod is not too thick, a spade or disc harrow can be used successfully instead of the plough.

If a clover crop has been left over the winter, it may be allowed to grow in the spring until there is a good crop to plough under, but in districts where droughts occur the land should be ploughed as soon as it is dry enough to work, not waiting for the clover to grow up; thus much moisture which would otherwise be transpired by the leaves of the clover would be saved, and the chances of suffering from drought lessened, by beginning cultivation earlier than it is generally begun in some places. Ploughing should be done in alternate years towards and from the trees, so as to keep the soil level. The following extract from Bulletin No. 164 of the Michigan Experiment Station, giving the results of an experiment to test the amount of moisture in the soil, shows what may be saved by early cultivation:—

‘Two tests were made of this question in Field No. 6. The plowing was done May 2. Samples were taken for determination of moisture on May 10 and 17, with the following results:—

May 10.	1st Foot.	2nd Foot.	3rd Foot.	Average 3 feet.
	Per cent.	Per cent.	Per cent.	Per cent.
Spring plowed.....	10.50	10.07	8.04	9.54
Not plowed.....	10.10	8.12	7.26	8.49
	.40	1.95	.78	1.05
May 17.				
Spring plowed.....	9.33	6.75	6.97	7.68
Not plowed.....	8.78	5.92	6.82	7.17
	.55	.83	.15	.51

‘This gives a difference in the first instance of 2.8 pounds per square foot to a depth of three feet and 1.4 pounds in the second instance, in favour of the land ploughed early in the spring.

‘Experiments tried by Professor King and reported in the Wisconsin Report for 1881, p. 101 and 102, show larger differences. The plowing was done April 29 and samples taken May 6, showing a difference for the upper three feet of 7.02 pounds of water per square foot. On another plot the observed difference of the samples taken May 14 to the same depth was 4.65 pounds.’

These determinations all show that to have as large a supply of moisture as possible for the crop it is necessary to plow or work the soil in some way to form a mulch to prevent evaporation as early in the spring as the condition of the land will allow.

After the land has been ploughed it should be harrowed or cultivated at intervals until about the middle of July. There is no fixed rule as to the number of times that harrowing should be done, as much will depend on the character of the season. The object, however, should be to keep the surface soil loose from spring till July. The soil should be cultivated after every shower of any consequence, and even if no rain falls it should be stirred at least once a week. Cultivation should cease in July, in order that late growth will not be encouraged, and that the wood may get thoroughly ripened. If cover crops are grown they will need the intervening time before winter to make the growth necessary to form a good protection for the roots of the trees.

Co
in the
rigidly.
he shou
Experir
the orch
and dro
somewh
extract
reasons

‘Th
mention
came thi
killing :
June clo
of this l
the rate
Red clov
a part of
under on
rate of 2
pease we
under, a
were sow
the Man
desired,
crops of th
ture of th
the apple
what is u
place, the
wind. D
the soil h
are more
whether t
the excep
seemed at
orchard.
lack mois
the soil, i
destructio
thorough
vigorous
fruits, it w
The o
them at tl
of the Ho
‘Sinc
Central E:

Constant cultivation year after year has the effect of reducing the humus in the soil, and the system just recommended should not be followed too rigidly. Circumstances should guide the fruit grower as to the best methods he should adopt to maintain sufficient humus in the soil. At the Central Experimental Farm there is naturally very little humus in the soil, as most of the orchard land is a light, sandy loam. There is, however, sufficient moisture, and drought is not feared. The methods adopted here are, consequently, somewhat different from those recommended in most cases. The following extract from the Annual Report of the Horticulturist for 1898 will give the reasons for the course we have adopted.

COVER CROPS.

'The clover sown for cover crops on 1st August, 1897, in the orchards, mention of which is made in the report of the Horticulturist for that year, came through the winter in splendid condition. Nowhere was there any winter-killing and when growth began it was a fine sight to behold. On the 13th June clover in the crab apple, pear, and plum orchard was turned under. Part of this land was re-seeded on the 14th July, with Mammoth Red clover, at the rate of 12 pounds per acre, and part with about equal parts of Mammoth Red clover and Lucerne mixed. This formed a good covering by autumn. In a part of the apple orchard where the soil is very poor, the clover was ploughed under on the 26th May. The land was harrowed and pease were sown at the rate of 2½ bushels to the acre on 1st of June. On the 22nd July, when the pease were beginning to bloom, and about 2 feet 6 in. high, they were turned under, and, after harrowing, equal parts of Mammoth Red and Lucerne clovers were sown at the rate of 12 pounds to the acre. Owing to the very dry autumn, the Mammoth Red clover did not make as vigorous a growth as could be desired, but the Lucerne was 11 inches in height when frozen. These two crops of leguminous plants ploughed under this season will improve the texture of the soil and enrich it considerably. The clover in the greater part of the apple orchards was not ploughed under this year. This is contrary to what is usually recommended, but it was left for several reasons. In the first place, the soil in the orchard is a sandy loam which is easily moved by the wind. During the years in which the orchards have been under cultivation, the soil has blown away so much from a number of the trees that the roots are more or less exposed. A second reason why it was left, was to determine whether the trees would seem to suffer in time of drought. Notwithstanding the exceptionally dry summer which we had, neither the clover nor the trees seemed affected by the drought, except in a small portion of the Russian orchard. This would seem to indicate that the soil in the orchards does not lack moisture. Taking all things into consideration, namely, the texture of the soil, its capacity for holding moisture, the exposure of the orchard, the destruction of purslane, which it seems impossible otherwise to kill, even with thorough cultivation, and the belief that it is better not to encourage too vigorous growth when so near the limit of the successful growing of large fruits, it was thought better not to cultivate this year.'

The objects of growing cover crops and the experience gained in growing them at the Central Experimental Farm were set forth in the annual report of the Horticulturist for 1899, as follows:—

'Since 1895, orchard cover crops have received much attention at the Central Experimental Farm, and in the reports of the Horticulturist for 1896,

1897 and 1898, considerable space has been devoted to this subject; but the importance of cover crops in the orchard cannot be too often nor too strongly impressed upon the fruit growers of Canada. After the disastrous effects of last winter on fruit trees in some parts of Ontario, the fruit growers living in those districts must realize more than ever before, perhaps, how necessary it is to have some protection for the roots of their trees.

It is now quite generally conceded that cultivation should cease in orchards in Eastern Canada about the middle of July. At this time the season's growth is well advanced and the ripening of the wood soon begins. The seed which is to produce the future cover crop should now be sown. In Eastern Ontario, the Common Red or Mammoth Red clover, sown broadcast at the rate of 12 pounds to the acre, will probably make the most satisfactory cover crop. It will reach a height of from 10 to 12 inches by winter, and will form a dense mat of foliage which will make a thick mulch, thus preventing the alternate freezing and thawing of the ground which occurs in late winter or early spring, and which often proves so disastrous to trees. After the seed is sown, the soil should be rolled with a heavy land roller, which will cause the moisture to rise to the surface of the soil and assist the germination of the seed. This rolling is very important, as, should the seed lie in the ground for any length of time without germinating, there will not be time for a good cover crop to be formed before winter. No nurse crop is, as a rule, necessary. In places where the soil is very dry, Lucerne or alfalfa might be sown with advantage, as the seed of this clover appears to germinate more readily than that of the Common Red clover. Cow peas and Crimson clover may be used in the warmer parts of the country.

Another advantage of clover growing in an orchard in autumn, is that much of the plant food in the soil which has been liberated and made more easily available by the constant cultivation during the early part of the summer, is prevented from leaching by being used by the growing plants, the clover thus becoming a 'catch crop,' as well as a cover crop.

Where soils suffer from lack of moisture in a dry time, the clover should be ploughed under as early in the spring as the land can be worked, and cultivation begun at once. This will conserve much of the moisture which would otherwise be transpired through the leaves of the growing plants until they were ploughed under towards the end of May, which is the usual time. If the soil, however, always contains plenty of moisture, it would be better to let the clover grow until about the third week of May, as there would be additional humus and nitrogen obtained by this method.

The great improvement made in the soil by the annual ploughing under of clover crops is shown by figures given by Mr. G. T. Powell, Ghent, N.Y., U.S., at the annual meeting of the Ontario Fruit Growers' Association, in 1899. After Crimson clover, which had been used as a cover crop, had been ploughed under in an orchard for three years, the soil was analyzed and the following differences were found between that where the clover had and had not been ploughed in:—

	Clover ploughed under for three years. Per cent.	No clover ploughed for three years. Per cent.
Water.....	15.00	8.75
Nitrogen.....	.21	.12
Humus.....	2.94	1.91
Phosphoric acid available	.015	.008

AL
red clo
great.
Fo
recomm
since th
ploughe
humus,
clover w
followed
inches h
that fro
on the fi
from eac
be imagi
Com
25 and 3
from all
not germ
weather
then but
purslane,
cover crop
In a
crops we
formed a
was then
pease, wit
Buck
came up J
Estimated
Soja
bushels pe
Average h
466 pound
Englis
rate of 4 b
7. Averag
592 pounds
Field
3 bushels
Average h
1,191 pound
After
clover on A
but owing t
did not germ
trees in this
On Jul
the soil was
16, after the

Although such good results would probably not be secured by the use of red clover, still the improvement in the land by such treatment would be very great.

For the reasons mentioned in my report for 1898, the methods which are recommended above have not been adopted at the Central Experimental Farm since the spring of that year. Clover is used for a cover crop, but it is only ploughed under every two years. As the soil here is light and lacking in humus, but apparently contains plenty of moisture, a system of cutting the clover with a field mower and leaving it to rot in the orchard, has been followed. In 1898 five cuttings were obtained, the clover being from 18 to 20 inches high at each cutting and just coming into bloom. It was estimated that from the first four cuttings 25 tons per acre of green crop were left lying on the field. Clover sown in 1898 was cut four times in 1899, and the crop from each cutting appeared fully as good as that of 1898. It can easily be imagined that this is improving the soil rapidly.

Common Red clover was sown in the orchards in 1899 on May 10, 17, 25 and 31; July 4, 11, 18 and 25. There was a good cover crop obtained from all of these sowings, with the exception of that on May 31, which did not germinate well, and from those of August 2, 9 and 16, at which time the weather was very dry and the seed did not germinate until September, and then but thinly. Clover sown on May 17 and 25 was nearly smothered by purslane, but eventually overtopped it and came on well and formed a good cover crop by autumn.

In a part of the apple orchard where the soil is very poor, two green crops were ploughed under in 1899. On June 10, clover which had formed a cover crop the previous winter was ploughed under and the land was then re-sown with buckwheat, soja beans, English horse beans and field pease, with the following results:—

Buckwheat.—Sown broadcast on June 17, at the rate of 2 bushels per acre; came up June 23. Ploughed under on July 25. Average height 27 inches. Estimated yield per acre of green crop: 8 tons 335 pounds.

Soja Beans.—Sown in drills 6 inches apart on June 17, at the rate of 3 bushels per acre; came up on June 24. Ploughed under on August 7. Average height 14 inches. Estimated yield per acre of green crop: 3 tons 466 pounds.

English Horse Beans.—Sown in drills 6 inches apart on June 17, at the rate of 4 bushels per acre; came up on June 27. Ploughed under on August 7. Average height 18 inches. Estimated yield per acre of green crop: 6 tons 592 pounds.

Field Pease.—Sown in drills 6 inches apart on June 17, at the rate of 3 bushels per acre; came up on June 24. Ploughed under on July 29. Average height 26 inches. Estimated yield per acre of green crop: 5 tons 1,191 pounds.

After these crops were ploughed under the land was re-seeded with clover on August 2, 9 and 16, in the hope of getting a cover crop by winter, but owing to nearly six weeks of very dry weather about that time the seed did not germinate until September and a cover crop was not formed. The trees in this part of the orchard were mulched with manure.

On July 6, English horse beans were sown in a part of the orchard where the soil was light and where the snow does not lie well in winter. On July 16, after the beans were up, Common Red clover was sown among them at the

rate of 12 pounds per acre. The beans reached a height of 18 inches by autumn and helped very much to hold the snow while they must have gathered much nitrogen during the growing season. There was also a good stand of Common Red clover.

On July 25, Lucerne clover was sown in a part of the orchard where the soil was very light. It reached a height of from 7 to 12 inches by autumn, and although there was a large number of plants destroyed by a storm carrying away the surface soil, there was a fairly good cover crop."

The advantage of using leguminous plants, such as those referred to, for cover crops is that by means of the nodules, or tubercles on their roots they are able to assimilate free nitrogen from the air, and thus add much of this expensive plant food to the soil without cost to the grower. The Hairy Vetch (*Vicia villosa*), another leguminous plant, has given great satisfaction where it has been used. It is a rapid grower and is not injured by light frosts.

In addition to the leguminous plants mentioned above, rye and buckwheat make good cover crops and are often used by fruit growers for this purpose. They have, however, the disadvantage of not adding any more plant food to the soil than they take out of it during their growth.

RENOVATING ORCHARDS.

Many orchards have been neglected so long and have reached such an age that it will not be profitable to attempt to renovate them, and the best plan would be, in such cases, to plant young trees. On the other hand there are many orchards where the trees, if cared for, would be in the prime of life, and neglect is the only cause which prevents profitable crops from being grown. It is of orchards such as these that a few suggestions are offered as to how to bring them back into good condition. The results desired cannot be accomplished in one year.

To begin with, the trees should be pruned, not too heavily at first, but enough limbs should be taken out to open up the top and permit a free circulation of air and the admission of sunlight to it. The trees will probably be much moss grown, and both they, and the fruit, affected with various diseases, and injurious insects are almost certain to abound. Spraying should be begun early in the season, as recommended in the spraying instructions in this bulletin, and the trees should be kept covered from top to bottom with Bordeaux mixture and Paris green until the fruit is almost fully grown. Scraping the trunks and large branches of the trees may be done if there is much moss, but as soon as the tree becomes more vigorous, and air and sunlight are admitted, much of the moss will disappear. If the oyster-shell bark-louse or other scale insects infest the trees, they should be sprayed with the lime mixture, or other materials mentioned in the spraying calendar. As the orchard, if neglected, is almost certain to be in sod, the soil should be ploughed shallow in the spring, turning under a good dressing of manure if it can be procured. If the sod is not too thick it might be worked up with the disc or spade harrow. The ground should then be kept thoroughly harrowed until July, working in other fertilizers if the land is poor and manure is not to be had, and then red clover seed sown at the rate of twelve pounds per acre and the

ground
conclude
increased
would be
done, the
in the spr
seeded do
not until
orchard b

It is
Each fruit
require to
are, howe

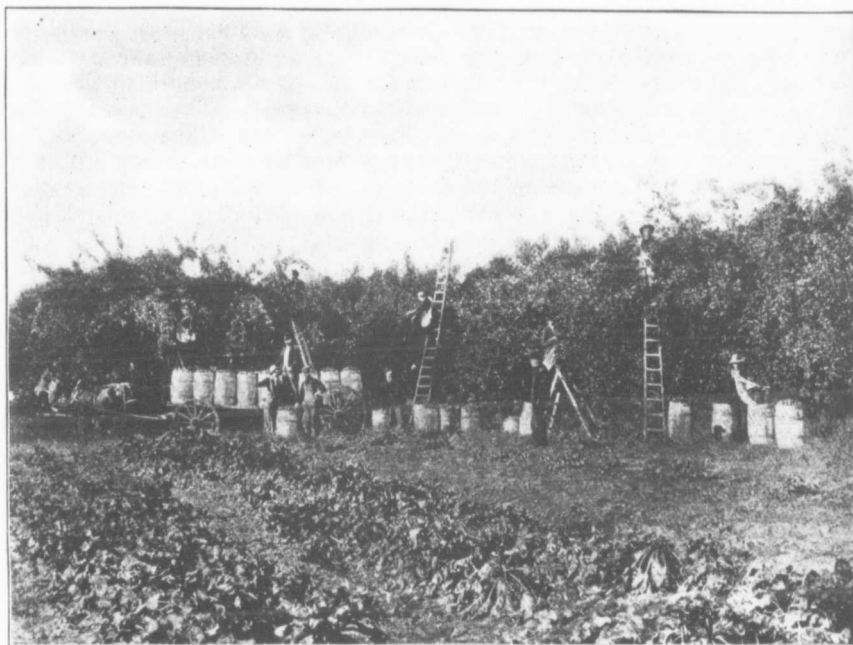


which are in
and disposed
putting up
export purp
Experience v

ground rolled. A good cover crop should be formed by autumn. This would conclude the first season's work. The results would probably be a greatly increased vigour in the trees, and the fruit, though perhaps not plentiful, would be cleaner. The second season, additional, but less, pruning should be done, the trees kept thoroughly sprayed as before, the clover ploughed under in the spring, and the land kept harrowed or cultivated till July, and then seeded down to clover. The fruit should be better than the year before, but not until the third year should the trees be expected to bear heavily and the orchard be in good condition.

PICKING AND PACKING.

It is difficult to give exact information as to the best time to pick apples. Each fruit grower must learn this from personal experience. Some varieties require to be picked at one stage of maturity, and some at another. There are, however, several general directions which may be given. Early apples



Picking apples in Niagara District, Ontario.

which are intended for near markets should be picked when almost mellow, and disposed of as soon as possible, as their season is short. The best way of putting up early apples is in 10 to 20 lb. baskets with leno covers. For export purposes they should be picked when well coloured but still firm. Experience will soon teach the best time to pick for this purpose. Winter

apples may be left on the trees until there is danger of injurious frost. In large orchards it is necessary to begin picking in good season, and the different varieties will have to be taken in succession, beginning with the early winter sorts and those varieties which drop easily. An apple, before being picked should have its seeds almost mature, and have taken on most of its colour. As seasons vary considerably, judgment has to be shown as to the best time to gather the fruit. It often happens that a good crop of apples of the best quality is ruined by improper picking or gathering. Winter varieties appear so hard when they are picked that one might be led to think a little careless handling would have no injurious effects upon them, but this is not the case. Apples are easily bruised, and some varieties much more easily than others. When an apple is bruised, its appearance is often spoiled for the home market and its shipping qualities very much lessened for the export trade. The bruises of some varieties, while disfiguring the fruit, do not cause the apple to rot rapidly; on the other hand, there are many varieties which will rot rapidly when once bruised. Bruises may be avoided by careful handling and nothing should induce the practice adopted by some people of shaking the apples from the trees.

There are many kinds of receptacles for picking apples in, but half bushel baskets are about as convenient and satisfactory as any. They should be lined with some soft material to prevent bruising, as too much caution cannot be taken in this regard. A hook may be fastened on the handle so that the basket may be suspended while the picker is at work. The easiest way to remove the apples from the branch will soon be learned. The stem should remain on the apple, as if broken off decay is more likely to set in. The fruit may be either sorted immediately or taken to a store house and done at some future time. Many of the best growers sort and pack in the orchard, and certainly the fruit has much less danger of being bruised if treated in this way. A sorting board covered with some soft material is arranged at a convenient distance from the ground on which the apples are emptied from the baskets. They are then usually sorted into three grades, namely, firsts, seconds and culls. The firsts and seconds are put in baskets as selected and the culls thrown to one side. These baskets should be small enough to go into a barrel, should the latter be used. Machines for grading and sizing fruit have been used for this work in recent years, but, unless the fruit is free from scab or codling moth, the hand will have to be used also. The usual practice is to face the end of the barrel with two layers of apples placed neatly and tightly in it with the hand. These should be a fair sample of the kind of apples which are in the middle of the barrel. The other apples are now gently emptied out of the baskets into the barrel and the fruit is made to settle down by rocking the barrel from time to time. This is a very important factor in successful packing. The last row of apples should come slightly above the heading groove. The apples are pressed into place by means of a lever, and a circular band lined with felt just fitting the barrel, until the top boards can be fitted in. If the apples have been well shaken when being put into the barrel very little pressing is necessary. As all the pressing that is required is to keep the apples from moving, the more pressure that is put on, the greater quantity of bruised apples there will be. Some yielding material, such as excelsior or felt, placed in each end of the barrel would lessen the amount of bruised fruit very much.

The
When p
Dur
in Canad
fruit has
will again
fruit at e
middle.

For
the follow

'Eve
packs tru
be marke
mises wh

(a) w
address o

(b) w

(c) w

'No

fruit pack
nation wh
unless suc
nearly uni
less than
and prop

'No
fruit pack
representa
false repre
tially smal
the faced o

Some
cases all in
to a store
next day.
others do
in boxes o
is probably
allow it to
cool they r

If the
packed, be
fruit kept c
proper plac

The choicest fruit packed in bushel boxes brings high prices in England. When packed in this way every specimen should be uniform and perfect.

During the past few years dishonest packing seems to have been growing in Canada, the result being that the reputation of Canadians and Canadian fruit has suffered very much and it will require some years before confidence will again be restored. Apples have been packed in such a manner that the fruit at either end of the barrel gives a very false impression of that in the middle. An Act has recently been passed which will prevent such fraud.

For the information of fruit growers in grading their fruit when packing, the following quotations are made from the Act:

'Every person who, by himself or through the agency of another person, packs fruit in a closed package, intended for sale, shall cause the package to be marked in a plain and indelible manner, before it is taken from the premises where it is packed,—

(a) with the initials of the Christian names, and the full surname and address of the packer;

(b) with the name of the variety or varieties; and

(c) with a designation of the grade of the fruit.

'No person shall sell, or offer, expose or have in his possession for sale any fruit packed in a closed package, upon which package is marked any designation which represents such fruit as of finest, best or extra good quality, unless such fruit consist of well-grown specimens of one variety, sound, of nearly uniform size, of good colour for the variety, of normal shape and not less than ninety per cent free from scab, worm holes, bruises and other defects, and properly packed.

'No person shall sell, or offer, expose or have in his possession for sale, any fruit packed in any package in which the faced or shown surface gives a false representation of the contents of such package; and it shall be considered a false representation when more than fifteen per cent of such fruit is substantially smaller in size than, or inferior in grade to, or different in variety from, the faced or shown surface of such package.'

Some of the best packers pick the fruit, pack it, and close the barrels or cases all in the same day; others pick and pack it the same day, but take it to a store room to cool off over night and then close the barrels or cases the next day. Others, again, do not close them until ready for shipment, and still others do not pack their fruit until they desire to ship it, but merely keep it in boxes or bins. All these systems have their advocates. The best method is probably the second, namely, to pick and pack the fruit the same day, but allow it to cool down before closing the barrels or cases. If the weather is cool they may be closed when packed.

STORING.

If the fruit is not disposed of at once it should, as soon as it is picked or packed, be put somewhere where the temperature may be controlled and the fruit kept cool. Every fruit grower who has a large orchard should have a proper place for storing his fruit. It often happens that at the time of picking,

the prices for apples are very low. If a grower has not a proper place to store them he is obliged to sell, while if he were able to hold them for a time, better prices would be obtained. This was strikingly the case in 1900.

A cellar often answers the purpose of a storeroom, but it takes a large cellar to store fruit from a large orchard. For most varieties of apples a well ventilated room above ground with comparatively dry air, the temperature of which may be kept low, is the best. Apples such as Russets which shrivel easily keep better in a moist atmosphere. A fruit building may be erected without a great expenditure of money. It should be built in such a manner that the warm air may be kept out and the cooler air kept in, or vice versa. The temperature should be kept as cool as possible in the autumn, and in the winter it should be maintained at from 32°F. to 35°F. The cooler apples are kept without freezing, the better.

Apples may be kept in such a building until they are required for shipment. If they are kept late into the winter they should be repacked before shipping, to avoid sending away anything that will be a discredit to the grower and a loss to the consumer.

In houses in cities it is often difficult to get a place where the temperature may be regulated, as it is usually either too warm or too cold. However, the coolest place should be chosen where there is no danger of frost. If there is a choice of two rooms that with the moister atmosphere would be the better, for, as a rule, the air is too dry for keeping apples properly in a city house. If the apples are in good condition and none of the specimens show signs of rotting they may be left in the barrel or box. If, however, they show signs of rotting they should be sorted and the perfect specimens wrapped in paper. If the room is very dry it will be better to put them back in the barrel, after wrapping, as they will shrivel less when kept in a mass where the air will not get at them so readily.

As the export of the early and tenderer fruits to Great Britain increases, the need of cold storage buildings will be felt and more of them will be erected. The temperature in such buildings will have to be kept down by means of ice or by some other artificial method, as the ordinary storeroom could not be kept cool enough in the heat of summer. To ship early apples to Great Britain successfully it is necessary to pick them before they are fully mature, and keep them constantly cool in the cold storage house, refrigerator car and steamer until they are landed in Great Britain. If they are subjected to a warm temperature between the time they are picked and when they reach the other side of the Atlantic they will be likely to prove a failure.

MARKETS.

The demand for Canadian apples of good quality and in good condition is an ever increasing one. In Great Britain the market appears to be unlimited and the prospects for opening an extensive trade with other European countries, also, are very bright. The Canadian fruit growers, packers and shippers should see to it that the fruit which is exported is well and honestly packed and that it is of such quality as will increase the demand for it even more than in the past.

At home, also, the consumption of apples is increasing, and when better rates are given by the railways so that the apples may be shipped at less cost

than at
in those

Alt
diseases
mixed w
became a

Wh
diseases
imprese
Bordeau:
was pub
recomme
small bro
in Amer
found th
the same

Pari
the destru
was not u
Its effecti
green col
Bordeaux

Wha
was recon
a remedy
for destro
merce are
icides they

Kero.
was in th
for destr
Agricultu
to recom
water are

the trees
remedy fo
this accou

Crude
remedy fo
having do
has been v
times it ha
compositio

Tobar
and is one
injuring tr
such as apl

than at present there will be a great demand for this fruit by those who live in those parts of Canada where apples cannot be grown successfully.

SPRAYING.

Although plants have been treated to prevent and exterminate fungous diseases and insect pests for many years it was not until poisons dissolved and mixed with liquids began to be used extensively for field work that spraying became an important part of successful fruit culture.

When the value of sulphate of copper as a preventive of the fungous diseases of fruits had been discovered, the value of spraying began to be impressed very strongly upon fruit growers. This discovery was made at Bordeaux, France, in 1882, but it was not until 1885 that the first formula was published. The mixture of sulphate of copper, lime and water, then recommended was a very thick and strong one and was applied by means of small brooms. The Bordeaux mixture, as it has been called, was soon tried in America. Experiments were made, and it was not long before it was found that a much thinner and weaker mixture could be used and by 1892 the same formula, practically, as is now recommended, was adopted.

Paris green, one of the most important insecticides, was first used for the destruction of biting insects injurious to fruits about 1872 or 1873, but was not used extensively for this purpose until four or five years afterwards. Its effectiveness is so apparent and it is so easily recognized by its bright green colour that it has become very popular. It is now usually applied with Bordeaux mixture on apple trees by which it loses none of its value.

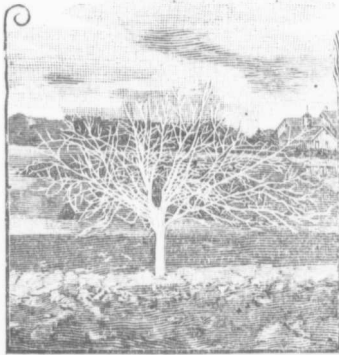
Whale oil soap which is one of the best insecticides for sucking insects was recommended before the Massachusetts Horticultural society in 1842 as a remedy for thrips, red spider and other insects; but it is now used largely for destroying scale insects and aphides. Some of the whale oil soaps in commerce are made from soda, but in order to be effective when used as insecticides they should be made from potash and not from soda.

Kerosene Oil.—The first published record of the use of this insecticide was in the Gardener's Monthly, December, 1865, when it was recommended for destroying scales on orange and other trees. Cook, of the Michigan Agricultural Experiment Station, appears to have been the first experimenter to recommend the kerosene emulsion, which he did in 1878. Kerosene and water are now used for destroying sucking insects, but the oil often injures the trees and great care has to be taken with it. Kerosene emulsion is a good remedy for sucking insects, but is not as readily made as some others, and on this account has not been as popular as it otherwise would have been.

Crude petroleum has for the past two years been recommended as a remedy for the San José Scale, Dr. J. B. Smith, New Brunswick, N.J., having done most to bring it into prominence through his experiments. It has been very effective in some instances and in others it has not, while sometimes it has proven injurious to the trees. Crude petroleum is not uniform in composition and hence has to be used with caution.

Tobacco has been used for a long time as a remedy for sucking insects and is one of the best in use at the present time. There is little danger of injuring trees with it, yet it is very effective in killing soft bodied insects such as aphides. Tobacco water is easily made and applied.

Lime is a very useful substance in spraying. It has made both sulphate of copper and Paris green quite safe to use in proportions which would otherwise be injurious to foliage. It was recommended as long ago as 1850 as a remedy for plum curculio and it has proven very effective in destroying the pear-tree psylla. The whitewashing of the trunks of trees is an old custom, and while it was not always known why the lime was applied, the results must have been good or the custom would not be such an old one. In 1899 it was discovered by the Horticulturist at the Central Experimental Farm that lime was very effective in ridding trees of the oyster-shell bark-louse, and this new use of lime should prove of much value to fruit growers where this insect is prevalent.



Apple tree sprayed with lime wash to destroy oyster-shell bark louse.

With the development of spraying came the development of spray pumps and nozzles, as, up to the time of the advent of Paris green and Bordeaux mixture, the pumps and nozzles used were not very suitable for the purpose, but these have been so perfected during the past few years that it is now difficult to find where an improvement can be made. Many intermediate pumps may be had between the small hand syringe and the powerful pump fitted to a forty gallon barrel, by means of which the tops of the highest apple trees may be reached with the spray. For orchard work it is most economical to get one of the best and most powerful pumps made. These can be obtained for from \$18 to \$24. Smaller pumps may be bought, but they are not suitable for orchard work. If, however, an extension rod is obtained, cheaper pumps may be used in gardens where there are but few trees and where most of the spraying is done on small fruits and vegetables. Such pumps may be obtained for from \$5 upwards.

At the Central Experimental Farm much attention has been given to spraying. In the first annual report, being that for the year 1887, the Entomologist published formulæ to be used, and in every report since has insisted on the necessity of spraying. Before the experimental farms were established he had, in his report to the Minister of Agriculture for 1885, published formulæ from his own experiments. Since 1890 many experiments have been conducted by the Horticulturist and Entomologist to determine the best formulæ to adopt, and if possible to discover some new remedies. In addition to the information given in the annual reports the following publications have been issued on spraying, 'Treatment of Apple Scab, Grape and Gooseberry Mildew' (Bulletin 10, 1891) by J. Craig. 'Recommendations for the Prevention of Damage by Some Common Insects of the Farm, Orchard and Garden' (Bulletin 11, 1891) by J. Fletcher. 'Spraying for the Prevention of Fungous Diseases and Injurious Insects' (Bulletin 23, 1895) by Fletcher and Craig. Spraying calendars by Fletcher and Craig in 1895 and 1897, and by Fletcher and Macoun in 1899 and 1901.

As the advantages of spraying have been thoroughly proven and demonstrated by men who have been employed by the Government to do this work, and as the matter has been written about time and again in reports, bulletins, periodicals, newspapers and spraying calendars, one might be led to think

that all fruit
course, just
case, and t
do not spr
with Bord
scab and c
results; th
properly m
done at the
prising tha
work prop
too often n
begun it is
ings are sug
be made.
rain occurs
and the wo
of the chief
thoroughly
spray as the
disease or in
given on th
and similar
knows the c
study of spr
but if his kn
should follo
seasons sugg
all the mixtu
Spraying
Experimenta
which are gi
recommende

DIS

Apple B
does much in
drying up of
affected and
practically us
blossoms and
subject to it
Affected twig
part and burn
Black Sp
years the ap
fruit so badly
spring and is
fruit may be a
the fruit incre

that all farmers and fruit growers would now spray their trees as a matter of course, just as they plough their fields; but this, unfortunately, is not the case, and there is still a large proportion of men engaged in fruit growing who do not spray. There is also another class of men who, knowing that spraying with Bordeaux mixture and Paris green will materially lessen the amount of scab and codling moth, do spray their trees, but are not satisfied with the results; the reason of the poor success being, either that the mixture is not properly made, the trees are not sprayed thoroughly, or the spraying is not done at the proper time. Spraying is an expensive operation, and it is surprising that so many continue to waste hard-earned money by not doing the work properly. The early sprayings are the important ones, and these are too often neglected on account of press of other work, and when spraying is begun it is often too late to be of much service. A certain number of sprayings are suggested in the spraying calendars, and the times when they should be made. It should, however, be impressed on those who spray, that if heavy rain occurs before the mixture has dried on the trees, it will be washed off and the work must be done over again. The neglect of this is probably one of the chief causes of poor success in spraying. Spraying should be done thoroughly, and the underside of the leaves should receive as much of the spray as the upper sides. Every leaf or fruit missed means a foothold for disease or insect pests. In preparing the mixtures and solutions, the formulæ given on the spraying calendars prepared by the Central Experimental Farm and similar institutions, should be followed as closely as possible. If a man knows the chemical composition of the materials he uses, and has made a study of spraying, he may alter them slightly to meet certain circumstances, but if his knowledge of the materials used goes no further than the name, he should follow the instructions closely. He should also do his spraying at the seasons suggested. A delay of a few days may mean the loss of practically all the mixture or solution used without getting anything in return.

Spraying calendars are published, from time to time at the Central Experimental Farm, conjointly by the Entomologist and Horticulturist in which are given full instructions for the preparation of the various formulæ recommended and the time at which each spraying should be made.

DISEASES AND OTHER INJURIES TO APPLES AND APPLE TREES.

Apple Blight or Fire Blight (Bacillus amylovorus). This disease often does much injury to apple trees. It is usually first indicated by the sudden drying up of the young twigs and spurs. Often whole branches will be affected and sometimes the trunk itself, causing the tree to die or become practically useless. The bacteria which cause the disease enter through the blossoms and bark of the tree. The Russian varieties of apples appear more subject to it than others. There is no known preventive or good remedy. Affected twigs and branches should be cut off about a foot below the affected part and burned to prevent the further spread and dissemination of the disease.

Black Spot Fungus or Scab (Fusicladium dendriticum). During recent years the apple scab fungus has been very troublesome, often injuring the fruit so badly that it is quite unsaleable. The disease attacks the tree in early spring and is first noticeable as light green patches on the young leaves. The fruit may be affected as soon as formed and if badly diseased will drop off. As the fruit increases in size the diseased patches enlarge and nearly all the surface

is often covered with the black spots before the fruit is picked. In addition to the disfigured appearance of the fruit, caused by this disease, the apples do not reach their full size. The apple scab develops most rapidly in moist weather. This disease may be almost entirely prevented by the proper use of Bordeaux mixture, the remedy recommended at the end of this paragraph. While a certain number of applications are recommended, more will have to be given if the season is wet. The object should be to keep the trees covered with the mixture from the first until the last spraying. If the mixture is washed off the tree the disease will have an opportunity of developing and it is difficult to check it, if it begins to spread.

REMEDY.—Spray with copper sulphate solution (1 lb. copper sulphate to 25 gallons water) before bud-start; and with Bordeaux mixture, just before blossoms open; soon after blossoms fall and two or three times after at intervals of from 10 to 15 days. The first three sprayings are the most important.

Crown Gall (Root Gall). Indicated by hard, gall-like masses on the crown and sometimes on the roots of apple trees, particularly on young trees. These galls often interfere very much with the circulation of sap in the trees, causing them to become sickly, and frequently resulting in their death. The roots of most of the large fruits are affected, and in the United States the losses from this disease have been very great. Until recently, it was not known what caused this injury. It was thought by some that the galls were simply malformations caused by the injury to the tree or were produced by unsuitable soil, by others, that they were produced by a parasitic fungus, and again, that they were caused by insects. This disease has been given much study recently by J. W. Toumey, of the Arizona Agricultural Experiment Station (see Bulletin 33). His conclusions are that it is caused by a parasitic slime-mould, the spores of which may be readily disseminated by the wind or by other means. No remedy has yet been found, and trees affected with it should be destroyed and burned to prevent its spreading. If the galls are removed, only, they will grow again. No trees should be planted, which have had these galls upon them.

Dry Rot.—This is a disease which affects the fruit and is indicated on the exterior of the apple by small circular depressions. When the skin is removed, dryish, brown tissue is found at the diseased spots, and when the fruit is badly affected this brown and pithy condition may be seen extending through much of the fruit. The diseased flesh is not bitter but is dry, tough and without flavour. When the apple is badly affected its commercial value is almost destroyed. Various causes have been assigned to this disease, namely, want of vigour of tree, lack of moisture in the soil, want of potash and lime in the soil. By those who have given most study to the rot it is ascribed to the concentration of sap caused by the transpiration of moisture, which causes the death of the cells. There is not yet any known remedy for this disease, but it will probably not be as troublesome if there is plenty of moisture in the soil, and if the trees are encouraged to make good, healthy growth.

Sunscald.—The injury to apple trees known as sunscald is one of the most serious hindrances to successful apple culture, particularly in the northern and eastern parts of Ontario and in the province of Quebec. Newly planted trees are, as a rule, more seriously affected by it than older ones, but both often suffer badly. The unhealthy appearance of the bark and wood on the south and south-west sides of the trunk of the tree and on the larger branches is the first indication of this injury. Afterwards the bark and wood dry up and fall away. Trees are often so badly affected that they die. This injury occurs

during the
days and
planting
rays of the
planting,
time. W
trunks m
thus prev
loose so t
it can be
finely mes
protector.
good subs
the tree is
ravages of
protect the
mice shou
parts shou
wax or pa
in the mar

Mice.

when it is
harbour.
before win
trunks wit
base to the
iron netting
Where the
to prevent

If a tr
injury is no
wrapped w
drying out,
and returni
upper part
its healing
put on it w
the tree shc
ation of mo
uninjured.
lower edges
Mice may b
weight of a
pieces of bo
a trough.]
spoonful of
renewing th

during the latter part of winter or very early in spring when there are warm days and cold nights. This injury may be prevented to a large extent by only planting trees which are headed low, thus exposing but a short trunk to the rays of the sun; also by inclining the young trees somewhat to the south when planting, thus preventing the sun's rays striking the trunk except for a short time. Where trees have been planted and are liable to become sunscalded, the trunks may be protected by using a veneer of wood which encircles the trees, thus preventing the rays of the sun from striking the trunk. It should be loose so that there will be an air space between it and the tree. The ends of it can be fastened together by means of wire. Another protector is made of finely meshed galvanized iron netting which is more permanent than the wooden protector. In outlying districts where these protectors cannot be purchased, a good substitute may be made out of birch bark. Building paper tied around the tree is also useful. All of these protectors are effective in preventing the ravages of mice. Cornstalks, boards, and many other things may be used to protect the tree from sunscald. Nothing, however, that will be likely to harbour mice should be used. When a tree has been injured by sunscald the injured parts should be carefully cleaned away and the wound covered with grafting wax or paint. If the tree is young and likely to suffer, it should be protected in the manner described above.

Mice.—Mice often girdle the trees in the orchard in winter, especially when it is in sod or when there is rubbish lying about in which they like to harbour. Everything in the way of rubbish should, however, be removed before winter. Their depredations may be prevented either by wrapping the trunks with building paper in autumn and banking up the earth about the base to the height of about a foot; by encircling the trunk with fine galvanized iron netting; or by using the veneer protectors used to prevent scalding. Where the latter are used the earth should be banked up a little at the base to prevent the mice from going underneath.

If a tree is girdled by mice it usually dies. If, however, as soon as the injury is noticed, the wound is cleaned and covered with grafting wax and wrapped with cloth so that the air is excluded and the wood prevented from drying out, the sap which rises through the soft wood will continue to do so and returning through the inner bark, growth will be made all around the upper part of the wound, and if the latter be not too large there is a chance of its healing over. If, however, the wood becomes dry before the bandage is put on it will almost certainly die. When the wax and bandage are applied the tree should be headed back considerably to lessen the amount of transpiration of moisture, as there will not be as much sap rise as if the tree were uninjured. Girdled trees are sometimes saved by connecting the upper and lower edges of the girdle with scions, which are inserted all around the trunk. Mice may be destroyed in the orchard by using a mixture of one part by weight of arsenic with three parts of corn meal. To use this safely nail two pieces of board each six feet long and six inches wide together so as to make a trough. Invert this near the trees to be protected and place about a table-spoonful of the poison on a shingle and put it near the middle of the run, renewing the poison as often as is necessary.

APPLE INSECTS.

BY JAMES FLETCHER, ENTOMOLOGIST AND BOTANIST.

In a condensed consideration of the most important insect enemies of the apple grower, it may be pointed out that these may be divided under the following headings:—

- Those which devour the foliage;
- Those which bore in the wood;
- Those which occur on the bark; and
- Those which attack the fruit.

All insects fall within two classes which can be separated by the nature of their mouth parts. A consideration of this point is of the utmost importance in the intelligent use of remedies. In the first class, Biting Insects, which have jaws with which they consume the substance of their food, as caterpillars, all that is necessary is to place on the food plant some poisonous material which will be eaten with the food. In the second class, Sucking Insects, which instead of jaws have a beak or hollow tube with which they suck up their food in a liquid form, as the plant-lice, something must be used which will kill by mere contact with their bodies.

For some insects such as borers in the wood, which cannot be reached by the above remedies, preventive measures may be taken by which the plants are rendered distasteful to the mature insects when seeking a suitable place to lay their eggs. For this purpose, various alkaline or strong-smelling deterrent washes are used.

The following are the formulæ of standard remedies which are recommended by the Entomologist and Botanist:—

INSECTICIDES AND FUNGICIDES.

I. KEROSENE EMULSION.
(Riley-Hubbard formula.)

Kerosene (coal oil).....	2 gallons.
Rain water.....	1 gallon.
Soap.....	$\frac{1}{2}$ lb.

Dissolve soap in water by boiling; take from fire, and, while hot, turn in kerosene and churn briskly for 5 minutes. To be diluted before use with 9 parts of water.

II. PARIS GREEN.

Paris green	1 lb.
Lime (fresh).....	1 lb.
Water	200 gallons.

For dry application. 1 lb. Paris green with 50 lbs. flour, land plaster, slaked lime or any other perfectly dry powder.

III. WHALE-OIL SOAP.

For scale-insects (young).....	1 lb. in 5 gallons water.
For aphids.....	1 lb. in 8 gallons “
For San José scale (in winter).....	2 lbs. in 1 gallon “

grown w
dissolved
intervals

of a stron
the morn
coating n

Dissol
vessel con
vessel. I
through c
into a ba
barrel wi
thoroughl
Stock
and kept
quantities

As so
open.

For th
applying l
force as to
treated as
are inaccur
so-called sp
by these te
of liquids.

IV. TOBACCO AND SOAP WASH.

For Plant-lice or Aphis.

Soak in hot water for a few hours 10 lbs. of tobacco leaves (home grown will do); strain off and add 2 lbs of Whale-oil soap. Stir until all is dissolved, and dilute to 40 gals. Apply early and two or three times at short intervals.

V. ALKALINE WASH.

For Borers.

Soft soap reduced to the consistency of thick paint by the addition of a strong solution of washing soda in water. If applied with a brush during the morning of a warm day, this will dry in a few hours and form a tenacious coating not easily dissolved by rain.

VI. POISONED BORDEAUX MIXTURE.

For Fungi and Insects on Fruit-trees.

Copper sulphate (blue-stone)	4 lbs
Lime (fresh).....	4 lbs.
Paris green.....	4 oz.
Water (1 barrel).	40 gallons.

Dissolve the copper sulphate (by suspending it inside a wooden or earthen vessel containing 4 or 5 or more gallons of water.) Slake the lime in another vessel. If the lime, when slaked, is lumpy or granular, it should be strained through coarse sacking or a fine sieve. Pour the copper sulphate solution into a barrel, or it may be dissolved in this in the first place; half fill the barrel with water, add the slaked lime, fill the barrel with water and stir thoroughly. It is then ready for use.

Stock solutions of dissolved copper sulphate and of lime may be prepared and kept in separate covered barrels throughout the spraying season. The quantities of bluestone, lime and water should be carefully noted.

VII. COPPER SULPHATE SOLUTION.

Copper sulphate (blue-stone).....	1 lb.
Water.....	25 gallons.

As soon as dissolved it is ready for use. *For use only before the buds open.*

CAUTION.

For the purposes of this note the operating of "Spraying" consists of applying liquids by means of a force pump and spraying nozzle with such force as to break up the liquid so thoroughly that it falls upon the plants treated as an actual mist or spray. Such terms as *sprinkling* and *showering* are inaccurate for the operation here intended. Unfortunately much of the so-called spraying as usually carried out could more accurately be designated by these terms, which describe a much less careful and less even distribution of liquids.

THE WORST ENEMIES OF THE APPLE TREE.

ATTACKING THE FOLIAGE.

1. THE EYE-SPOTTED BUD-MOTH (*Tmetocera ocellana*).—Small, dark brown caterpillars, $\frac{1}{4}$ of an inch in length, with black heads and collars, destroying the buds when just unfolding, and sometimes boring down the centre of the twig. *Remedy*: Spray early with a strong Paris green wash (Paris green 1 pound, fresh lime 1 pound, water 100 gallons).

2. THE CIGAR CASE-BEARER (*Coleophora fletcherella*) and

3. THE PISTOL CASE-BEARER (*Coleophora malivorella*).—Small yellow caterpillars in curved cases, which pass the winter on the twigs of apples and cluster around the opening buds, injuring the foliage and flowers. *Remedy*: Spray early with the wash mentioned under No. 1 above, or with kerosene emulsion (Formula I).

4. LEAF-ROLLERS.—The caterpillars of several small Tineid moths, when full-grown from $\frac{1}{4}$ to $\frac{1}{2}$ inch in length, which bind together the young leaves and flower buds, forming a tent inside which they feed. *Remedy*: The same as for No. 1.

5. TENT CATERPILLARS (*Clisiocampa*).—Two kinds attack the foliage of the apple as well as of many other trees. The Apple-tree Tent Caterpillar forms a tent in the fork of two twigs; the Forest Tent Caterpillar does not make a conspicuous tent, but spins a flat mat of silk on the side of a branch or on the trunk; to these resting places the young caterpillars resort when not feeding. The mature insects are thick-bodied, reddish brown moths expanding about $1\frac{1}{2}$ inches across the wings, which are crossed obliquely by two bands. These bands are pale in the first-named, but dark in the moth of the Forest Tent Caterpillar. During July the females lay rings of about 200 eggs on the twigs of trees, in which state the insect passes the winter. *Remedies*: Collect and destroy the egg clusters during the winter. Spray the trees with poison (Formula II or VI) directly the young caterpillars are noticed. All tents should also be cut off and destroyed early, before the leaves hide them.

6. GREEN FRUIT WORMS (*Xylina*).—Green caterpillars dotted and lined with yellowish white, $1\frac{1}{2}$ inches long, occasionally attacking the foliage and the forming fruit. *Remedy*: Spraying regularly with Formula VI will prevent injury from these insects.

7. CANKERWORM (*Anisopteryx pometaria*).—Silver brown caterpillars about an inch in length, with only six pairs of legs, occurring sometimes in large numbers, attacking the leaves so severely as to give the trees the appearance of having been scorched with fire. The wingless female moths appear only in autumn and climb up trees to lay their eggs in flat patches on the bark. From these the young caterpillars hatch in spring. *Remedies*: Spray as soon as caterpillars appear with Formula II or VI. In autumn, place mechanical contrivances or bands of thick paper painted with a mixture of castor oil 2 pounds, rosin 3 pounds; or with printer's ink, or some other viscid substance to catch the females when ascending the trees to lay eggs.

8. THE
eggs may
hatch and
They also
Tobacco
water, For

ATTACK

9. BOE
BORER (*Sap*
borers whi
the best re
before the
Formula V
pint to 4 ga
the trunks
grub may b
by the sunk
bark the gr
killed with

OCCURRI

10. THE
scale-insects,
a depressed
This very ir
but when al
though dust
to eradicate
bad infestat
most econom
are the spr
soap solution
tion of crud
to discover a

11. THE
insects furni
inch in lengt
lice hatch in
for a few day
one brood in
wash (1 or 2
insects hatch.
(Formula III

There ar
which may be

8. THE APPLE APHIS (*Aphis mali*).—During winter small shining black eggs may be found on the twigs. From these, early in spring, green plant-lice hatch and cluster on and in between the young leaves of the opening buds. They also occur in large numbers beneath the leaves in autumn. *Remedies*: Tobacco and soap wash (Formula IV.), whale-oil soap (1 lb. in 8 gallons of water, Formula III).

ATTACKING THE WOOD.

9. BORERS: FLAT-HEADED BORER (*Chrysobothris femorata*), ROUND-HEADED BORER (*Saperda candida*).—The above named are the two commonest kinds of borers which attack the apple. They vary somewhat in their habits, but the best remedy for both is undoubtedly a regular treatment every June just before the time the eggs are usually laid, with deterrent washes, such as Formula V or the same with crude carbolic acid added in the proportion of 1 pint to 4 gallons of the wash, to be applied with a large brush to the bark of the trunks and larger limbs. When a tree is infested, the presence of the grub may be detected by the borings which it pushes out of its burrows and by the sunken discoloured appearance of the bark. By cutting through the bark the grub can be destroyed. If it has penetrated into the wood, it can be killed with a piece of stout pliable wire.

OCCURRING ON THE BARK.

10. THE SAN JOSÉ SCALE (*Aspidiotus perniciosus*).—Minute almost circular scale-insects, one thirtieth of an inch wide, shaped like an inverted saucer with a depressed ring around a central point. Inside this ring, black or dark-coloured. This very inconspicuous insect, when in small numbers, is easily overlooked, but when abundant gives to the bark a dirty, scurfy and grayish colour as though dusted with ashes. *Remedy*: This is by far the most difficult insect to eradicate which the fruit growers have ever had to deal with. In cases of bad infestation the destruction of infested trees with fire will be found the most economic course. The two treatments which have given the best results, are the spraying of trees in winter or before the buds burst with whale-oil soap solution (2 lbs. in 1 gallon of water) or with a 25 to 30 per cent application of crude petroleum and water. Experiments are now being carried on to discover a more effective safe remedy for this insect.

11. THE OYSTER-SHELL BARK-LOUSE (*Mytilaspis pomorum*).—Small scale-insects furnished with a beak and protected by a waxy scale one-tenth of an inch in length shaped somewhat like an elongated oyster shell. The young lice hatch in spring about 1st of June, when they possess legs and are active for a few days only; at this time they are soft and unprotected. There is only one brood in the year. *Remedy*: Spray the trees during winter with lime wash (1 or 2 lbs. of fresh lime to a gallon of water), or, when the young scale-insects hatch, spray with kerosene emulsion (Formula I) or whale-oil soap (Formula III).

There are several other kinds of scale-insects which occur upon the apple, which may be treated in the same way as the Oyster-shell Bark-lice.

12. THE WOOLLY APHIS (*Schizoneura lanigera*).—Clusters of white downy plant-lice, causing wart-like excrescences on the roots and stems or around wounds where a branch has been cut off. This insect is seldom a serious pest in the East, but is very troublesome in British Columbia. *Remedies*: Spray the colonies on the branches and trunks with kerosene emulsion or a wash made with 1 pound of concentrated lye and 1 pound of whale-oil soap in 5 gallons of water. For the root colonies, remove the surface soil to a depth of 6 inches, for a foot or two around the trunk and dig in tobacco dust or refuse from a tobacco factory.

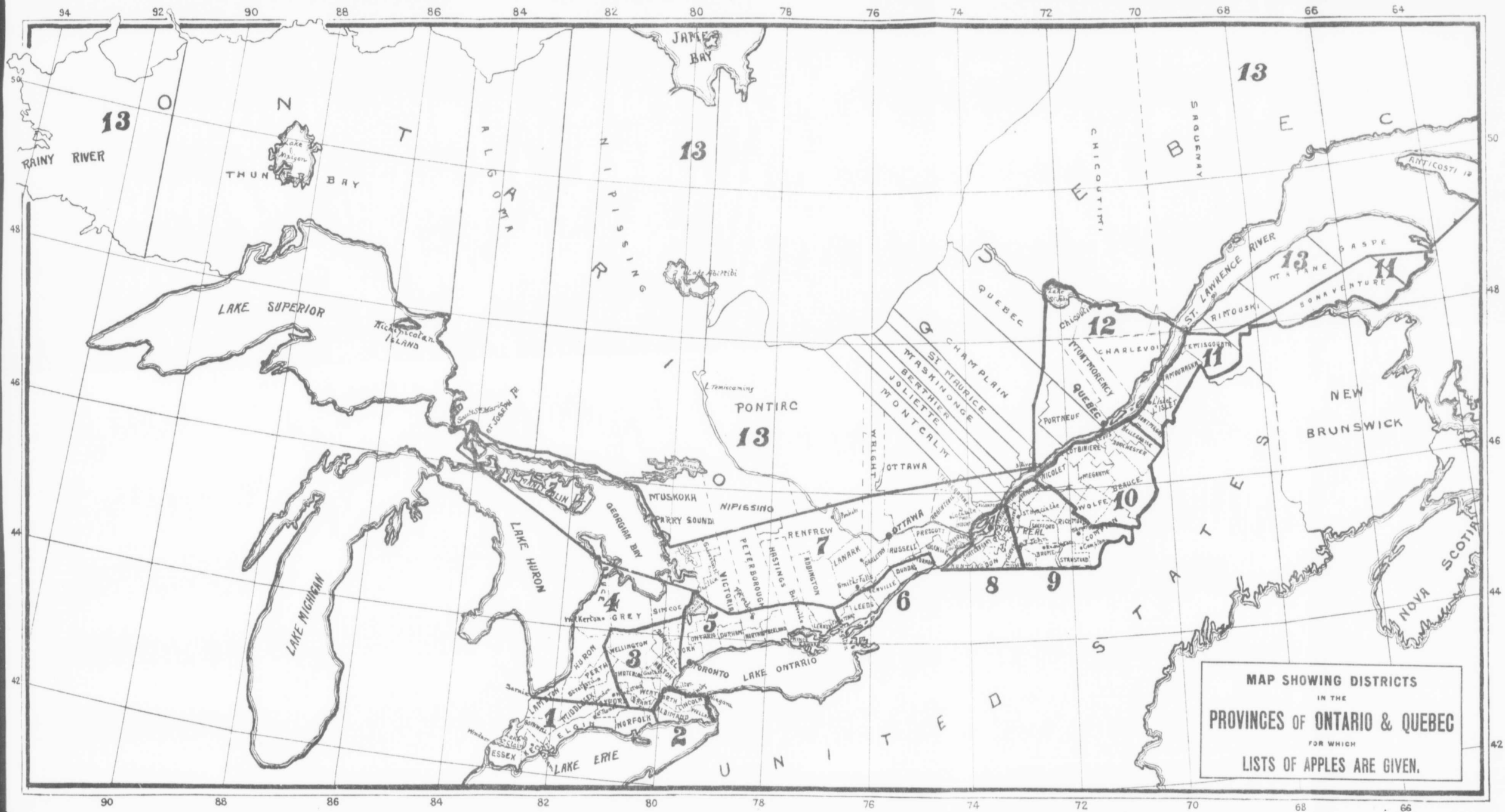
ATTACKING THE FRUIT.

13. THE CODLING MOTH (*Carpocapsa pomonella*).—This is the parent of the destructive Apple Worm so well known to all growers and consumers of apples all over the world. In Eastern Canada there is only one regular brood of the insect; west of Toronto there are two broods, the latter of which is by far the more destructive. Where there is only one brood, spraying with Paris green (Formula II or VI) three or four times in the spring, beginning immediately after the flowers have fallen, at intervals of ten days, is all that is required; where there are two broods, banding the trees in autumn with strips of burlap, whips of hay, or one of the many contrivances known as "tree protectors," will be found necessary. The caterpillars resort to these shelters when ready to spin their cocoons and can be easily destroyed at any time before the following spring, when the moths would emerge.

Besides protecting apple trees from the attacks of the Codling Moth, spraying with the poisoned Bordeaux mixture (Formula VI), as advised above, will destroy many other enemies which feed on the foliage, such as Cankerworms, Tent Caterpillars, Leaf-rollers, &c.

THE APPLE MAGGOT (*Trypeta pomonella*).—Slender white footless maggots $\frac{1}{4}$ of an inch in length, tapering gradually to the head and cut off abruptly behind, burrowing in all directions through the flesh of apples, feeding on the pulp and leaving brown channels. There are sometimes as many as a dozen maggots in a single apple. Infested fruit ripens prematurely and falls, when the maggots leave and, entering the soil a short distance, form puparia inside which they remain unchanged until the following spring. *Remedy*: Spraying is useless against this insect. The remedy most to be relied on is the prompt destruction of windfalls so as to prevent the maggots going into the ground. This can best be done by keeping a sufficient number of pigs, sheep or other stock in the orchard. The penning up of poultry beneath infested trees has been found a most useful practice.





MAP SHOWING DISTRICTS
 IN THE
 PROVINCES OF ONTARIO & QUEBEC
 FOR WHICH
 LISTS OF APPLES ARE GIVEN.